MMS OCS Study Number 2009-006

Synthesis: Three Decades of Research on Socioeconomic Effects Related to Offshore Petroleum Development in Coastal Alaska

Editors
Stephen R. Braund
Jack Kruse

Funded by: United States Department of the Interior
Minerals Management Service
Alaska OCS Region, Environmental Studies
Contract No. 1435-01-98-CT-30914

May 2009

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Photographs by Stephen R. Braund
Front Cover: Saint Lawrence Island and Nelson Island
Back Cover: Saint Lawrence Island

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This book is dedicated to the many residents of Alaska who have generously donated their time and energy to support social science research efforts with the trust that study reports will provide the information that government agencies need to make appropriate management decisions.

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The editors also would like to acknowledge the numerous researchers and authors who produced technical reports for MMS's Environmental Studies Program. Between 1975 and 2004, these researchers produced 167 Technical Reports (TRs) and nine Special Reports (SRs) that are the focus of this book.

Finally, the editors gratefully acknowledge the residents of rural Alaska communities who graciously participated in countless interviews over the past three decades in the expectation that their participation would assist in the assessment of potential affects of offshore oil and gas development and provide useful information to facilitate mitigation of any potential negative effects.

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Professor Haycox is a professor of American cultural history at the University of Alaska Anchorage, specializing in the relationship of Alaska to the history of the American west. He has published widely on Alaska Native history. His two most recent books are *Frigid Embrace: Politics, Economics* and *Environment in Alaska*, and *Alaska: An American Colony*. He recently won the prestigious Edith R. Bullock Prize, given by the University of Alaska Foundation. Dr. Haycox earned his Ph.D. at the University of Oregon, and he was selected as Historian of the Year by the Alaska Historical Society in 2003.

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Dr. Huskey is Professor of Economics at the University of Alaska Anchorage. He has been with the University since 1978. He completed his Ph.D. at Washington University in St. Louis, Missouri. Huskey's main area of research is the economics of remote regions, in particular the rural regions of Alaska. He has published a number of papers on the special economics of remote economies. He has also done research on the teaching of economics and and has also published two books designed to teach economic principles to middle school students. He is affiliated with the University's Center for Economic Education and served on the MMS OCS Scientific Advisory Committee from 1993 to 1999, with reinstatement in 2004.

Joseph G. Jorgensen

Dr. Jorgensen received his Ph.D. in anthropology with special emphasis on statistics, philosophy of science and linguistics from Indiana University and held professorships at the Universities of Oregon, Michigan, and California (retiring as Professor Emeritus from UC-Irvine in 2000). His many book publications on Native North American ethnology and linguistics include: Salish Language and Culture;

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Jack Kruse

Jack Kruse is Professor Emeritus of Public Policy at the Institute of Social and Economic Research (ISER), University of Alaska Anchorage. Dr. Kruse joined the ISER faculty in 1975 and conducted Alaska public policy research, usually through surveys, for more than 25 years. He directed ISER from 1994 to 1997, and since his retirement has continued his career of Arctic research. Over the years, his studies have included: the effects of Trans-Alaska pipeline construction on Fairbanks; the effects of oil development on the North Slope Iñupiat; and the effects of the 1986-88 recession on Alaskans. He has worked extensively with Alaska Native communities and is currently leading Alaska's part of an international survey of living conditions among aboriginal people throughout the Arctic. Dr. Kruse received his Ph.D. in Natural Resources from the University of Michigan specializing in social psychology, economics, and survey research.

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Dr. J. Steven Picou is Professor of Sociology and Chair of the Department of Sociology and Anthropology, University of South Alabama in Mobile. Over the last 28 years he has studied the social and psychological impacts of toxic contamination. Dr. Picou has also directed several interdisciplinary research teams that have investigated the human impacts of the *Exxon Valdez* Oil Spill. Dr. Picou's research has been supported by grants from the National Science Foundation and the Prince William Sound Regional Citizens' Advisory Council. He has authored or co-authored 12 articles, one edited book, eight book chapters and numerous research monographs on the social impacts of the *Exxon Valdez* Oil Spill. Dr. Picou received his Ph.D. in Sociology from Louisiana State University.

Dee M. Williams

Dr. Williams received a Ph.D. in cultural anthropology from Columbia University in the City of New York, with specialization in human ecology and economic development. As an international applied social scientist and scholar, he has worked throughout the Pacific Rim on issues of resource management and culture change among subsistence-oriented minority populations. His work on land degradation and modernization problems in Asia culminated in many journal articles and a published book entitled *Beyond Great Walls: Environment, Identity, and Development on the Chinese Grasslands of Inner Mongolia* (Stanford, 2002). In 2003, Dr. Williams assumed the role of Contracting Officer's Technical Representative on this MMS book project after he moved to Anchorage to become the Socio-cultural Specialist for the Environmental Studies Program in Alaska.

Robert J. Wolfe

Dr. Robert J. Wolfe is senior researcher of Robert J. Wolfe and Associates, a social science group that conducts basic and applied research, located in San Marcos, California. He holds a Ph.D. in sociocultural anthropology with specialties in subsistence economic systems in Alaska and medical anthropology. From 1982-2001 he was the Research Director for the Division of Subsistence in the Alaska Department of Fish and Game. Prior to that, he taught at the University of Southern California, Division of Health Sciences. He has conducted applied research on subsistence fishing and hunting throughout Alaska.

Rosita Worl

Dr. Worl has made important contributions in developing public awareness of Alaska Native cultures and subsistence economies. She has completed many landmark studies and reports on bowhead whale and seal hunting, impacts of industrial development on Native communities, repatriation, and Tlingit real and intellectual property laws. Worl holds a doctoral degree in anthropology from Harvard University. She serves as the President of the Sealaska Heritage Institute, which is dedicated to preserving and maintaining the Tlingit, Haida, and Tsimshian cultures and languages. She also holds an appointment as an assistant professor of anthropology at the University of Alaska Southeast and serves on many boards, including the Sealaska Corporation and the Alaska Federation of Natives (AFN).

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List of Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
AEWC	Alaska Eskimo Whaling Commission
AFN	Alaska Federation of Natives
ANCSA	Alaska Native Claims Settlement Act
ANIA	Arctic Institute of North America
ANILCA	Alaska National Interest Lands Conservation Act
ANIMIDA	Arctic Nearshore Impact Monitoring in the Development Area
ANWR	Arctic National Wildlife Refuge
AOSIS	Alaska OCS Social Indicators System
APF	Alpine Central Processing Facility
ARCO	Atlantic Richfield Co.
ARCON	Arctic Contractors
ARCSS	Arctic System Science
Arctic IMPAK	Arctic and Sub-arctic Economic Impact Models for Petroleum Activities in Alaska
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BP	British Petroleum
BPXA	British Petroleum Exploration (Alaska)
CCC/HOK	Crittenden, Cassetta, Cannon/Hellmuth, Obata and Kassabaum
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
COR	Conservation of Resource Model
CPAI	ConocoPhillips Alaska, Inc.
EIS	Environmental Impact Statement
ESP	Environmental Studies Program
ETO	Exposure to Oil Model
EVOS	Exxon Valdez Oil Spill
FWS	Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
HUD	Housing and Urban Development
IAI	Impact Assessment, Inc.
IAP	Integrated Activity Plan
ISER	Institute of Social and Economic Research
KANA	Kodiak Area Native Association
KSOPI	Kuukpik Subsistence Oversight Panel, Inc.
MAP	Man-in-the-Arctic Program
MMS	Minerals Management Service
NARL	Naval Arctic Research Laboratory
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPR-A	National Petroleum Reserve-Alaska
NPS	National Park Service
NRC	National Research Council
NSF	National Science Foundation
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OMB	Office of Management and Budget

PBOC	Prudhoe Bay Oilfield Complex
PMM	Peat, Marwick, Mitchell & Co.
PTSD	Post Traumatic Stress Disorder
PWSRCAC	Prince William Sound Regional Citizens' Advisory Council
RAM	Rural Alaska Model
RRC	Renewable Resource Community Model
RFSUNY	Research Foundation of State University of New York
SAP	NPR-A Subsistence Advisory Panel
SIA	Social Impact Assessment
SPSS	Statistical Package for the Social Sciences
SR	Special Report
SRB&A	Stephen R. Braund & Associates
TR	Technical Report
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
USDOI	United States Department of the Interior
USGS	U.S. Geological Survey

Preface

Dee M. Williams, Ph.D.

This book intends to review, synthesize, and contextualize three decades of social research efforts in Alaska (1975-2004). The impetus and funding for the project came from the Environmental Studies Program (ESP) in the Alaska regional office of the Minerals Management Service (MMS), Offshore Program. As the current Socio-cultural Specialist of that institution, it is my responsibility to explain in brief the major purposes and processes that lie behind the production of this book and the large collection of social research on which it is based. The retrospective moment also provides a rare opportunity to address the signals of popular misunderstanding about our work that occasionally surface in the public imagination. But more importantly, the completion of this book provides a welcome occasion to revitalize agency dialogue with the many stakeholders of coastal communities throughout Alaska to whom our work, and this book, is dedicated.

Background

The ESP was established and funded by the United States Congress to support the offshore oil and gas leasing program of the Department of Interior in pursuit of national energy policies.[1] Administered originally in 1973 by the Bureau of Land Management (BLM), then by the MMS since 1982, the consistent mandate of the ESP has been to establish the information needed for assessment and management of potential impacts from oil and gas development on the Outer Continental Shelf (OCS) and coastal environments. The OCS refers to 1.76 billion acres of Federal jurisdiction lands submerged under the ocean seaward of State boundaries, generally beginning three geographic miles off the coastline (for most states) and extending for 200 miles. The Outer Continental Shelf Lands Act (OCSLA) of 1953, as amended (43 U.S.C. 1331 et seq.), provide guidelines for balancing orderly energy resource development with protection of the human, marine, and coastal environments. The basic responsibility is

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[1] The United States is concurrently the world's largest energy producer, consumer, and net importer. At the beginning of 2004, the nation produced about 7.8 million barrels of oil per day, of which 5.7 was crude oil and the rest was natural gas and other liquids. But the nation consumed over 20 million barrels of petroleum products per day, and about 62% of that supply must be imported. Proven domestic oil reserves are concentrated overwhelmingly in four states: Texas (22%), Louisiana (22%), Alaska (20%), and California (18%). These figures include onshore, plus Federal and state offshore reserves. Source: Energy Information Administration (April, 2004), <eia.doe.gov/emeu/cabs/usa.html#back>

to expedite mineral resource exploration and development at fair market value in a safe and responsible manner. To help meet these and many other administrative requirements, the ESP has maintained a strong marine natural science emphasis in the study of physical oceanography, oil spill fate and effects, biology, and protected species. In the Alaska region, the ESP has also supported a longstanding social science research component to monitor and help develop mitigation for possible exploration and development effects on the human environment.

Through fiscal year 2004, the Department of Interior has funded more than $768 million nationwide through the ESP to produce environmental studies of the OCS in support of oil and gas lease sale decisions.[2] Approximately $286 million has been directed into environmental studies in the Alaska region, with $24.5 million expended on social science research efforts alone. This equates to approximately $47 million in constant contemporary dollars. Since 1975, the social research component in Alaska has produced more than 200 scientific reports, including 167 Technical Reports and 9 Special Reports, with at least 30 multi-volume titles. To date, these reports have informed more than 60 published Environmental Impact Statements (EIS), including both draft and final versions, in support of 22 lease sales throughout coastal Alaska, and two development and production plans in the Beaufort Sea. These reports have also informed a slate of evolving lease sale mitigation measures, including standard stipulations, Information to Lessee clauses, and Required Operating Procedures for the regulation of industrial activities. The reports have also informed the permitting process for 14 pre-lease stratigraphic test wells and 83 post-lease exploration wells drilled across seven planning areas throughout the State.

It is relevant to note that the offshore leasing process in Alaska has generated more than $6 billion in revenues (through bonuses, rents, and royalties) that have been channeled into the Federal Treasury. Another $591 million in revenues have been distributed among the State of Alaska, Alaska Native organizations, and local communities through a variety of different appropriation vehicles.[3] By state formula, 50 percent of the offshore Federal revenues paid to Alaska (through OCSLA Section 8(g)

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[2] Regional offices currently operate on the Pacific Coast (Camarillo, CA), the Gulf of Mexico (New Orleans, LA), the Atlantic Coast (managed from New Orleans, LA), and Alaska (Anchorage), with national headquarters located in Herndon, VA.

[3] These appropriation vehicles have included: Outer Continental Shelf Lands Act, Section 8(g) disbursements ($531 million); Land and Water Conservation Fund disbursements (estimated $32 million); National Historic Preservation Fund disbursements (estimated $13 million); Coastal Impact Assistance Appropriations ($12.2 million); and Tribal Preservation Fund disbursements ($2.8 million). These figures are current through 2004.

disbursements) goes into the Permanent Fund Account and thereby provides direct financial benefit to every qualified resident on an annual basis. Since the ESP social science reports play a significant role in the leasing process, they also belong to the vast constellation of activities that help to generate these substantial government revenues.

Purpose

The Alaska ESP social research reports embody a remarkable amount of collective effort and money, and they constitute a distinctive aggregation of social science literature. At a minimum, the reports are noteworthy if only for the comprehensive temporal and spatial scale on which they document relevant data and analysis of social conditions throughout coastal Alaska during formative years of statewide development. The sheer magnitude of the research effort is impressive, and yet the collection has become increasingly complex to utilize with each newly completed study. The MMS thus commissioned this book, as a social scientist peer-reviewed publication, to provide a broad synthesis of the highlights of its longstanding social research efforts in Alaska. The book, with its companion DVD-ROM that includes 176 MMS technical reports and nine special reports in electronic .pdf format, is intended to facilitate and enhance convenient public and professional access to a vast reservoir of information whose utility for monitoring social change will extend far into the future. The book may best be considered a working tool and road map because it serves more as an index of historical efforts for the ongoing navigation of current and future analytical needs than it does as a static artifact of final conclusions.

More than two hundred formal reports produced over a span of some thirty years present a formidable collection of details for any person to review, and the editors and authors of this book have made a commendable effort to extricate and identify key findings from the literature. They appropriately draw attention to highlights relating to various categories of research topic, research method, and historical shifts in programmatic agenda. But they do not ─ and could not reasonably be expected to ─ distill *all* that is significant from MMS social research in Alaska, nor can they possibly eliminate the subjective dimensions of an editorial exercise that requires interpreting and implicitly evaluating the work of so many different individuals in pursuit of so many different objectives. In light of these realities, some adjustments in format have occurred during the production of this book that will hopefully enrich the discussion and amplify the range of insights available to each reader.

One adjustment involves the presentation toward the end of the book of three discussant essays, written by veteran social research contractors in Alaska, which provides a forum to explore and reflect upon alternative conceptions of "key findings" from the same body of MMS literature. These essays appear in Chapter Ten. The MMS asked the discussants to read the book and to add their own constructive perspectives to the subjective question of thematic synthesis on a broad scale: "What specific aspects of the social research experience in Alaska should be emphasized for additional consideration?" The resulting discussion is intended to enhance the reader's experience of the book with respect to thematic content, scholarly balance, and scientific merit.

A second adjustment involves adding Appendix B to explain more about the institutional context of MMS social research that otherwise would remain largely undisclosed in the book. Several key points about agency realities deserve emphasis there as essential background to the analysis and discussion that follows in the book. In sequence, these background topics include: agency jurisdiction, scale of effort, contract management, study planning and procurement, and programmatic highlights.

Since 1975, the social research component of the ESP has come a long way, and this book tells much of that story. The primary environmental issue has always been the risk of an oil spill, and although ESP data can help to clarify the parameters and consequences of a possible spill event, research can never resolve the underlying political issue of what constitutes an acceptable level of risk in relation to perceived benefits. Neither can social research ever resolve the fundamental issue of asymmetric risks and benefits distributed among various stakeholders. But research can clarify the social parameters of potential impact and risk, and strive to document as clearly as possible the wide range of implications that attach to alternative management decisions, even as local communities attempt to maintain some control over the level of oil development that might occur in their midst. That worthwhile effort, and the chronicle of its progression in Alaska, merits our close attention.

Chapter 1 - Introduction

Stephen R. Braund[1] and Jack Kruse[2]

[1]Stephen R. Braund & Associates, Anchorage, Alaska
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Over the past 40 years, oil development has played a central role in the lives of most Alaskans. Oil revenues have paid for village high schools, annual permanent fund dividend checks to every resident, satellite earth stations, and bought many capital improvements such as airports and even premier convention and performing arts facilities to many communities. More generally, petroleum activities have directly and indirectly accounted for at least one out of every three jobs in Alaska since 1975 (Goldsmith 1997). The prospect of oil and natural gas also gave Alaska Natives the leverage needed to achieve a land claims agreement (Mitchell 2001:314). Oil resources have provided the tax base for the North Slope Borough for over 20 years. People throughout the state have experienced at least some of the economic benefits of oil development. Development itself has occurred primarily in rural areas used for subsistence purposes by Native peoples who have occupied the area for thousands of years. Fears of development impacts on subsistence has been a primary concern and became a reality with the *Exxon Valdez* Oil Spill (EVOS), although this spill was unrelated to offshore petroleum development.

This book synthesizes three decades of social research, between 1975 and 2004, related to the potential effects of offshore oil development on the peoples of Alaska. The U.S. Department of Interior Minerals Management Service (MMS), through its Environmental Studies Program (ESP) within the Leasing and Environment Division, funded most Alaska social science research in the 1980s and early 1990s. Between 1975 and 2004, this program produced 167 technical and nine special social and economic reports (see Appendix A). The first objective of this introduction is to describe the social research component of the Alaska ESP program.[4] An explanation of how the federal government initially designed the social component of the ESP and how it evolved will help the reader to understand how the federal government intended the different types of studies to fit together. It will also provide useful background information

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[4] During the first 19 years of its existence (1975-1994), the social research component of the ESP was recognized under its own name as the Social and Economic Studies Program, or SESP. Since 1994, MMS has considered all research under the ESP as one program. To minimize confusion between the SESP and post-SESP eras of research, we have chosen to use "social component of the ESP" or simply "ESP" throughout the book to refer to Alaska Outer Continental Shelf ESP-sponsored social science research.

for the reader to understand better the discussions of the technical reports in the following chapters. The second objective in this chapter is to familiarize the reader with the other primary sponsors of social science research in Alaska, and to demonstrate how the different streams of research funding have complemented each other.

The Social Research Component of the MMS Environmental Studies Program

By the mid-1970s, with the effects of the Trans-Alaska Pipeline construction boom still reverberating throughout Alaska, the Department of Interior included a human component within its environmental impact assessment of offshore oil development. After all, Outer Continental Shelf leasing could launch the next big wave of development, and with such development could come potentially enormous effects on isolated coastal communities, given all indications from the pipeline boom.

The coastal waters more than three miles (the state/federal boundary) and up to 200 miles offshore of the United States are known as the Outer Continental Shelf (OCS) and includes "…all submerged lands lying seaward of the State/Federal boundary" (Figure 1.1)[5]. Agencies within the federal Department of the Interior have been responsible for management, exploration and development of mineral resources in the OCS[6]. Prior to the establishment of the MMS in 1982, the Bureau of Land Management (BLM) had this responsibility.

In 1953, Congress passed the Outer Continental Shelf Lands Act (OCSLA), giving the Secretary of the Interior authority to manage mineral resources on the OCS. In addition, Congress gave the Department of Interior the responsibility for collecting and distributing any revenues that result from the production of oil and gas, issuing permits for oil and gas exploration, development and production, and for inspecting all activities conducted on the OCS, as well as issuing leases and regulating operations conducted on the OCS. The federal government considered oil and gas development within the OCS extremely important because the government estimated that the OCS contained nearly 17 percent of domestic oil reserves, 25 percent of natural gas reserves and other resources of commercial value such as manganese, gold, phosphorite, and construction aggregates.

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[5] See http://www.mms.gov/ooc/newweb/q&a.htm p.1

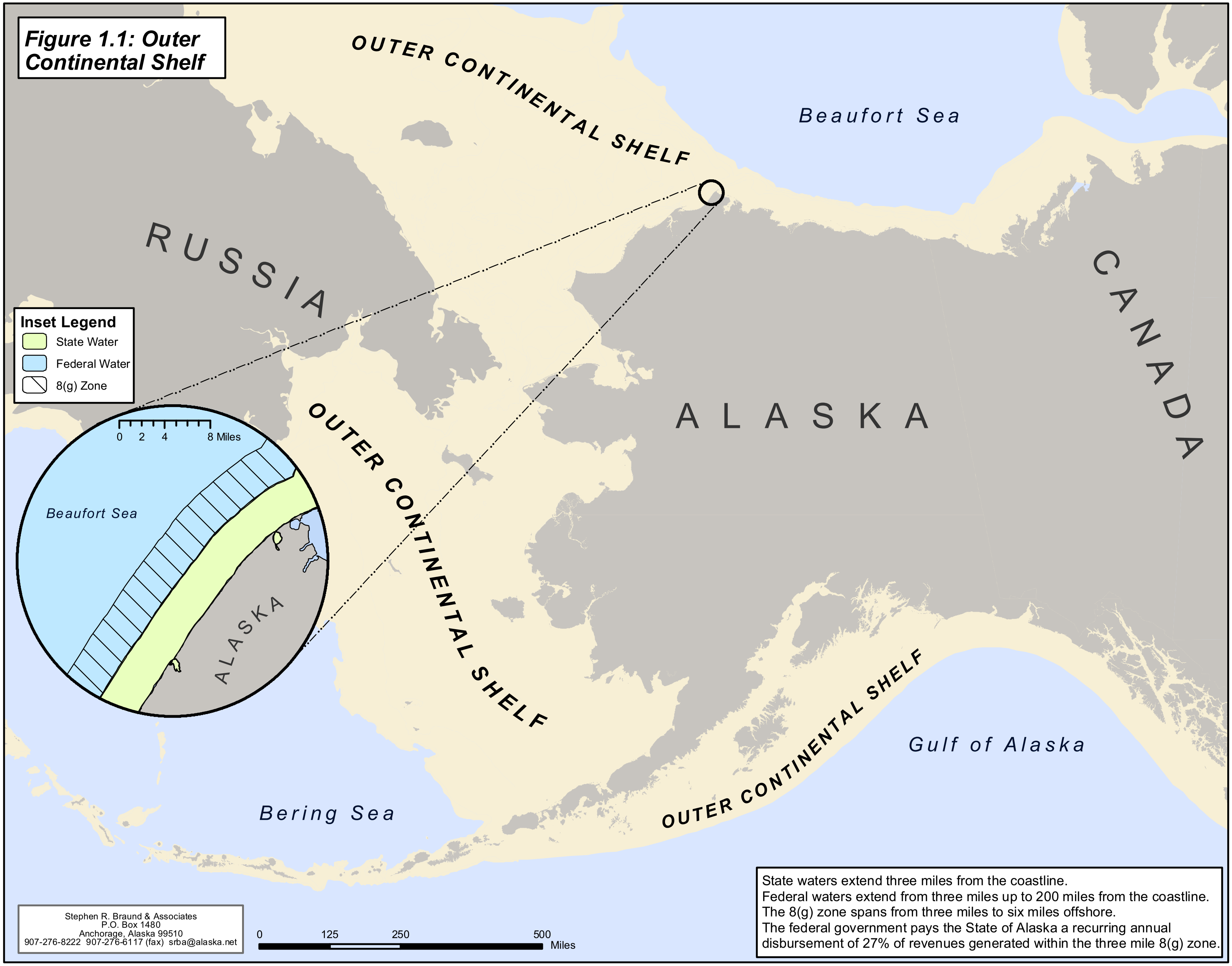
Figure 1.1: Outer Continental Shelf
OUTER CONTINENTAL SHELF
Beaufort Sea
RUSSIA
ALASKA
CANADA
Inset Legend
State Water
Federal Water
8(g) Zone
0 2 4 8 Miles
Beaufort Sea
ALASKA
OUTER CONTINENTAL SHELF
Gulf of Alaska
OUTER CONTINENTAL SHELF
Bering Sea
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0 125 250 500
Miles
State waters extend three miles from the coastline.
Federal waters extend from three miles up to 200 miles from the coastline.
The 8(g) zone spans from three miles to six miles offshore.
The federal government pays the State of Alaska a recurring annual disbursement of 27% of revenues generated within the three mile 8(g) zone.

Chapter Two details the history of petroleum development in Alaska. Important to understanding the evolution of federal government management of the OCS is the discovery of a large onshore oil field at Prudhoe Bay in 1967 and the energy crisis of the early 1970s. The federal government greatly accelerated its leasing program in the mid-1970s in response to these events (Peat, Marwick, Mitchell & Co. [PMM] 1978b:3). The National Environmental Policy Act (NEPA) of 1969, and amendments to the OCSLA passed in 1978, mandated the MMS to prepare an Environmental Impact Statement (EIS) prior to any offshore lease sale if the action could have significant environmental effects. These acts also mandated that the federal government consider the effects of major federal actions on the human environment. Section 256.82 of Title 30 in the Code of Federal Regulations (CFR) integrated the mandates of these acts in terms of the responsibilities of the MMS:

> (a) The Director shall conduct a study of any area or region included in any lease sale in order to establish information needed for assessment and management of impact on the human, marine and coastal environments which may be affected by OCS oil and gas activities in such area or region ....
>
> (d) After the leasing and developing of any area or region, the Director shall conduct such studies as are deemed necessary to establish additional information and shall monitor the human, marine and coastal environments of such area or region in a manner which can be compared with the results of studies conducted prior to OCS oil and gas development. This shall be done to identify any significant changes in the quality and productivity of such environments, to establish trends in the areas studies, and to design experiments identifying the causes of such changes. Findings from such studies shall be used to recommend modifications in practices which are employed to mitigate the effects of OCS activities and to enhance the data/information base for predicting impacts which might result from a single lease sale or cumulative OCS activities.

The CFR contains two additional directives relevant to the social component of the MMS program:

> Section 251.2 (r) "Human environment" means the physical, social, and economic components, conditions, and factors which interactively determine the state, condition, and quality of living conditions, employment, and health of those affected, directly or indirectly, by activities occurring on the OCS.
>
> Section 256.82 (e) Information available or collected by the studies program shall, to the extent practicable, be provided in a form and in a time frame that can be used in the decision-making process associated with a specific leasing action or with longer term OCS minerals management responsibilities.

The Department of Interior, BLM initiated its ESP in 1973, formulated the purposes and objectives of the social research component of the ESP in 1975, and implemented the social research component of the ESP program in 1976 (Banks 1986). The purpose of the ESP is to gather and analyze environmental, social, and economic information to assist with MMS EIS preparation and facilitate sound decision-making related to the MMS offshore oil and gas program. The purpose of the social component of the

ESP, and the primary focus of this book, is to focus on the social and economic questions, and to natural and physical environmental factors important to answering these questions.

The federal government faced the dilemma of where and how to start to fulfill its mandate to assess the potential effects of offshore oil development in Alaska. The challenge was immense in a number of dimensions. To begin with, Alaska's coastline is almost as long as that for the entire lower 48 states (5,580 statute miles compared with 6,053 statute miles)[7]. Little current information was available about who lived in the coastal communities where offshore oil and gas activity might occur, how these people earned their living, what was the social and political structure in these communities, and how might offshore development affect them.

It is also important to keep in mind that the economic, social and political landscape of coastal Alaska was significantly different in the mid-1970s than it is today. Prudhoe Bay oil had just started to flow, there were no federal offshore leases, and there were no existing offshore oil development EISs to consult for guidance. The 1971 Alaska Native Claims Settlement Act (ANCSA) was only a couple of years old, and the significance of its full effect had not emerged. Regional Native corporations established under the Act were in their infancy and over 200 village corporations in Native Alaska faced difficulties in trying to understand the rules and procedures of corporate America. The North Slope Borough had only been in existence a year when the ESP started. The International Whaling Commission had not yet imposed a bowhead whale quota for Alaska coastal whaling communities. The Alaska Eskimo Whaling Commission did not yet exist, and Congress had not yet passed the Alaska National Interest Conservation Lands Act. Only after the passage of the Alaska National Interest Conservation Lands Act in 1980 did subsistence develop as the controversial issue it is today.

It was clear that, by definition, OCS leases would occur offshore. It was less clear, however, where development activities themselves would occur. Developers might locate staging areas and even supply bases miles from drilling areas. Coastal communities lacked the docks and other infrastructure to make them likely candidates for staging areas and supply bases, thereby increasing the geographic uncertainty. Still, nearby coastal communities would likely experience the most immediate effects of offshore

[7] Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Ocean Service

development. The residents of these Alaska coastal communities are primarily Alaska Natives, including the Iñupiat along the Chukchi and Beaufort seas, the Yup'ik in Southwest Alaska and Saint Lawrence Island, the Eyak in the Copper River Delta, the Alutiiq in Prince William Sound, Kodiak and the Alaska Peninsula, the Aleut along the Aleutian Islands, the Tlingit, Haida and Tsimshian in Southeast Alaska, and the Athabaskan in Southcentral Alaska (Figure 1.2).

While Alaska's coastal Native communities were a logical focus for the social research component of the ESP, these communities were not a part of mainstream America. The range of potential impacts and the research required to understand them would require multiple social science disciplines and innovative applications of research methods. Even the logistics of traveling to remote communities or communicating with them promised great difficulties. Weather often resulted in flight cancellations, for example, and telephone service was still spotty and unreliable at that time.

In late 1975, the Department of Interior, through the Alaska Sea Grant Program, involved social scientists from the Department, the State of Alaska, the University of Alaska and private consultants to create the "Study Plan for Social and Economic Impact Assessment of Alaska Outer Continental Shelf Petroleum Development" (University of Alaska Fairbanks Sea Grant 1975, as cited from Banks 1986). The plan stated, "These changes [resulting from OCS development], however, go beyond conventional economic considerations and are of deeper social and cultural significance. The ultimate objective of this research program is to arrive at a basis for prediction and evaluation of the changes" (ibid., 3-4). Following the publication of the Alaska Sea Grant report of the conference, the Department of Interior issued a request for proposals to manage a social research program within the ESP. The BLM chose the general contracting firm of Peat, Marwick, Mitchell and Company as the lead institution to manage the social component of the ESP. When MMS later assumed responsibilities for OCS planning and development from the BLM in 1982, it also assumed direct responsibility of managing the ESP.

Evolving Design of the Social Component of the ESP

ESP research informs specific leasing decisions. The federal government was planning lease sales when BLM first implemented the social component of the ESP in 1976. The government had to prepare EISs before these lease sales could take place. The challenge was enormous. To meet this challenge, PMM immediately commissioned two categories of background studies: *study methods* and *case studies*.

Figure 1.2:
Native Peoples of Alaska
Source: Krauss, 1982
Arctic Ocean
Beaufort Sea
Chukchi Sea
Inupiat
Athabaskan
Siberian Yup'ik
Yup'ik
Bering Sea
Alutiiq
Eyak
Tlingit
Tsimshian
Gulf of Alaska
Haida
Aleut
Pacific Ocean
Stephen R. Braund & Associates
P.O. Box 1480
Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net
0
125
250
500
Miles

Early technical reports intended to lay a foundation for subsequent study methods included:

- Definition of Alaska Petroleum Development Regions (PMM et al. 1978, TR1[8])
- Literature Survey (PMM et al. 1977a, TR2)
- Statewide [Economic and Demographic] Impacts of OCS Petroleum Facilities Development in Alaska (Institute of Social and Economic Research [ISER] 1979a, SR1)
- Anchorage Socioeconomic and Physical Baseline (Ender, Gehler, Gorski, and Harper 1978a, TR12)
- Design of a Population Distribution Model (Huskey, Serow, and Volin 1979, TR24)
- Small Community Population Impact Model (ISER, 1980a, SR4)
- Historic Indicators of Alaska Native Culture Change (Cultural Dynamics, Ltd. 1978, TR15)
- OCS Visual Resources Management Methodology Study (Harmon, O'Donnell, and Henninger Associates 1979, TR27)

Early case studies included:

- Prudhoe Bay Case Study (Crittenden, Cassetta, Cannon/Hellmuth, Obata and Kassabaum, Inc. [CCC/HOK, Inc.] 1978, TR4)
- Alyeska/Fairbanks Case Study (Wordsmiths 1978, TR14)
- Case Study of Copper Center, Alaska [a community along the route of the Trans-Alaska pipeline] (Reckord 1979, TR7)
- Developing Predictive Indicators of Community and Population Change [comparative analyses of household survey data for Fairbanks and Valdez] (ISER, 1979b, TR26)
- Socioeconomic Impacts of Selected Foreign OCS Developments (Habitat North 1979, TR28)

Authors of the following chapters discuss all but four of these studies. The present discussion focuses on an early study important to understanding the initial design of the social component of the ESP, and briefly addresses the other three studies not discussed elsewhere.

Peat, Marwick, and Mitchell led a consortium of firms on one of the first background studies with the goal to identify Petroleum Development Regions and to identify the stages of offshore petroleum development, both being important elements of the design of the social component of the ESP. For

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[8] Throughout this book we include in the citation of MMS Technical Reports the technical report number (e.g., "TR1"). Appendix 1 contains a comprehensive listing of MMS Technical Reports, including the technical report number and the "OCS Study Number" later assigned to reports.

purposes of petroleum exploration and drilling, the federal government had already divided the Alaska OCS into lease sale basins, called "OCS Planning Areas" (Figure 1.3). The social component of the ESP called for the identification of corresponding onshore areas, called Petroleum Development Regions, "to guide data collection and to facilitate the research necessary to perform other program tasks" (PMM, URSA, CCC/HOK and Dames & Moore 1978:1, TR1).

Authors of the program's first technical report (PMM, URSA, CCC/HOK, and Dames & Moore 1978, TR1) defined Petroleum Development Regions by first estimating how OCS activity (exploration, development, production, and phase-out) might occur offshore and identifying where there might be onshore direct impacts such as support services for offshore activities. The authors of Technical Report No. 1 next identified the larger outlying area potentially directly or indirectly effected by social, cultural, economic, political and physical associations with the areas of direct impact. For example, if Nome became a base of operations for drilling in the Bering Sea, other villages on the Seward Peninsula might experience employment opportunities in Nome and/or disruptions to the natural resources stemming from the marine traffic between Nome and offshore facilities.

Making the best use of available data (e.g., population and labor statistics) also influenced the definition of regions. The authors of Technical Report No. 1 sought to make the boundaries of the Petroleum Development Regions consistent with the boundaries of regional units by which existing public data were maintained (e.g., census districts). Ultimately, they followed Native corporation boundaries to a larger degree than other agencies. The Native corporations were a logical regional model because they represented many interrelated geographic and cultural features. Additionally, Native corporations were increasingly the focus of socioeconomic research, yielding a body of data on which the MMS research program could build. The result of the above considerations were seven Petroleum Development Regions (Figure 1.4). The regions were:

- Gulf of Alaska, containing
    - North Gulf of Alaska
    - Lower Cook Inlet
    - Kodiak
- Beaufort Sea
- Bering-Norton
- Bering-St. George
- Kodiak-Aleutian


Figure 1.3: OCS Planning Areas
Source: Minerals Management Service, Mapping and Boundary Branch
Arctic Ocean
RUSSIA
Chukchi Sea
Beaufort Sea
Barrow
Prudhoe Bay
ALASKA
CANADA
Hope Basin
Nome
Norton Basin
Fairbanks
Bering Sea
St Matthew Hall
Navarin Basin
Bethel
Anchorage
Valdez
Cook Inlet
Juneau
Aleutian Basin
St George Basin
North Aleutian Basin
Bowers Basin
Gulf of Alaska
Kodiak
Shumagin
Aleutian Arc
Pacific Ocean
Stephen R. Braund & Associates
P.O. Box 1480
Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net
0 125 250 500 Miles

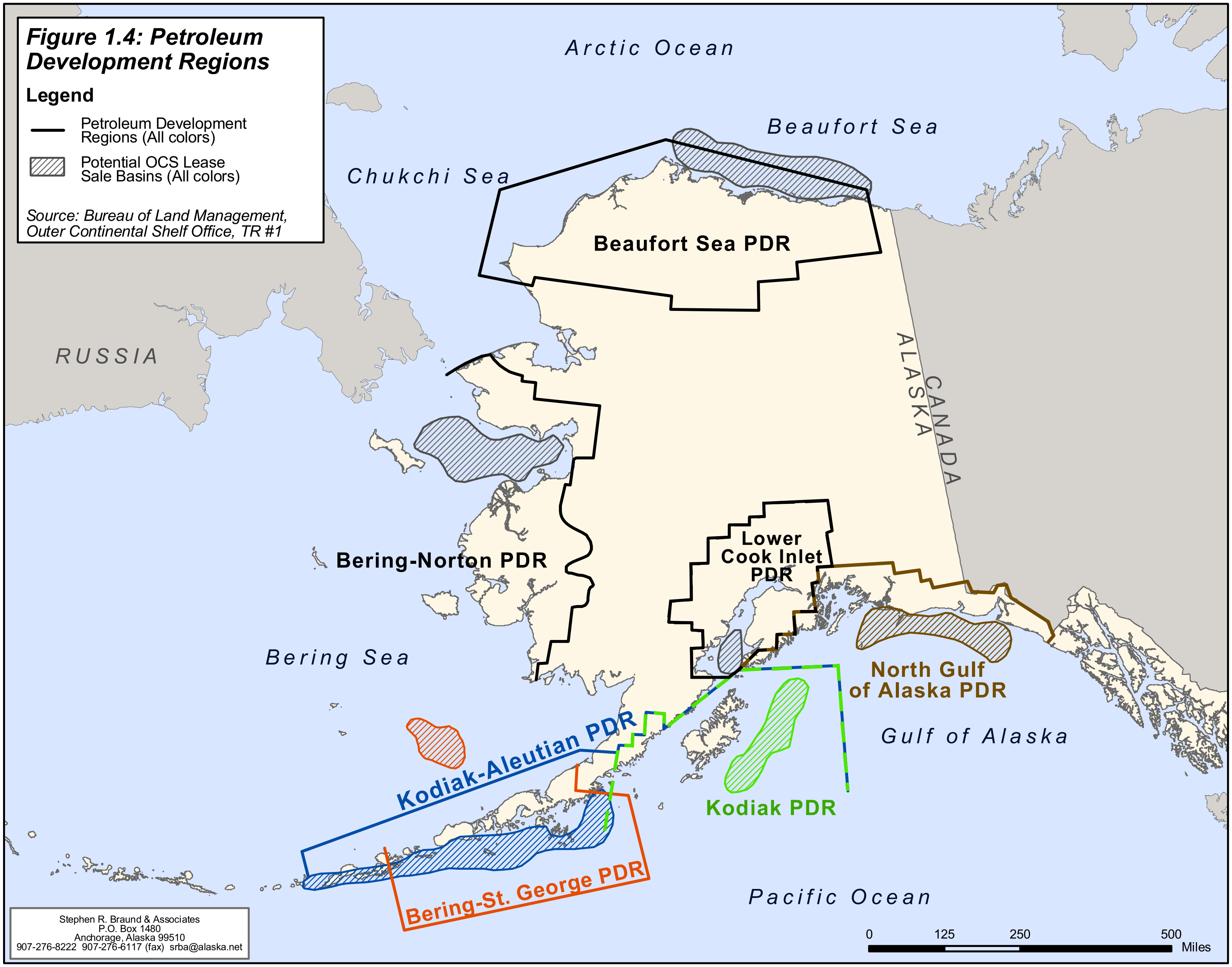

Figure 1.4: Petroleum Development Regions
Legend
Petroleum Development Regions (All colors)
Potential OCS Lease Sale Basins (All colors)
Source: Bureau of Land Management, Outer Continental Shelf Office, TR #1
Arctic Ocean
Beaufort Sea
Chukchi Sea
Beaufort Sea PDR
RUSSIA
ALASKA
CANADA
Bering-Norton PDR
Lower Cook Inlet PDR
North Gulf of Alaska PDR
Bering Sea
Gulf of Alaska
Kodiak-Aleutian PDR
Kodiak PDR
Bering-St. George PDR
Pacific Ocean
0
125
250
500
Miles
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The first technical report went beyond the identification of study regions to identify the geographic units requiring data. Recognizing “traditional” and “modern” systems in Alaska, the authors identified the need to design a research program that would rely on existing socioeconomic data at the regional level (e.g., population, employment, vital statistics, revenue, and epidemiological information) and accommodate the collection of new data about the “traditional” systems for which little information had been developed. The report described these traditional systems as the “small remote communities whose people have a broad cultural diversity and are intimately dependent on the local physical environment (PMM et al. 1978:2, TR1). Thus, the geographic units for effects assessment included the State of Alaska as a whole, the regions where oil and gas development was likely to occur, and, within these regions, communities (PMM et al. 1978, TR1).

A second objective of the first technical report was to identify the stages of offshore petroleum development important to the prediction of social and economic impacts[9]. The researchers differentiated between four stages of OCS activities: exploration, development, production, and phase-out (PMM et al. 1978, TR1). Exploration included preparation of environmental impact studies and public hearings, lease sales, and exploratory drilling using jack-ups, semi-submersible rigs, or drill ships. Such activity might require onshore support facilities to assist the transportation and housing of people and equipment engaged. The researchers noted the Department of Interior’s expectation that wherever possible and economically feasible, onshore support activities would be located in existing coastal communities.

Researchers expected development, the second stage, to involve drilling production wells from steel or concrete platforms. Support would include storage, dehydration, compression and separation facilities, all expected to be contained offshore. Also anticipated were transportation modes to move products to shore, or offshore tanker moorages to take on oil. Other facilities might involve onshore storage facilities, ports or pipelines.

The most relevant aspects of the third stage of OCS activity, production, were state and regional government revenues, direct employment, and the attending risk of oil spill. The final stage of OCS

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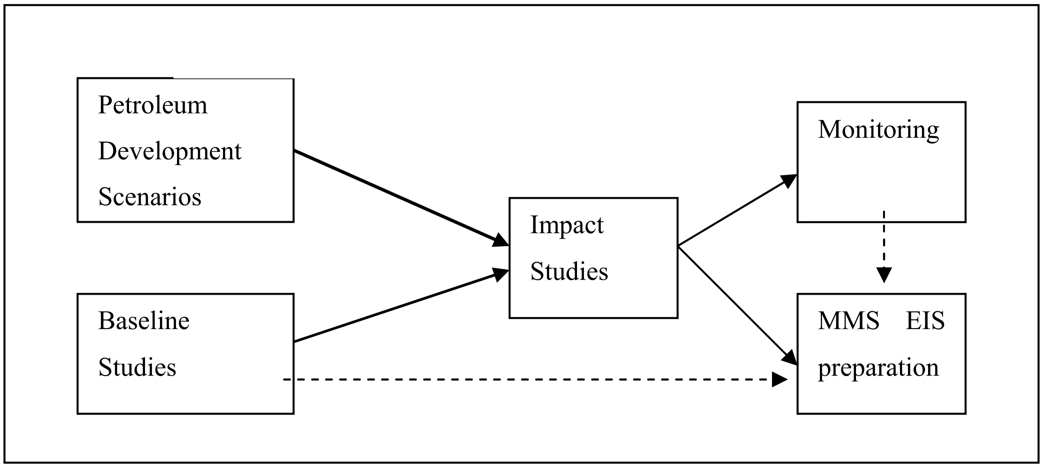
[9] For a more recent description of the stages in petroleum development (e.g., anticipation, platform construction, operation, storage and shipment, abandonment), see Appendix H of the Beaufort Sea Environmental Analysis, Proposed Oil and Gas Lease Sale 195, 2004.

activity was phase-out, which could result in transfer of facilities to public or private entities in regional communities, and a statewide effect on public revenues, expenditures, and associated employment.

The synthesis chapters to follow discuss all but four of the early background and case studies. One of the four, Technical Report No. 1, is summarized above. The other three early studies not covered elsewhere are briefly mentioned here. Technical Report No. 2. contains a comprehensive survey of literature as of 1977 (PMM et al. 1977a). The scope of the literature search included the state as a whole and four of the major petroleum development areas identified in Technical Report No. 1: Beaufort Sea, Bering Sea-Norton Sound, Southwest (Bering Sea-St. George, Kodiak-Aleutian), and Gulf of Alaska (Cook Inlet, Kodiak and Northern Gulf of Alaska). Sources surveyed included informed individuals, existing bibliographies, libraries, government agencies, and special consultants. The material gathered was organized into sixteen subject categories covering socioeconomic and natural environment data. With its master bibliography and index, the literature remains an important tool over 30 years after its publication in 1977. The *Prudhoe Bay Case Study* (CCC/HOK Inc. 1978, TR4) analyzed Prudhoe Bay as an isolated development "enclave" and assessed its relationship with the regional government, the North Slope Borough. This study did not address the relationships between the Prudhoe Bay development and local peoples or their coastal communities. Instead, it focused on the living and working conditions at Prudhoe Bay and discussed lessons learned relevant to future enclave development in Alaska. In *Socioeconomic Impacts of Selected Foreign OCS Developments*, Habitat North researchers focused on a comparison of the socioeconomic impacts of North Sea oil development with projected impacts of Beaufort Sea development (Habitat North, Inc. 1979, TR28). Specifically, researchers compared the impact of North Sea development on Scotland with prospective changes in Alaska. "In virtually every arena of national life," the researchers reported with regard to Scotland, "oil developments and their attendant economic and social impacts have led to major changes in baseline characteristics of the country." The same general statement could be made of Alaska today as a function of Prudhoe Bay and associated North Slope onshore development.

Having identified a set of geographic analysis units (petroleum development regions), and a set of four stages of offshore petroleum development, PMM envisioned four types of studies would be required to predict and evaluate changes in the human environment resulting from offshore petroleum development activities. These four types of studies were: baseline studies, petroleum development scenarios, impact studies, and monitoring. PMM applied this study model (with the exception of monitoring, which was not yet relevant) first in the Beaufort Sea petroleum development region. Researchers produced 18 technical reports for the Beaufort Sea region by 1981. These studies fall within three categories: petroleum development scenarios, baseline studies, impact studies (See Figure 1.5).

Figure 1.5: Initial Core Study Research Design



The Beaufort Sea Petroleum Development Region, excluding two interim reports, included 16 initial core studies:

Petroleum Development Scenarios

- Beaufort Sea Region Petroleum Development Scenarios (Dames & Moore 1978a, TR6)

Baseline Studies

- Beaufort Sea Natural Physical Environment (Dames & Moore 1978b, TR10)
- Beaufort Sea Transportation Systems Analysis (Peter Eakland and Associates 1981, TR65)
- Beaufort Sea Region Man-Made Environment (Alaska Consultants, Inc. 1978a, TR8)
- Beaufort Sea Region Socioeconomic Baseline (PMM 1978a, TR11)
- Beaufort Sea Region Sociocultural Systems (Worl Associates 1978a TR9)
- Governance in the Beaufort Sea Petroleum Development Region (ISER 1978a, TR16)
- Beaufort Sea Sociocultural Systems Update Analysis (Worl, Worl, and Lonner 1981, TR64)

Impact Assessments

- Natural Physical Environmental Impact of the Beaufort Sea Petroleum Development Scenarios (Dames & Moore 1978c, TR21)
- Transportation Impact of the Beaufort Sea Petroleum Development Scenarios (Dennis Dooley and Associates 1978, TR20)

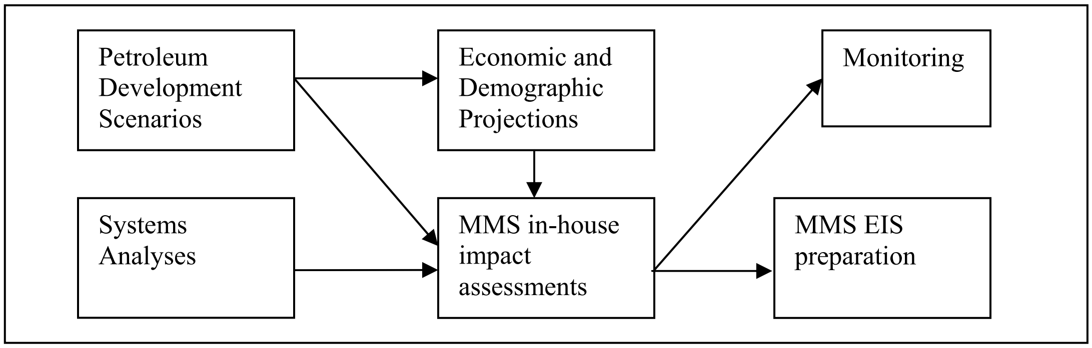
- Man-Made Environmental Impacts of the Beaufort Sea Petroleum Development Scenarios (Alaska Consultants, Inc. 1978b, TR19)
- Summary of Socioeconomic Impacts of the Beaufort Sea Petroleum Development Scenarios (James Lindsay and Associates 1978, TR23)
- Sociocultural Systems Impacts of the Beaufort Sea Petroleum Development Scenarios (Worl Associates 1978b, TR22)
- Economic and Demographic Impacts of the Beaufort Sea Petroleum Development Scenarios (ISER 1978b, TR18)
- Anchorage Impacts of the Beaufort Sea Petroleum Development Scenario (Ender, Gehler, Gorski, and Harper 1978b, TR13)
- Beaufort Sea Statewide and Regional Demographic and Economic Systems Impacts Analysis (ISER 1981a, TR 62)

As the list of technical reports demonstrates, PMM's initial research design called for linked sets of baseline studies and impact assessments for five components of the environment: natural, transportation, man-made, socioeconomic, and sociocultural (commercial fishing was added later). In addition, the Beaufort region technical reports included economic and demographic projections for three geographic areas: coastal communities, Anchorage, and statewide.

PMM attempted to establish the ideal set of "core studies" in the Beaufort Sea region. Acceleration of the lease process soon hampered the logic of the analysis. The petroleum development scenarios identified assumptions regarding potential drilling locations, the likelihood of finding commercially viable deposits, and the technological challenges likely to be associated with the specific locations. Researchers used U.S. Geological Survey (USGS) estimates of undiscovered recoverable oil and gas resources tied to specific scenarios if such estimates were available. ESP technology assessment reports assessed the most suitable technologies for developing petroleum resources under the environmental conditions associated with the sale area. Authors of these reports analyzed each of the technologies they identified from an economic and financial standpoint. They then estimated and compared amortized costs per unit of production. They estimated manpower needs for each phase of development in each lease sale area based on their technology assessments. The main problem was that the federal government repeatedly called for revisions in the development scenarios. Construction of the hypothetical scenarios involved dozens of judgements about which agency staff and contract staff did not always agree (such as the number and locations of potential production platforms). The development scenarios were therefore often out of date or substantially modified by the time researchers completed the work based on scenario assumptions

(Banks 1986). Subsequent sets of studies evolved in the 1980s toward the following modified approach for the core studies (Figure 1.6):

Figure 1.6: Modified Core Study Research Design



Thus, the economic and demographic projections continued to depend on the petroleum development scenarios, while the sociocultural, socioeconomic, transportation, and commercial fishing studies produced an understanding of systems that federal staff could use in conjunction with the petroleum development scenarios to assess impacts. The transition occurred gradually, as reflected in the mixture of approaches used to generate technical reports for the seven Petroleum Development Regions.

Summing up the organization of the initial core studies within the social component of the ESP, there were four core study categories: petroleum development scenarios (and technology assessments), baselines (and later termed system analyses), impact assessments, and monitoring. Within the baseline category, the initial design included as separate reports socioeconomic, sociocultural, natural, and man-made environment baselines. The mixture of these studies changed over time in response to the difficulty of fixing petroleum development scenarios. Baselines evolved into Systems Analyses, and focused primarily on socioeconomic, sociocultural, commercial fishing, and transportation analysis. Table 1.1 lists by region and type of study the 60 initial technical reports produced during the first seven years of the ESP's social component for the seven Petroleum Development Regions, starting with the first region addressed, the Beaufort Sea. (See Appendix A for the complete list of social and economic ESP reports for Alaska.)

The social component of the ESP thus far included three major types of studies: the initial research methods and case studies commissioned by PMM and the core studies. The social component of the ESP has continued to include studies of all three types. Researchers have produced a total of 61 additional core studies through 2004 under the modified core study design shown in Figure 1.6. In addition to the eight

Table 1.1: Early Social ESP Studies by Petroleum Development Region, 1978 through 1982[1]

Core Studies	Beaufort	Northern Gulf of Alaska	Western Gulf of Alaska	Lower Cook Inlet	Bering-Norton	Bering-St. George Basin	Kodiak-Aleutian
Petroleum Development Scenarios/Technology Assessment	TR6	TR29	TR35	TR43	TR49, SR3	TR56	TR63
Baselines							
Man-Made Environment	TR8						
Natural Physical Environment	TR10						
Socioeconomic Baseline	TR11	TR32	TR32				
Anchorage Socioeconomic and Physical Baseline	TR12	TR48	TR48	TR48			
Governance in the Beaufort Sea Petroleum Development Region	TR16						
Systems Analyses							
Sociocultural Systems	TR9, TR64	TR36		TR47	TR54		TR67
Natural Physical Environment							
Economic and Demographic Analysis				TR42	TR50	TR57	
Socioeconomic Systems Analysis			TR69		TR53	TR59	
Commercial Fishing Industry Analysis				TR44	TR51	TR60	TR60
Transportation Systems Analysis	TR65		TR66	TR45	TR52	TR58	
Impact Assessments							
Anchorage Impacts	TR13			TR48		TR61	
Economic and Demographic Impacts	TR18	TR34	TR38				
Statewide impacts	TR62						TR68
Man-Made Environmental Impacts	TR19						
Transportation Impact	TR20	TR31	TR37				
Natural Physical Environmental Impact	TR21						
Sociocultural Systems Impact	TR22		TR39, TR41				
Commercial Fishing Industry Impacts		TR30	TR30				
Summary of Socioeconomic Impacts	TR23	TR33	TR40	TR46			
Monitoring		TR17	TR17	TR55			
Interim & Summary Reports	TR3, 5, 25	TR25	TR25	TR25	TR25	TR25	TR25

[1] See Appendix A for list of MMS ESP Technical Reports

early research methods studies already mentioned, researchers have completed 13 research methods studies. And, in addition to the five early case studies already mentioned, researchers have produced five supplemental case studies.

This three-category taxonomy accounts for 121 core studies, 21 research methods studies, and 10 case studies, all but 24 of the 176 technical reports and special reports produced within the social component of the ESP through 2004. It misses two important types of studies, however. As discussed in forthcoming chapters, the primary concern shared by coastal residents is a possible disruption of subsistence activities and uses. Recognizing this fact, the ESP initiated studies in the mid- to late 1980s to document subsistence harvest systems and examine the effects of possible subsistence harvest disruptions. Researchers have completed 14 discrete subsistence studies through 2004.

A final category of ESP social component studies is social indicators, a subset of monitoring studies.[10] MMS first initiated social indicators research methods development in the early 1980s and developed a systematic methodology by the end of the decade. Since then, researchers have produced 10 social indicators technical reports.

Important to understanding the scope of social science research contained in the ESP is the fact that the social indicators technical reports were published after more than ten years of initiation of the social component of the ESP and were the first reports containing data based on formal survey research methods approved by the federal Office of Management and Budget All federal information collection is subject to Office of Management and Budget regulations, which are intended to minimize the time burden of information requests on local residents. Research conducted by, or for, the federal government which asks the same questions of ten or more people requires submission of a lengthy application that commonly takes about six months to process and increases the cost of research. The interview time is counted against an agency quota of time in which all its information needs must be met. Prior to the social indicator studies, MMS had explicitly prohibited researchers from including formal survey techniques requiring Office of Management and Budget approval in their proposed study designs. As a result, primary data collection had been constrained to qualitative research techniques and use of existing quantitative data.

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[10] Callaway (1996:1) described social indicators as "measures that hopefully are sensitive enough that would allow the MMS to understand the impact of their activities on communities. It is part of an impact assessment or environmental impact statement process."

The social research component of the ESP in Alaska has continued to evolve beyond social indicators. Recent studies exhibit four trends. First is a more explicit integration of multi-disciplinary studies. Examples include a Beaufort Sea monitoring study that includes an ethnographic component (Galginaitis 2003; Galginaitis and Funk 2005, MMS 2005-025; 2004, MMS 2004-030) and an ongoing study combining western scientists and local Iñupiat experts to analyze existing data to address variation in the abundance of Arctic cisco (ABR, Inc., Stephen R. Braund & Assocates, Sigma Plus, MJM Research, Kuukpik Subsistence Oversight Panel, Inc. [KSOPI], forthcoming).

The second trend is a greater focus on various social systems. Examples include a Study on the Economic and Social Effects of the Oil Industry in Alaska from 1975 to 1995 (McDowell Group, Inc. and Barker 1999, TR162) and an ongoing social and economic assessment of major oil spill litigation settlement (Impact Assessment, Inc., forthcoming).

A third trend is to ask increasingly specific research questions. Examples include an ongoing study researching the technical dialogue with Alaska coastal communities (EDAW, Inc., Applied Sociocultural Research, Rise Alaska, Northern Economics, Georgetown University, University of California-Irvine, and Morrow and Hensel Consulting, forthcoming) and a study of the drift gillnet fishery with oil and gas interactions in Cook Inlet (Impact Assessment, Inc. 2004, TR176)

Finally, there a trend to integrate social research with specific community requests. Examples include an ongoing study designed to assess potential impacts of OCS activities on bowhead whale hunting activities in the Beaufort Sea (EDAW, Inc., forthcoming), a collection of traditional knowledge of the Alaskan North Slope (Ukpeagvik Iñupiat Corporation Science Division, forthcoming), and the ongoing Arctic cisco study.

Other Social Science Research in Alaska

ESP-sponsored research has complemented other primary sponsors of social science research in Alaska. This complementarity has increased the value of ESP-sponsored research beyond what it would have been had it occurred in isolation, as the following brief account helps to illustrate. At the first Alaska Science

Conference held in 1950 in Washington DC, only three social scientists presented papers[11]. Between 1960 and 1975, the year BLM formulated the Alaska ESP social research program, researchers published less than five professional papers reporting social science research in Alaska per year[12]. An indication of the large relative contribution of the ESP program to the scale of social science research activity in Alaska is the fact that the ESP program alone published an average of six technical research reports per year over its first 30 years of existence. This number does not include related books, articles and papers published in the academic literature. The increased research activity brought about by the ESP was the result of increased funding and programmatic focus more than it was a matter of increased interest.

Examples of work by major contributors to social science research in the fifteen years prior to the start of the ESP program include Sonnenfeld's *Changes in Subsistence Among the Barrow Eskimo* (1956); Spencer's *The North Alaskan Eskimo* (1959); Hughes' *An Eskimo Village in the Modern World* (1960); Lantis' *Eskimo Childhood and Interpersonal Relationships* (1960), *Factionalism and Leadership: A Case Study of Nunivak Island* (1972) and *The Current Nativistic Movement in Alaska* (1973); VanStone's, *An Eskimo Village in Transition* (1962); Oswalt's *Partially Acculturated Communities: Canadian Athapaskans and West Alaskan Eskimos* (1963a), Mission *of Change in Alaska: Eskimos and Moravians on the Kuskokwim* (1963b) and *Napaskiak: An Alaskan Eskimo Community* (1963c); Chance's *The Eskimos of North Alaska* (1966); Nelson's *Hunters of the Northern Ice (1969)*; Foote's *An Approach to Systems Analysis in Cultural Geography* (1968) and *A Human Geographical Study* (1966); Saario and Kessel's *Human Ecological Investigations at Kivalina* (1966); Milan's *The Acculturation of the Contemporary Eskimo of Wainwright, Alaska (1964) and The Demography of an Alaskan Eskimo Village (1970)*; de Laguna's *Under Mount Saint Elias* (1972); Ray's *The Eskimos of Bering Strait, 1650-1898* (1975); Burch's *The Eskimo Trading Partnership in North Alaska* (1970), *Eskimo Kinsmen* (1975) and *Overland Travel Routes in Northwest Alaska* (1976); and Nowak's *Subsistence Trends In A Modern Eskimo Community* (1975). As these titles suggest, several researchers focused in particular on the effects of rapidly expanding Western influences on Native village life.

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[11] Lantis, Margaret 1951 What is happening and what can happen to Alaskan Eskimos? Alaskan Science Conference 1st: 1950 Washington, D.C. Proceedings. Washington, D.C. 1951, p. 45. Bulletin of the National Research Council. no. 122; Skarland, Ivar 1951 Economic, Social, and Anthropological Problems in Alaska, ibid., 40-44; Haldeman, Jack 1951 Health Problems of Alaska Eskimos, Indians, and Aleuts. ibid., 113-117.

[12] This is based on a comprehensive literature review conducted in the process of writing this book. For a copy of the literature database, contact the editors.

In 1970, the Alaska research community convened at the twentieth Alaska Science Conference to examine how Alaska might change in the coming decade as a result of petroleum development and a settlement of Alaska Native claims. The University of Alaska Press published proceedings of the conference as a book edited by George Rogers, *Change in Alaska: People, Petroleum, and Politics* (1970). Although there was no ongoing social science research program in Alaska prior to the ESP, the federal government was not entirely absent from the scene. As early as the 1940s the federal government commissioned a report on aboriginal claims in Southeast Alaska (Goldschmidt and Haas 1946). In the late 1960s, the federal government commissioned a compilation of existing information on Alaska Native social and economic conditions preparatory to settling Native claims to land in Alaska. The result was the United States Federal Field Committee's (1968) report, *Alaska Natives and the Land*. Many in Congress thought that the primary goal of ANCSA should be to improve living conditions among Alaska Natives. They, unlike the Alaska Native leadership, did not see the Act primarily as a settlement of land claims (Mitchell 2000). Further, some members of Congress thought that (what they saw as) a large monetary settlement eliminated the need for ongoing direct federal assistance to Alaska Natives. ANCSA ultimately included a provision obligating the federal government to continue its trust relationship with Alaska Natives and therefore to address the social and economic problems of Alaska Natives[13]. Section 2(c) of the Act further required, "a study of all Federal programs primarily designed to benefit Native people."[14] As part of the 2(c) study, Robert Nathan Associates (n.d.) conducted a large-scale household survey on Alaska Native living conditions.

In the early 1970s, the National Science Foundation awarded a multi-year grant to ISER, of the University of Alaska, to study the social and economic effects of energy development in Alaska. The Man-in-the-Arctic Program, or MAP, brought new research expertise to Alaska and yielded models of Alaska's population and economy whose descendents are still used to assess alternative policies today (Kresge, Morehouse, and Rogers (1977); Kresge and Seiver (1978); and Kresge, Seiver, Goldsmith, and Scott (1984). Under the MAP program, researchers also conducted regional-scale surveys with Alaska's North Slope Iñupiat and Fairbanks populations to understand better the distribution of social, economic, and subsistence effects of oil development (Kruse 1976, 1980, 1981, 1982; Kruse, Kleinfeld and Travis

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[13] Public Law 92-203 Sec. 2(c).

[14] ibid.

1982)[15]. By the late 1970s, the National Science Foundation-funded MAP project had begun to document systematically the social and economic effects of construction of the Trans-Alaska pipeline. It did not require formal research on recent changes, however, for Alaskans to realize that future petroleum development in Alaska could bring further change. The question of the day was, "How would the effects of offshore oil development or construction of an arctic gas pipeline differ from the effects of construction of the Trans-Alaska pipeline?" Both types of development were on the horizon, but research to date could not answer this question. This brings us to initiation of the social component of the MMS ESP described in the first section of our introduction.

Other major social science initiatives emerged after the ESP program started. These initiatives affected, and likely will affect, the ESP program itself. At about the same time the ESP program started, the State of Alaska set in motion what became a sustained program of village subsistence research. The Alaska Department of Fish and Game's Subsistence Division has produced some 260 technical reports related to subsistence in 180 Alaska communities. The Subsistence Division studies complement the ESP studies by providing an important baseline understanding of the importance and role of subsistence in rural Alaska[16]. In fact, some of the Division of Subsistence studies were conducted in cooperation with MMS.

In the early 1980s, the National Research Council's Polar Research Board convened a committee to consider the need for expanding social science research in the Arctic. The committee's work appeared as a National Research Council report, "*Arctic Social Sciences: An Agenda for Action*" (National Research Council 1989). Largely as a result, the National Science Foundation established the Arctic Social Sciences program within the Office of Polar Programs. This program has funded over 500 studies since its inception in 1991, many of which contribute to our understanding of change in Alaska[17]. Between 1995 and 2004, the National Science Foundation spent approximately $25 million on Arctic social science research.

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[15] For a list of publications from the MAP program, visit the publications pages of the website of the Institute of Social and Economic Research (www.iser.uaa.alaska.edu).

[16] For a comprehensive listing of Subsistence Division technical reports, visit the Division website (http://www.state.ak.us/adfg/subsist/subhome.htm) and choose Technical Paper Series Abstracts.

[17] For a comprehensive listing of National Science Foundation Arctic Social Sciences awards, visit the National Science Foundation Fastlane website award pages (https://www.fastlane.nsf.gov/a6/A6Start.htm), choose "Award Search", then "Program Information", "ARC Arctic Science Section" under NSF Organization and "Arctic Social Sciences" under Program. Then choose either "current" or "expired" awards.

The EVOS in 1989 raised a host of concerns about its effects on the villages along Prince William Sound and coastline villages affected by the spreading oil in Cook Inlet, Kodiak, and the Alaska Peninsula regions. Through a combination of National Science Foundation, state, and plaintiff funding, researchers examined many of these questions following the spill[18].

Since planning for the social component of the ESP program started in 1975, a substantial body of social science research in Alaska has also resulted from policy debates. While much of this research was not directly oil-related, it has contributed to our overall understanding of Alaska and to our ability to assess oil development effects. Examples of policy issues driving research include: the proposed Susitna Hydroelectric project; commercial and sport fisheries management; proposed petrochemical development; state spending; the Red Dog Mine; the Western Arctic Coal Project; Capitol Relocation; the Bristol Bay Regional Power Plan; and the U.S. bowhead whaling quota[19].

Finally, the National Science Foundation's Arctic System Science (ARCSS) program recently entered a phase that focuses on the relationships of global changes with arctic human systems. Included in the scope of global changes are the effects of Arctic oil development and climate change on peoples of the north[20].

Organization of this Book

The goal of this book is to bring together three decades of MMS research on the effects of oil and gas development on the peoples of Alaska. The major question is, "What have we learned about the potential effects of offshore oil development on the peoples of Alaska?" The editors debated how best to bring the expertise of commissioned chapter authors to bear on this question. One option would have been to use the types of studies included in the design of the social component of the ESP. These are, in summary:

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[18] For a comprehensive listing of research related to the social, economic, and cultural effects of the *Exxon Valdez* Oil Spill, visit the Oil Spill Trustee Council website (http://www.oilspill.state.ak.us/research/srchindex.htm) "Search and Research" pages and use the Topical Literature Search feature. Also see Impact Assessment, Inc. 2001, TR161.

[19] The best source of publication information for policy-related research is the Alaska Resources Library and Information Services (ARLIS) website (http://www.arlis.org/index.html)

[20] For a comprehensive listing of National Science Foundation Arctic System Science awards, visit the National Science Foundation Fastlane website award pages (https://www.fastlane.nsf.gov/a6/A6Start.htm) and choose "Arctic System Science" program.

- Core Studies, including
    - Petroleum Development Scenarios
    - Baseline Studies
    - Impact Studies
    - Monitoring Studies
- Research Methods Studies
- Case Studies
- Subsistence Studies
- Social Indicators Studies

The editors quickly realized that no individual has sufficient expertise to take the lead in writing about all the research methods studies, or all the baseline studies as they are cumulative across many disciplines. Yet it seemed impractical to organize chapters by discipline. The editors decided to take an empirical approach to the organization of this book. They compiled a database of 2,042 relevant social science research publications and grouped them into 26 subject categories mentioned in the MMS request for proposals for this book. The editors then combined subject categories with the goal of creating a book with seven synthesis chapters, an introduction, an historical context, and a summary discussion. The goal was to have each synthesis chapter represent a comparable proportion of the literature. The editors gave added weight to MMS Technical Reports and considered over 600 other peer-reviewed publications. The seven resulting synthesis chapters cover the following topics:

- Petroleum and the Alaska Economy (Goldsmith, Kruse, Larsen)
- Community Effects of Offshore Petroleum Development (Huskey)
- Sociocultural Research (Braund and Morehead)
- Subsistence (Wolfe)
- Subsistence Harvest Patterns and Oil Development on Alaska's North Slope (Pedersen, Kruse, and Braund)
- Long-Term Consequences of the *Exxon Valdez* Oil Spill for Subsistence Uses of Fish and Game (Fall)
- Community Impacts of the *Exxon Valdez* Oil Spill (Picu, Formichella, Marshall, and Arata)

It is interesting to contemplate what combination of factors produces roughly equal numbers of publications in each of the above areas. The design of the social component of the ESP had an influence. The typical suite of core studies conducted for a petroleum development region, or later an individual lease sale, included a prediction of statewide and regional economic effects, a prediction of community economic and population effects, and a sociocultural systems baseline. These three types of reports account for many of the publications in the first three synthesis chapters (Chapters Three, Four, and Five). The fourth synthesis chapter (Chapter Six), subsistence, emerged from the cumulative findings of earlier studies of the importance of subsistence to the entire suite of potential impacts of offshore development. The geographic distribution of petroleum development activities played a role in synthesis chapter organization as well; Alaska's North Slope and offshore seas have been a focus of petroleum development activity and a focus for subsistence research (Chapter Seven). Finally, EVOS resulted in a large body of social science research unique in that it examines actual impacts. While the spill occurred as the result of transportation of oil produced onshore, EVOS-related research nevertheless helps us to understand and predict the effects of a catastrophic offshore oil spill on Alaska communities, hence the final two synthesis chapters (Chapters Eight and Nine).

Chapter Two, a Brief Economic History of Alaska, lays out an important context for understanding all the synthesis chapters. Chapter Ten is an attempt by the editors to draw together and highlight the major insights drawn in the synthesis of research. Finally, recognizing the diversity of social science disciplines and perspectives, MMS commissioned three essays from other scientists who contributed substantially to the social component of the ESP (Chapter Ten).

Chapter 2 - Brief Economic History of Alaska

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The purpose of this chapter is to provide introductory context for the analysis of the socioeconomic impact of petroleum development in Alaska that follows in subsequent chapters. The chapter has two parts: the first is a general discussion of the state's economic character and history; the second reviews the history of petroleum exploration and development in Alaska. This chapter represents a history of the Western market economy as opposed to the subsistence economy of Alaska Natives.

Alaska's Economic Character

Alaska is a natural resource state. Throughout the region's history, investors have been attracted to its natural resources. The development of those resources has been the basis of the region's economy, aided by large federal expenditures. In fact, the establishment and development of Alaska's modern economy, one which replicates and provides material opportunities analogous to those of mainstream American culture, has been dependent on the extraction of a succession of natural resources: first fur, then gold, then salmon and other fish, later copper, after World War II forest products, and in modern times, petroleum (Haycox 2001). Until very recent years, this dependence on extractive activities has been the only economy of Alaska, because high transportation costs to the Lower 48 states and high infrastructure costs in Alaska have defeated manufacturing and agriculture and have rendered virtually all other basic industries (with the exception of fisheries, tourism and oil development) unprofitable.[21]

Repeated Congressional and state programs to nurture agriculture in Alaska, for example, have failed to generate successful farming on any but the most limited scale. In 1898, Congress responded to a sudden six-fold increase in the non-Native, immigrant population in the region (a function of the Klondike gold discovery) by extending the work of the Agricultural Experiment Station program to Alaska. The objectives of the program were to determine the amount and location of arable land, and what flora could be cultivated in the region. This action reflected the view of Congress that frontier development must be supported by self-sustaining agricultural production.

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[21] See, for example, James Shortridge, "The Alaska Agricultural Empire: An American Agrarian Vision, 1898," *Pacific Northwest Quarterly* 69 (October 1978): 145-58; "Collapse of Frontier Farming in Alaska," *Annals of the Association of American Geographers* 66 (1976): 583-604.

The results were disappointing in two respects. First, though many plants grow well in Alaska, the growing season is too short and the climate too damp for successful wheat and corn production, the staples of twentieth century American agriculture. In addition, though dairy farming is technically feasible, dairy products can be shipped easily and cheaply from the Seattle area by water transport; and, after the government railroad to Anchorage and Fairbanks was opened in 1918, dairy products from Seattle could be sold more cheaply in Alaska markets than locally generated products (Gruening 1954:117, 212-213, 316). Second, few migrants were interested in agriculture; it was the prospect of quick riches through gold prospecting that drew most of them to the territory. Though the government made agricultural homesteads available after 1898, few migrants took advantage of the program. Some individuals did attempt to establish farms in the Matanuska Valley after construction of the Alaska Railroad. Wasilla was founded in 1916 as the distribution center for Matanuska development. But the number of homesteaders was small.[22]

The obstacles to successful agricultural development became clearer between 1935 and 1940 after the New Deal administration of Franklin Roosevelt extended the rural rehabilitation program to Alaska with the Matanuska Colony. Families with an unemployed head of household with farming experience were selected from applicants willing to resettle in Alaska to develop Matanuska farms with low-interest mortgages. Though some families established successful farms, most did not. Most left the project either to return to the lower states, or to take employment constructing military bases near Anchorage after 1940. Those few who developed their farms found themselves priced out of the market by products produced in volume in Washington, Oregon and California and imported into the territory (Miller 1975). Today, a few truck farmers sell vegetables at periodic open-air markets in Anchorage, Palmer and Fairbanks, but otherwise there is no appreciable agriculture in the region.

Manufacturing has had a similar history in Alaska. In 1891, Congress provided eighty-acre homesteads for trade and manufacturing, but little or no manufacturing developed. In fact, the government intended the act primarily for salmon canners who needed title to the land on which they constructed their operations (Gruening 1954:80).

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[22] See, for example, *Pathfinder* 4 (Sept. 1923), 23; 5, (Sept. 1924), 14-15. American west historian Richard White discusses the phenomenon of modern western migration, directed toward enrichment rather than settlement, in *"It's Your Misfortune and None of My Own:" A History of the American West* (Norman: University of Oklahoma Press, 1991), 192-94.

The failure of government programs to stimulate economic development in Alaska was not due to a lack of interest by Alaska's non-Native population in achieving a modern lifestyle. Though some migrants have come to Alaska to live in the wild, their number has always been very few. Nearly all migrants came only when assured they would be able to enjoy the benefits of a modern wage-supported consumer economy. Nearly all migrants lived in towns with all the amenities and technologies of modern America. Such towns included Ketchikan, Sitka, Juneau, Cordova, Kodiak, Fairbanks, and Anchorage.

Juneau provides a typical example of this phenomenon. When the federal government conducted the first decennial census in Alaska in 1880, the enumerator found just 435 non-Natives in the territory. That same year, however, prospectors discovered gold in what is now the city of Juneau. Within months of Juneau's founding in 1880-81, commercial establishments crowded the muddy main street, and framed houses climbed steadily up the sides of the surrounding mountains from the water's edge. By 1890 the town had nine general merchandise houses, 22 saloons, three hotels, two separate restaurants, a boarding house, a hospital, three churches, a fire brigade, a brass band, two stove and tin ware shops, two jewelry stores, two breweries, two fur and curio shops, two cigar factories, a slaughterhouse, a meat market, a lumber mill, a weekly newspaper, a millinery shop, a photographer's studio, a confectionery, a steam laundry, a barber, and several blacksmith shops. There was also a collection of lawyers and doctors. Citizens used a 400 seat theater, known as the "opera house," for public meetings in addition to entertainment. The town of Douglas, which grew up on the opposite side of Gastineau Channel, was a smaller community, but nonetheless supported 13 saloons, a drug store, four general merchandise stores, two grocery stores, two hotels, and a barbershop. There was also the post office and a shoe shop (U.S. Department of Interior, Census Office 1891:238). But within months of the Treadwell discovery at Gastineau Channel, the population grew to nearly a thousand, and by the summer of 1881, the population grew to two thousand (Hinckley 1972:197). The 1890 census found 5,000 non-Natives in Alaska, nearly all of them at Juneau-Treadwell.

But Juneau's economic base was perilously narrow. Before 1899, development of the low-grade lode gold deposits on Douglas Island by a group of San Francisco investors headed by John Treadwell almost entirely supported Juneau's economy. The capital these absentee investors poured into the project, and its subsequent operation, was all that sustained Juneau, Douglas and two smaller communities, Thane and Treadwell. After 1899, when Congress moved the territorial capital from Sitka, adding federal spending to Juneau's economic base.

Juneau set the pattern for Alaska's economic history. Aside from the Treadwell gold mine, the only other economic activities in the early 1890s were the harvest of fur seals on the Pribilof Islands by the Alaska Commercial Company, under a monopoly lease from the U.S. Congress, and outfitting migrants headed for the Cassiar gold district on the Stikine River in British Columbia by a score of merchants in Wrangell. Where economic conditions deteriorated, people left. Between 1867 and 1873, for example, Sitka had atrophied from about 800 non-Natives to half that number. Sitka had no jobs and the Army had withdrawn in 1877 because there was nothing for the troops to do.

The Klondike gold rush deserves special mention. It was a remarkably short-lived phenomenon. Though Dawson was a town of 20,000 people in the summer of 1898, by 1900 it had atrophied to about a thousand. The same phenomenon repeated itself at Nome. In the summer of 1899, Nome was a town of 20,000, but by the next summer it had shrunk to about 12,000 and by the summer of 1901 was down to about one thousand. Placer deposits did not last long in the western gold fields, and gold operations soon became industrialized as non-resident investors put up the money to develop subsurface lode deposits. Photos of the Chilkoot Trail in the winter of 1897-98 show a business every 30 or 50 yards. Forty thousand Argonauts crossed Chilkoot and White passes, and they brought a substantial amount of capital with them. They had to, for the Canadians would not let people into their country who did not have the liquid capital or actual supplies to sustain them for a year. But as soon as that imported capital had been captured by the people who established commercial enterprises, and no more capital was coming in, the entrepreneurs packed their signboards and returned home, hard on the heels of the fleeing Argonauts who had quickly discovered that there was only enough gold to support a few hundred people for the long term. In short, nearly all of the people came north simply engaged in a quick capital exchange among themselves, and then went home (Berton 1958, Hunt 1974).

Some stayed, of course. The Alaska population of non-Natives in the 1900 decennial census was about 30,000, and that number would remain virtually constant for four decades. But gold production peaked in Alaska in 1906, and by 1910 nearly all the significant placers were exhausted (Gruening 1954:125). People were desperate for some kind of economic sustenance. The construction of the Copper River and Northwestern Railway in March 1911, followed by the onset of production at the Kennecott mines, helped many. Then, in 1914, Congress authorized construction of the government railroad, to compete with the monopoly-owned Syndicate railroad. Construction began on the Alaska Railroad in 1915. With the exception of the Hurricane Gulch and Nenana River bridges, construction was essentially complete to Nenana when America entered World War I in April 1917 (Hunt 1976:102, 112-14). After the war, Alaska would exist in economic doldrums until World War II with government (through the territorial bureaucracy), the government railroad, and emergency Depression expenditures forming the base of the economy. Copper production peaked in about 1922.

Non-Natives did not come to Alaska for subsistence living; they came to advance themselves economically. But that was only possible if there were jobs, and these jobs came only when the absentee capital investors were willing to put money into the exploitation of the region's natural resources, and when their investments attracted federal spending. When resources were discovered – gold at Juneau/Douglas in 1880, salmon in the 1880s, copper in the Wrangell Mountains before the turn of the century, marketable forest products after World War II, and petroleum first on the Kenai Peninsula in 1957, and then on the Arctic Slope in 1967-68 – non-resident investors poured investment capital into their development, creating jobs. The jobs and commercial opportunities created by the capital investment are what drew the population. Towns grew up for the job holders, and businessmen established commercial enterprises based on paychecks paid to the labor force by the resource development corporations. This was the history of Juneau and Treadwell. It was later the history of Cordova, regional headquarters for the Alaska Syndicate which owned the Kennecott Copper Mines, the Copper River and Northwestern Railway used to transport the ore to tidewater, and the Alaska Steamship Company used to ship Kennecott ore south to the syndicate's smelter at Tacoma, Washington (Sterns 1967).

Patricia Nelson Limerick wrote in her history of the modern west, *The Legacy of Conquest: The Unbroken Past of the American West*, that the west's early economic development rested on a foundation of "furs, farmland, timber, minerals, and federal money," upon which settlers were dependent for their livelihoods (Limerick 1988:82). Substituting fish for farmland, this analysis fits Alaska history perfectly. Contemporary analyses of Alaska's dependence of petroleum development and federal spending confirm the pattern.

History of Petroleum Exploration and Production in Alaska

While petroleum has been only one of several minerals exploited from Alaska's land, since Prudhoe Bay petroleum has been, along with federal spending, the platform upon which Alaska's contemporary economy rests. Today, one-third of Alaska's economic base is petroleum employment and investment, ancillary enterprises such as drilling, service and supply companies, and taxation on petroleum production; federal spending is another third (Alaska Science & Technology Foundation with ISER 1999). But high-volume petroleum extraction is a modern phenomenon in Alaska. Prior to the discovery at Prudhoe Bay in 1967-68, petroleum production in Alaska did not play a significant economic role. However, oil exploration has a long history in the region.

Russians noted oil seepages on land at Iniskin Bay (west shore of Cook Inlet, due west of Homer) and Cold Bay (on the Alaska Peninsula) early in their 125-year occupation of Alaska, but they made no attempts to utilize the finds (Figure 2.1). Nor was there any petroleum exploration or development in the years immediately following the American purchase in 1867. Developers apparently filed the first oil claims in Alaska sometime in the 1890s on the Iniskin Peninsula (west shore of Cook Inlet). They drilled wells there in 1898, striking small amounts of oil, but also seawater. Though they drilled more wells over several years, none proved productive (Wolf 1997). At about the same time, an investment group financed drilling at Dry Bay (south of Yakutat). These wells also were unproductive, as were wells drilled at Puale Bay, near Cold Bay toward the end of the Alaska Peninsula.

Alaska's first productive oil drilling operation was at Katalla, on the Gulf of Alaska south of the Copper River delta. People had reported seepages around the shore of Controller Bay for many years. Around 1900, a group of investors asked an English petroleum expert to evaluate the area's potential. His positive assessment prompted drilling soon afterward, apparently finding oil in several wells. However, judging conditions to be unfavorable, they did not undertake production. That would wait until 1911, when developers brought several wells in the district into production. However, the quantities were not large enough to justify transportation, so developers processed most of the recovered oil at a refinery the group constructed at Katalla, and then they shipped the refined product by tanker-barge to Cordova. This arrangement continued for nearly 20 years. The original investors sold their claims and improvements in 1916, and the purchasers sold to still other investors in 1920. The operation was still modestly productive when fire destroyed the refinery in 1933. Owners abandoned the wells at that time.[23]

The development at Katalla demonstrated that oil production was possible in Alaska. But it also demonstrated that the costs of exploration and production would be high, primarily because of the cost of

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[23] Nelson, Arnold, "Bubble of Oil at Katalla," *Alaska Journal* 11 (1981): 18-27; Edward Harrison, "Katalla," *Alaska-Yukon Magazine* 3 (Aug 1907): 528-533; Edward F. Medley, "Katalla and Yakataga Oil Fields," *Pathfinder* 2 (January 1921): 5-7; Elizabeth A. Tower, *Icebound Empire: Politics and Industry on the Last Frontier, 1898-1938* (Anchorage: Elizabeth A. Tower, 1996).

Figure 2.1: Alaska

transportation and other costs associated with production infrastructure. Fields the size of Katalla had been modest successes in the contiguous states; in Alaska they were modest failures. The properties at Katalla have continued to change hands since the 1930s. In the early 1980s, Chugach Natives Inc. received leasing rights in the area as part of the Alaska Native Land Claims Settlement Act.[24]

When oil exploration began in Alaska, prospectors filed claims under the Hardrock Mining Act of 1872. Soon after the turn of the century, however, large mining and oil corporations began to file blanket claims to large tracts of potential oil land. Concerned about the nation's strategic needs, President Theodore Roosevelt withdrew all coal and most oil lands in the country in 1906 until such time as Congress should devise a way to control coal and oil claims. Roosevelt used authority given him by the Congress in the 1906 Antiquities Act to make the withdrawal.[25] Congress did not resolve this national concern until 1920 when it adopted the Mineral Leasing Act, which established a leasing regime for coal, oil and natural gas. Most states soon followed with leasing acts of their own. At the same time, Congress provided for the creation of several strategic oil reserves. The largest, Naval Petroleum Reserve No. 4 (Pet. 4), was established on Alaska's Arctic coast. In 1976, Congress renamed the 23 million-acre reserve National Petroleum Reserve – Alaska (NPR-A) and transferred management from the U.S. Navy to the U.S. Department of the Interior directing BLM to manage it.

With the passage of the Mineral Leasing Act, most lands with oil potential (though not all coal lands) in the country were re-opened to entry, including in Alaska. Nearly 400 exploration permits were issued for Alaska in 1921 (Wolf 1997). Many were for activities at Cold Bay, and also near Kanatak on the Alaska Peninsula just across Shelikof Strait from the southern end of Kodiak Island. None of the permits let for Alaska at this time resulted in commercially viable finds, and soon discoveries in Texas and Oklahoma flooded the market and drove down prices. Most oil activity in Alaska ceased, though some scattered activity continued, including an unsuccessful well drilled at Cape Yakataga.

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[24] "Alaska Crude Resumes Drilling at Katalla," Alaska Report 32 (Aug. 1986): 1.

[25] Hal K. Rothman, *Preserving Different Pasts: The American National Monuments (*Urbana: University of Illinois Press, 1989); Charles F. Wilkinson, *Crossing the Next Meridian: Land, Water and the Future of the West* (Washington, D.C.: Island Press, 1992), 40-50, 55; George W. Mowry, *Theodore Roosevelt and the Progressive Movement* (New York: Hill and Wang, 1963).

The establishment of the government reserve on the Arctic Coast was the result of several exploratory expeditions conducted by the USGS. Eskimos had known of oil seepages on the north coastal plain since time immemorial. The English explorer Thomas Simpson reported these seepages in 1839, as did U.S. Navy Lieutenant W.L. Howard in 1886. In 1901, W.J. Peters and F.C. Schraeder, both veteran Alaska surveyors, mapped much of the western coastal area, and between 1906 and 1914 Ernest de Koven Leffingwell undertook several trips across the area and reported optimistically on the distribution and potential of the seepages. The Navy conducted a geologic reconnaissance in the years immediately following establishment of the Naval Petroleum Reserve No. 4 in 1923 (Johnson and Jorgenson 1963).

During World War II, demand for petroleum generated considerable strategic concern. U.S. and Canadian Army engineers completed the remarkable feat of constructing the Alaska Highway from Dawson Creek, B.C., to Fairbanks, Alaska. More directly in response to the demand for petroleum, they completed another, similarly ambitious project with construction of an oil pipeline from Norman Wells on the Mackenzie River in Canada's Northwest Territories to Whitehorse, Yukon Territory, and on to Skagway, Alaska. By the time the four-inch line was completed in 1944, shipments of petroleum products from Seattle to Alaska ports together with meager production from the Norman Wells field led the Army to abandon the project. But its construction manifested the level of interest in developing potential oil deposits in the North (see Nielson 1988 and Coates 1991:55-6; 75-7, 194-5).

In 1943, the U.S. Navy undertook an exploratory program in Pet. 4. Two wells drilled in the Umiat area of the reserve produced oil, but not in commercial quantity. In 1946, the USGS and the Navy undertook an eight-year exploration program. Teams drilled 36 test wells but found only two minor oil deposits and natural gas fields at Barrow and Gubik. The federal government pumped gas from the Barrow field to the village of Barrow for limited distribution, but otherwise the government did not use the resource. The program did generate considerable information on northern conditions and transportation needs, however, and encouraged industry planners to consider the Arctic as a potentially viable petroleum province. Joseph Sonnenfeld authored a 1957 monograph, *Changes in Subsistence among the Barrow Eskimo,* that anticipated the research goals of MMS by documenting the effects of this early petroleum development on the Native population in Barrow (Sonnenfeld 1957). Based on a literature review, interviews with local Iñupiat, and participant observation in various North Slope subsistence pursuits, Sonnenfeld reported on changes in the Barrow Iñupiat subsistence economy as a result of external agents including explorers, commercial whalers, traders, missionaries, reindeer herding, technology, wage labor, and petroleum exploration associated with Pet. 4.

Far more important in generating interest in Alaska oil, however, was the discovery of the Swanson River field on the Kenai Peninsula in 1957. The difference was the magnitude of the find. Richfield Oil of California was one of several companies that took an interest in geologic locations in the Kenai National Moose Range on the west side of the Peninsula in the mid-1950s. Others included Phillips, Marathon, and Unocal, as well as Shell, Sunray, Mobil, Chevron, and Texaco. Richfield was the first to drill. They struck oil with their first well, begun in April 1957. The discovery, reported on July 15 of that year, tested at 900 barrels a day. It was the first major commercial discovery in Alaska (Coates 1991:93; Roderick 1997:73-88). Other companies and groups of companies began drilling programs in the area, and in 1959, Unocal discovered a major natural gas field near the Swanson River oil field.

In 1960, following the achievement of statehood by Alaska and the creation of the state natural resources bureaucracy, the state sold exploration leases to oil companies for work in Cook Inlet. Two years later, the exploration crews discovered the Middle Ground Shoal oil field off Port Nikiski, at the same latitude as the onshore Swanson River field. Middle Shoal oil production began in 1967. Subsequently, developers drilled 20 successful wells in upper Cook Inlet. All but four are in production at the present time. They have pumped nearly 1.3 billion barrels of oil along with over 5 trillion cubic feet of natural gas. Industry analysts classify the Cook Inlet oil and gas basin as a moderate-sized deposit (Kornbrath 1995).

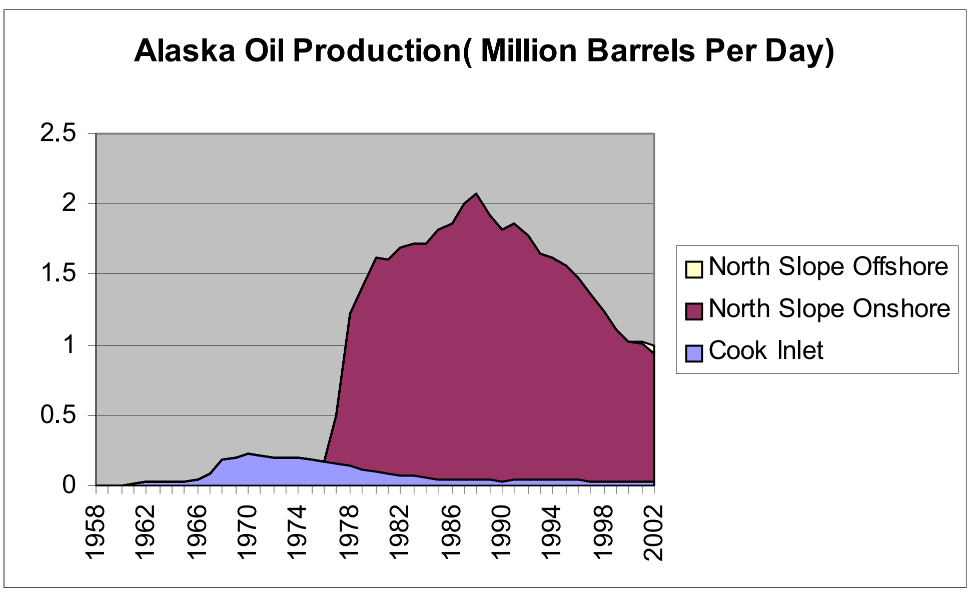
It is worth considering the impact of Cook Inlet development on communities on the shores of Cook Inlet and the Kenai Peninsula Borough. The village of Kenai, nearest the development, was home to perhaps 500 people in 1957. A state highway had connected the Peninsula to Anchorage only shortly before. The boom in economic development and population growth initiated by oil activity was immediate, of considerable magnitude, and sustained. Oil field labor absorbed most of the existing work force and attracted new settlers. Oil field supply and ancillary industrial growth were substantial. A urea plant, an ammonia producing facility and a refinery (operated by Tesoro) all had been constructed by the early 1970s. Commercial development followed apace, culminating in modest shopping malls in Kenai and nearby Soldotna in the late 1970s. In 2000, the population of Kenai was about 7,000; nearly 4,000 lived in nearby Soldotna. The population of all of the Kenai Peninsula Borough, which includes Seward and Homer as well as Tyonek on the west side of the inlet, was approximately 50,000.

The economy of the region is heavily dependent on petroleum and gas production. Both have declined over the past decade, and now predictions suggest that the recoverable known natural gas deposits in the Cook Inlet basin may be exhausted within 15 to 20 years. Until a recent new discovery in the MacArthur oil field (27 July 2001), forecasts for the area economy had been pessimistic. This pattern is consistent with the broader economic character of Alaska dependence on a single natural resource to sustain modern settlement and economic development.

Prudhoe Bay and Other Onshore North Slope Development

Discovery of North America's largest oil field at Prudhoe Bay on the state's Arctic Coast in 1967 changed Alaska dramatically and probably permanently. Wealth of a magnitude unpredictable and unimaginable began to flow into the state with construction of the Trans-Alaska oil pipeline in 1974, and production starting in 1977 (Figure 2.2). For three decades, Alaska's North Slope has produced about 20 percent of domestic oil consumed in the United States. In 1995, Congress lifted a ban on the export of Alaska oil, allowing the product to circulate on the world market. By 2003, Prudhoe Bay has produced about 11 billion barrels of oil, and the total North Slope production is over 14 billion barrels (Alaska Department of Natural Resources 2003).

Figure 2.2: Oil Production in Alaska



Source: Alaska Department of Revenue, Tax Division

Though seepages and favorable topographical features led many oil geologists to believe that the North Slope might be rich in oil, proving that assumption was by no means inevitable. The unsuccessful exploration programs undertaken by the U.S. Navy and the USGS on Pet. 4 confirmed that fact. The Prudhoe Bay story began in 1958 when the BLM opened land between Pet. 4 and the proposed Alaska National Wildlife Range in northeast Alaska to leasing on a non-competitive basis (Roderick 1997:40-41, 175-208). The Alaska Statehood Act, passed by Congress in the summer of 1958, provided that the new state could select 104 million of Alaska's 375 million acres of land for state title from unoccupied and unappropriated land. With Alaska statehood official in 1959, state planners debated whether to select the newly opened federal lands on the North Slope. The Egan administration initially rejected that idea. The Statehood Act also provided that the state would receive 90 percent of federal mineral lease revenue in Alaska, a provision meant to help the state defray the costs of state administration. State interest in possible North Slope oil ran high, however, and in 1964 the state decided to select the lands, title to which was quickly conveyed. The first state lease sale, offered on a competitive basis, attracted most of the major oil companies operating in North America at that time. The state offered additional tracts in 1965 and 1968. Most companies formed partnerships and began exploratory work. Leases were not required for seismic testing and geologic mapping. Generating positive data from such work, several companies began to drill. By 1967, however, no one had found oil.

In 1966, Richfield Oil, the discoverer of the Swanson River field on the Kenai Peninsula, working in partnership with Humble Oil, merged with Atlantic Oil to become the Atlantic Richfield Co. (ARCO). By 1967, ARCO had drilled a number of dry holes on its North Slope leases and began preparations to withdraw. One final effort began with freeze-up in 1967. On the day after Christmas, the crew opened the rig to check the results. Natural gas burst into the air. When ignited from a two-inch pipe, it flared 50 feet in a 30-mile-per-hour wind. ARCO's confirmation well, begun immediately, delivered comparable flow in March 1968. The initial estimate for the field was 9.6 billion recoverable barrels (ibid., 222). By 2002, technology has increased the estimate to 13 billion (Bradner 2002).

Industry analysts appreciated immediately that an oil pipeline across Alaska to an ice-free port on the Gulf of Alaska would be necessary to get the North Slope oil to markets. But a huge obstacle to construction of a pipeline existed. The same Statehood Act that had granted Alaska 104 million acres of land also prohibited the state from selecting any land that might be subject to Native title. Treaties had never been executed between the United States and Alaska's Native people, and Congress had put off questions of land disposition in the region throughout the nineteenth and twentieth centuries. When Alaska became a state in 1959, no one knew to what lands Alaska Natives might have title. As the state began to select lands in 1959, Native individuals and groups began to protest those selections and to file their own claims to large tracts of land. The number of Native claims grew rapidly, and because many overlapped with one another, they were greater in sum by 1965 than the total land area of the state. Amid the resulting chaos, the U.S. Secretary of the Interior stepped in to halt further state land selections until a solution could be devised. Government officials soon realized that the problem was of such magnitude that only Congress could resolve the issue. As the proposed pipeline route would cross both state and Native lands, the project was postponed (Coates 1991:162-74).

A solution proposed by the state's principal Native organization, the Alaska Federation of Natives (AFN), paved the way for pipeline construction. When Congress refined and then adopted the idea in landmark legislation in 1971, ANCSA conferred title to Natives on 44 million acres; Natives relinquished any title to Alaska's remaining 330 million acres. The federal government paid nearly one billion dollars in compensation. The federal government did not pay individuals; rather, the government used the money to capitalize regional and village economic development corporations, in one or another of which all living Alaska Natives of one-quarter or more Native ancestry became stockholders. In this way the government intended the compensatory award to work for Natives in perpetuity (ibid., 175-216).

While the ANCSA corporations are "for profit" entities chartered under and operating in accordance with the laws of the State of Alaska, and have no direct social responsibilities, they have had a profound effect on the development of Alaska Native people, cultures and communities, and on the relationship between Alaska's Native people and the broader general community of Alaska. Before ANCSA, Alaska's Native people lived still with the palpable legacy of discrimination. In salient, non-quantifiable ways, ANCSA helped to remove that legacy, and to both legitimize and empower Alaska's Natives. Alaska Natives are now collectively the largest private land owner in Alaska. ANCSA corporations manage investment portfolios worth millions of dollars annually. Moreover, Alaska Natives are fully integrated into the state's politics, serving in numerous elected and appointed positions across the state. Speaking about the legacy of ANCSA, Perry Eaton, a Native CEO born in Kodiak and director of construction for a showpiece Native cultural center that opened in Anchorage in 2000, said in an interview that "the place we enjoy as Alaska Natives today wouldn't exist without ANCSA. It gives us a tremendous amount of stature and control over our destiny, much greater than we had before" (Anchorage Daily News 28 January 2001).[26] Native leaders echoed these sentiments in interviews conducted as part of a University of Alaska project at the 30th anniversary of the act in 2003. Without exception these leaders noted the contribution of ANCSA to Alaska Native capability and integration into Alaskan life.[27]

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[26] See also Anchorage Daily News, 14 November 1998, Section E1; Anchorage Daily News, 16 October, 1999 Section D2.

[27] The ANCSA 30 interviews can be found at LitSite, the University of Alaska general Alaska literature website http://litiste.alaska.edu/aktraditions/aktradition.html.

But anticipated construction of the pipeline did not begin with passage of ANCSA. Even before Congress completed its work, environmental groups filed suit to halt the project, charging that industry plans for it did not meet the requirements of the new environmental legislation adopted by Congress in 1969, NEPA. Under this legislation, any action involving federal land or permits that may result in significant environmental effects required an EIS. A federal judge granted an injunction to halt construction. As the industry scrambled to produce a properly engineered plan, national leaders debated whether or not there should be a pipeline at all. Environmental concerns included the notion that Alaska is America's last wilderness, with the last vast stretches of untrammeled land in the country, and that the government should preserve these lands for future generations.

The outcome of the debate was very much in question, so much so that national leaders again recognized that the Congress would have to make the determination. In July 1973, in a dramatic vote in the Senate following approval of the measure in the House of Representatives, senators reached a deadlock on a vote as to whether the Department of the Interior had satisfied the requirements of NEPA related to the plans for pipeline construction. The vote was 49-49. Vice-president Spiro Agnew cast the deciding vote to approve the Alaska Pipeline Authorization Act on 17 July (ibid., 217-50). It is interesting to note that a separate EIS was never prepared for Prudhoe Bay; and the Trans-Alaska Pipeline EIS only considered the initial development at Prudhoe Bay.

Oil producers began construction of the Trans-Alaska Pipeline in the winter of 1973-74 and completed construction by the summer of 1977. Over 28,000 personnel worked on various aspects of the project, which cost $7.7 billion, vastly beyond the industry's $900,000 estimate in 1970. Money flowed easily. The industry was determined to complete the project in record time, and did, but at great cost. The separate company created by the leaseholders to build and operate the line, Alyeska Pipeline Service Company, had to pay high wages and provide the best food, accommodations and other amenities to maintain the labor force. The high wages resulted in typical boomtown conditions in Fairbanks and Anchorage. Unemployment dropped to near zero in both cities as Alaskans left their routines to take advantage of the high wages and unusual circumstances. Off-duty workers spent lavishly in Fairbanks and Anchorage, where crime rates rose substantially. A number of gangland-style murders were associated with the Teamsters Union in Fairbanks, which controlled much of the labor and supply for the project. At one point the union was banking $1 million a week in dues. The boomtown atmosphere intimidated local residents who learned first-hand the nature of the raucous frontier celebrated in tales of the gold rush (Strohmeyer 1993:121-58).

Meanwhile, exploration and development have continued elsewhere on the North Slope. In 1976, Congress renamed the Naval Petroleum Reserve Number 4 as the National Petroleum Reserve – Alaska (NPR-A) and the BLM sold leases in the early 1980s and again in 1999 and 2002 (U.S. Department of the Interior, BLM and MMS 2003:1.A.2). Efforts are currently underway to develop the reserves found there (U.S. Department of the Interior, BLM 2004). New fields on the periphery of the Prudhoe Bay/Kuparuk development area are expanding the production infrastructure in the Central Arctic, e.g., Alpine North and South, Tarn II, Palm, Liberty, and Sourdough prospects (see Chapter Seven for a more detailed discussion of recent North Slope Oil Development). Efforts to open leasing in the Arctic National Wildlife Refuge continue, 150 miles east of Prudhoe Bay. In the Central Arctic area of the North Slope, the Alaska Department of Natural Resources, Division of Oil and Gas, has leased tracts on land and near-shore areas. The state program has identified additional oil reserves in the Central Arctic with subsequent development.

It would be difficult to overstate the impact of modern oil development in Alaska. Taxation on oil production on the North Slope, crafted by the Alaska legislature in 1973, has generated $50 billion for the state in nearly 25 years, $2 billion a year on average. For over two decades, about 80 percent of Alaska's unrestricted general fund revenue has come from oil taxation. One third of Alaska's economic base, as stated earlier, is oil production and ancillary economic activity.

The character of Alaska would change dramatically if that revenue disappeared, as the state's citizens observed when oil prices crashed in 1985-86. From a high of $40 per barrel in 1981, and a steady rate of about $27 a barrel in 1985, oil prices fell to less than $15 by 1986. The impact on the state's economy was devastating, a broad economic collapse felt by virtually every household across the state, despite the fact that there was no state income tax and the state continued to issue permanent fund dividend checks. The value of state general fund revenues fell from $4.1 billion in 1984 to $2.9 billion in 1986 and $2.1 billion in 1988. State general appropriations fell from $4.3 billion in 1984 to $3.1 billion in 1986, and $2.4 billion in 1988. Capital expenditures from the appropriations fell from $1.7 billion in 1985 by a third, to $606 million in 1986, and $214 million in 1988. By 1990, they had dipped to $143 million.[28] State government officials acted quickly to cut capital spending but that was hardly enough to prevent a

[28] Alaska Department of Revenue, Revenue Sources (Juneau: Alaska Department of Revenue, 1984-90); State of Alaska, Executive Budget (Juneau: Office of the Governor, 1984-90); Anchorage Daily News, November 2, 1988.

crisis. The deep cuts to the operating budget meant a widespread loss of jobs, reduced incomes, and loss of business and property value. Banks, which had lent freely during the boom, failed with startling regularity. Of 15 banking institutions in the state, nine went bankrupt.[29]

McDowell Group, Inc. and Barker (1999, TR 162) documented the socioeconomic effects of the oil industry in Alaska from 1975 to 1995. In a multi-part study, the authors analyzed the effects of the oil industry on state revenues, capital projects, local governments, employment and earnings, and individuals and households. The report includes both statewide analyses as well as local-level impacts for Anchorage, the Kenai Peninsula Borough, the Northwest Arctic Borough and three communities (Kotzebue, Kiana, and Noorvik) in the Northwest Arctic Borough.

The *Exxon Valdez* tanker oil spill in Prince William Sound in 1989 introduced another aspect of oil's impact in Alaska. The *Exxon Valdez* spill was the largest oil spill in United States history, 10.8 million gallons. Though not high ranking among world oil spills, 34th, it is generally considered to be the most damaging to the environment of all spills. Prince William Sound was a unique, rich natural ecosystem of about two million acres. A spill of such magnitude would have been counted a disaster under any circumstances. Coming as it did after a maturing of the American environmental consciousness in the 1960s and 1970s, the spill stood as confirmation of the legitimacy of environmental protection and the realization of environmentalists' more dire forecasts. This was particularly true once investigators analyzed the causes of the spill. Moreover, the impact on the Alutiiq communities in Prince William Sound, Lower Cook Inlet, Kodiak Island, and the Alaska Peninsula was culturally traumatic (Fall, Miraglia, Simeone, Utermohle, and Wolfe 2001:291-306). The environmental destruction caused by the oil spill caused distress, grief, hardship, and a sense of loss to individuals and groups who held interests in the natural systems, including subsistence harvesters. The Alutiiq closest to the spill largely organize their annual pattern of life around seasonal harvests, distribution and use of wild foods. They were especially hard hit. The spill resulted in upheaval of community life in these communities caused by such things as reduced subsistence harvests, fear of contamination of subsistence resources, and nearly all adults working on the massive clean-up effort. In short, the oil spill directly threatened the natural resource foundation of the Alutiiq way of life (ibid.). (See Chapter Eight for a detailed discussion of long term consequences of the oil spill for Native subsistence.)

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[29] Anchorage Daily News, September 27, 1987.

There were also positive economic impacts for Alaska in the long run. The corporation spent over $2 billion on the three-year clean up. Much of that money went to Alaska fishermen for use of their vessels, to Alaska labor, and to Alaska contractors. Subsequently the corporation was fined another $1 billion, $100 million in criminal fines and $900 million in civil fines and penalties, most of which went into the *Exxon Valdez* Oil Spill Trustee Council fund[30]. The corporation is still fighting a $4 billion class action punitive damage award. With the exception of the Prince William Sound communities closest to the spill and potential recipients of the pending punitive damage award, negative feelings toward the oil industry from EVOS lasted only a short time in Alaska.

Offshore Leasing

Turning to the history of the federal and state offshore petroleum leasing, there have been 22 federal OCS lease sales, the first in April 1976 and the latest in April 2004, for a total of 1,655 offshore leases issued (see Table 2.1 and Figure 2.3)[31]. Of the approximately 156 million acres the federal government offered for lease, industry leased over 8.9 million acres and paid the federal government approximately 6.5 billion dollars in lease bonuses.

The Department of the Interior sold leases for drilling activity in the Gulf of Alaska in 1976, 1980, and 1981 and sold leases in the Lower Cook Inlet in 1977, 1981, 1982, and 1997. Drilling in these two regions occurred between April 1976 and June 1978. Lease holders drilled 11 wells in the Gulf of Alaska. The authors of Technical Report No. 17 (Dames & Moore 1978d, TR17) found that drilling in the Northern Gulf of Alaska and the Lower Cook Inlet resulted in small increases in local construction, transportation and communications employment, short-term spurts of activity for a few local businesses, and significant and rapid appreciation of real estate values. The effects were not significant in Anchorage, or in any of the rural communities touched most directly by the activity, including Yakutat, Seward and Homer. The impacts were also consistent with expectations (Dames & Moore 1978d:57).[32] Yakutat experienced the greatest impact, with temporary employment for 36 persons, conversion of a dock, and transfer of

[30] Exxon Valdez Oil Spill Trustee Council website, http://www.evostc.state.ak.us

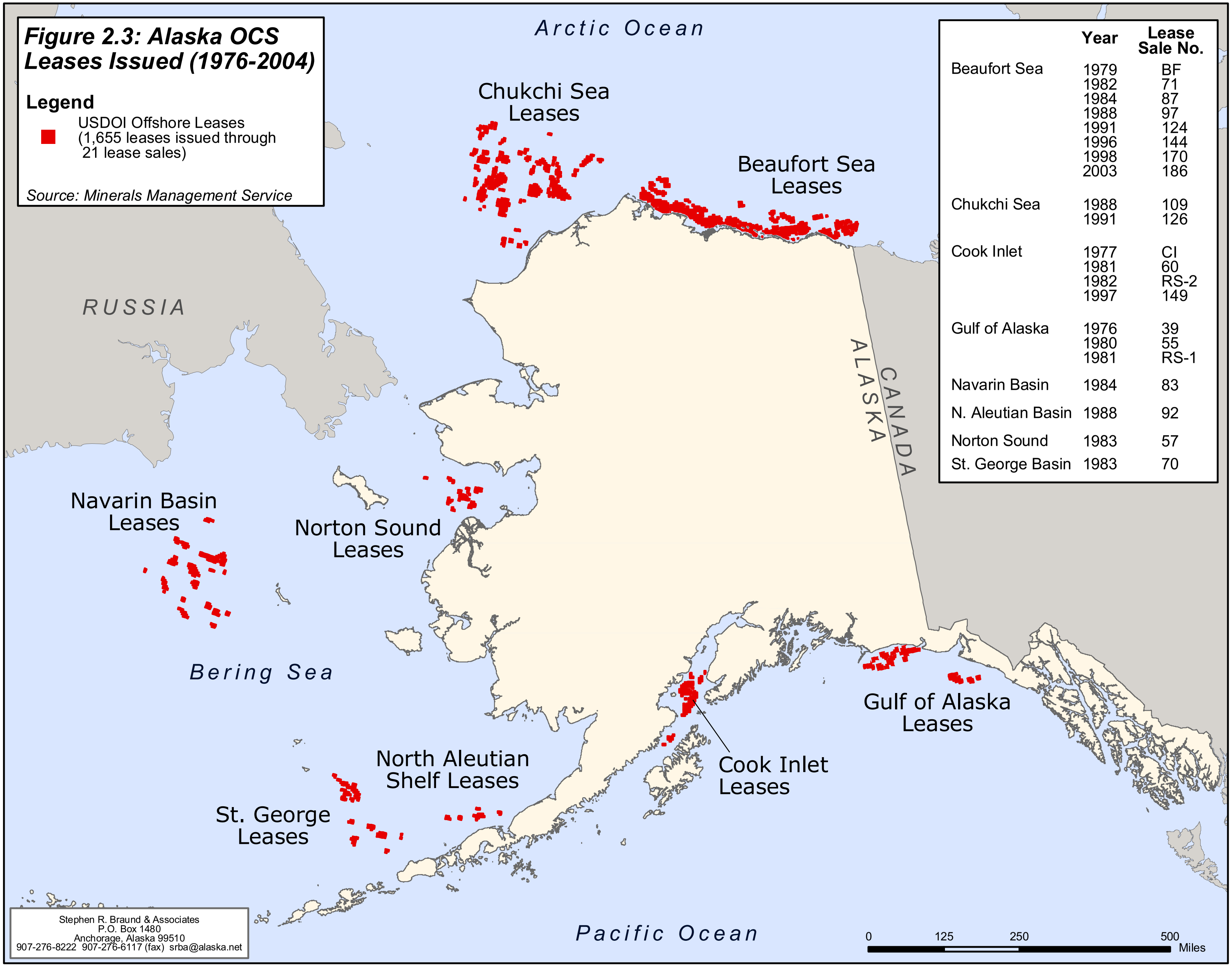
[31] MMS held Beaufort Sea Lease Sale 195 in March 2005 that attracted consideral bidders.

[32] Technical Report No. 17, Alaska OCS Socioeconomic Studies Program, *Monitoring Petroleum Activities in the Gulf of Alaska and Lower Cook Inlet between April 1975 and June 1978* (Bureau of Land Management, Alaska Outer Continental Shelf Office, 1978), p. 57: “OCS exploration normally should not result in significant impacts of a social and economic nature at the community level.”

Table 2.1: Alaska OCS Region Lease Sales and Leases Issued

Plan Area	Sale	Month of Sale	Year of Sale	Leases Issued
Gulf of Alaska	39	April	1976	76
Cook Inlet	CI	October	1977	87
Beaufort Sea	BF	December	1979	24
Gulf of Alaska	55	October	1980	35
Gulf of Alaska	RS-1	June	1981	1
Cook Inlet	60	September	1981	13
Cook Inlet	RS-2	August	1982	0
Beaufort Sea	71	October	1982	121
Norton Sound	57	March	1983	59
St. George Basin	70	April	1983	96
Navarin Basin	83	April	1984	163
Beaufort Sea	87	August	1984	227
Beaufort Sea	97	March	1988	202
Chukchi Sea	109	May	1988	350
North Aleutian	92	October	1988	23
Beaufort Sea	124	June	1991	57
Chukchi Sea	126	August	1991	28
Beaufort Sea	144	September	1996	29
Cook Inlet	149	June	1997	2
Beaufort Sea	170	August	1998	28
Beaufort Sea	186	September	2003	34
Cook Inlet	191	April	2004	0
Total Leases Issued				1,655

Source: MMS, Alaska OCS Region, http://www.mms.gov/alaska/lease/hlease/leasetable.htm.



	Year	Lease Sale No.
Beaufort Sea	1979	BF
	1982	71
	1984	87
	1988	97
	1991	124
	1996	144
	1998	170
	2003	186
Chukchi Sea	1988	109
	1991	126
Cook Inlet	1977	CI
	1981	60
	1982	RS-2
	1997	149
Gulf of Alaska	1976	39
	1980	55
	1981	RS-1
Navarin Basin	1984	83
N. Aleutian Basin	1988	92
Norton Sound	1983	57
St. George Basin	1983	70

Figure 2.3: Alaska OCS Leases Issued (1976-2004)

industry property to the city following completion of drilling. Northern Resource Management interviewed a variety of residents and groups to produce, *Monitoring Oil Exploration Activities in Lower Cook Inlet* (Northern Resource Management 1980, TR55). Fishermen in the area had been concerned about the impact of oil activity on the fishery, including increased shipping. But researchers concluded that impact had been minimal. They attributed this outcome to the existing oil infrastructure in the Kenai area and the fact that residents of the Kenai Peninsula already were familiar with the oil industry as a whole, and that the oil companies were conscientious in informing the public of the nature of their activities.

The Department of the Interior planned a second generation lease sale in the Northern Gulf for 1980. The government anticipated that the new leases would involve drilling in deeper waters than the earlier program (Dames & Moore 1979b and c, TR29). Therefore, the compilers predicted increased use of hybrid, compliant and floating platform designs, and subsea completed wells. They anticipated the need for offshore storage facilities. The report also outlined more elaborate production facilities in the event of an oil discovery.

Geophysical surveys were conducted in the Bering Sea in 1963 and continental offshore stratigraphic test wells were drilled between 1976 and 1983. The Department of the Interior leased tracts in the Norton and St. George basins in 1983, and in the Navarin Basin in 1984. Lease holders drilled 11 exploratory wells in 1984. The drilling phase included drilling vessel operations, marine and air support services and bases, lease operator supervision, and services provided by numerous specialized contractors such as mud loggers and divers. MMS commissioned *Monitoring OCS Activity in the Bering Sea,* Technical Report No. 114 to research this activity. Patrick Burden & Associates contacted over 70 firms who were active in Bering Sea exploration as lease operators or service contractors. While the commitment of the oil industry was substantial – they invested over $500 million in the exploration program – the sociocultural impacts were regarded as low (Patrick Burden & Associates and Dames & Moore 1985, TR114). Employment opportunities in Unalaska were not substantial, though some commercial activity did benefit the community. The program did not generate a permanent “oil patch” economy in Unalaska. The impact on St. Matthew Island and the Pribilof Islands was negligible, and on Nome, it was marginal.

The Department of the Interior has conducted eight lease sales in the Beaufort Sea: 1979, 1982, 1984, 1988, 1991, 1996, 1998, and 2003. By 1985, the industry had drilled 17 exploration wells. Authors of Technical Report No. 107, *Monitoring Oil Exploration Activities in the Beaufort Sea*, concluded that “despite adverse environmental and logistic conditions and despite stipulations, permit requirements and other regulatory constraints, industry was clearly able to solve the physical and institutional obstacles and carry out a significant and effective exploration program" (Kevin Waring & Associates, Glen Lundell & Associates and Fison Associates 1985:190, TR107). Reporters considered this a major industrial undertaking, noting that it drew a labor force from across Alaska, not just Prudhoe Bay. Nonetheless, reporters noted that petroleum development at Prudhoe Bay dwarfed the exploration of the Beaufort Sea.

In June 2000, the U.S. Supreme Court ruled that the federal government owned lands that had been contested by the state in the Dinkum Sands region of the Beaufort Sea. The state had sold two leases on these lands; the federal government took over these leases with different royalty implications for the state.[33] There are currently 64 leases active in that area.

By 2003, lease holders had drilled 84 exploratory wells[34]. The following is a list of the wells by MMS planning area (see also Figure 2.4):

Beaufort Sea	31 wells drilled
Chukchi Sea	4 wells drilled
Norton Sound	6 wells drilled
Navarin Basin	8 wells drilled
St. George Basin	10 wells drilled
Cook Inlet	13 wells drilled
Gulf of Alaska	12 wells drilled

The number of exploration wells drilled has been less than anticipated in the early ESP Petroleum Development Scenarios. The impacts of exploratory drilling have been less than expected for this reason, and in part because much of the supply and labor force contracted has not drawn upon the local communities.

Lease holders have not discovered commercial quantities of oil or gas in most of the offshore wells drilled.[35] However, British Petroleum Exploration (Alaska) (BPXA) has developed a Beaufort Sea offshore site on state lands on the North Slope near Prudhoe Bay Alaska, the Northstar site. Directional

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[33] Minerals Management Service, Alaska OCS Region website, http://www.mms.gov/alaska/lease/leasetable.htm

[34] By 2003, MMS had permitted 88 post lease exploration wells and industry had drilled 84 wells, but only completed drilling 83 wells, not completing one well in the Beaufort Sea.

[35] Minerals Management Service, Alaska OCS Region website, http://www.mms.gov/alaska/fo/history/salearea.htm

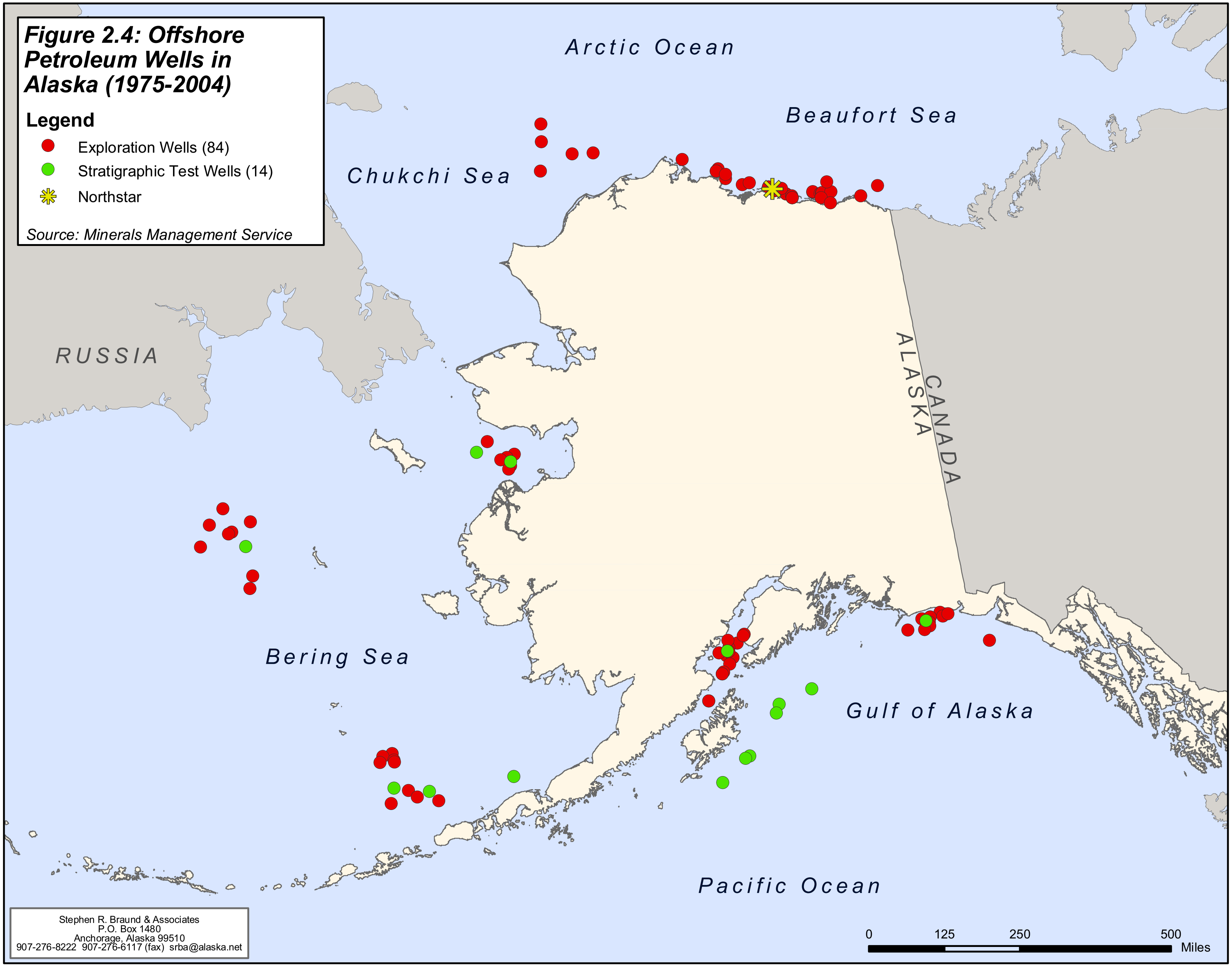
Figure 2.4: Offshore Petroleum Wells in Alaska (1975-2004)
Legend
Exploration Wells (84)
Stratigraphic Test Wells (14)
Northstar
Source: Minerals Management Service
Arctic Ocean
Beaufort Sea
Chukchi Sea
RUSSIA
ALASKA
CANADA
Bering Sea
Gulf of Alaska
Pacific Ocean
Stephen R. Braund & Associates
P.O. Box 1480
Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net
0
125
250
500
Miles

wells from this site reach beyond state lands into OCS lands. This constitutes the first oil or gas production from OCS lands in Alaska, and it began production on October 31, 2001. In 2002, the MMS completed the final EIS for an offshore development at Liberty, a short distance east of Prudhoe Bay (Figure 2.4) (U.S. Department of the Interior, MMS 2002), but the project remains on hold by corporate decision. The MMS in 2001 also approved seasonal exploratory drilling at an offshore prospect named McCovey. The McCovey prospect is near Cross Island, the principle fall whaling area used by Nuiqsut whalers. Chapter Seven provides additional details on current North Slope oil exploration and development particularly as it intersects with subsistence activity.

Offshore development in Alaska has been minimal with 1,655 leases resulting in 84 exploration wells and one production facility at Northstar. According to Iñupiat whalers, impacts from this development are mostly associated with Beaufort Sea seismic activity and its effect of deflecting bowhead whales during the fall subsistence whale hunt. On the other hand, Prudhoe Bay and associated onshore developments have had more significant impacts through induced changes in demography, employment, fiscal effects, land claims, the formation of the North Slope Borough, and technological disaster.

Chapter 3 - Petroleum and the Alaska Economy

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Introduction

The first section of this chapter introduces a conceptual framework for examining the effects of petroleum development on the Alaska economy. The second section of the chapter reviews work under the ESP to develop petroleum development scenarios and technology assessments. This work generated the inputs for subsequent economic analyses. The third section describes the development of a suite of statewide econometric, demographic, and fiscal models. This story is a good example of how basic research funded by the federal National Science Foundation dovetailed with the applied research of the ESP. Equipped with the conceptual background and modeling tools to examine the economic effects of petroleum development in Alaska, section four, *Impacts of Offshore Development on Alaska's Economy,* has three parts. The first part reviewes the potential cumulative impacts of offshore development, had it occurred. The second is an explanation of key economic and demographic relationships, and the third is a comparison of baseline model projections with actual changes in Alaska over the last 20 years. Section five examines the *Broader Policy Applications* of models that formed the basis of economic and demographic impact projections in the ESP. The reach of these models went well beyond the ESP itself and reflects an additional contribution of the ESP.

Conceptual Background: Petroleum and the Alaska Economy

The usual place people start thinking about how development influences the economy is jobs. The story line is that development means jobs, jobs produce income, and spending of this income drives the economy. In the case of Alaska, jobs are a part, but not the largest part, of the story. If a five-year resident of Alaska lands a job as a roustabout on an oil rig, he or she earns about $15 an hour and that is new money to the Alaska economy. But suppose that the same job goes to a resident of Louisiana? While he or she may spend some of the income in Alaska – say at the airport enroute to Baton Rouge for "R&R" – most of the money will probably leave the state. Looking at the employment directly generated by petroleum development activities is certainly important, but taking into account who gets the jobs is too.

Oilfield construction and servicing is big business. In 1978, an offshore oil platform cost $30 million or more to build. This big ticket item, along with the more mundane support activities like food and cleaning services, are a second potential linkage between petroleum development and Alaska's economy. Again, however, the story line is not so simple. It may be cheaper to construct an offshore oil exploration rig on the west coast and tow it to Alaska. The contracted food service company for a remote industrial enclave may be based in Tulsa. Many of its employees may be residents of Oklahoma. To anticipate the effects of development we need to understand geographic differences in wage rates and labor force experience. We also need to know about transportation costs and the ways in which technology offers opportunities to reduce the cost of petroleum development.

In addition to direct jobs in the oil industry and support industries, a third linkage to the Alaska economy is public revenues. The story of Prudhoe Bay and the Alaska economy would have been much different if the State of Alaska did not own the land and petroleum resources beneath what we now call the Prudhoe Bay development. Because the State of Alaska is itself a producer, the state gets royalties for the oil produced from Prudhoe Bay. The state also received a major economic kick start in the form of $903 million in rents and lease bonus payments in 1970, and more since then. Alaska also has a special energy facilities tax and a corporate income tax. Revenues received by the state and a few of its boroughs are, as will be shown, the largest part of the story of the effects of petroleum development on Alaska's economy.

The flip side of public revenues is public costs. People moving to the state to take petroleum industry jobs may bring their families. Children of these families go to local schools. Drivers in the family contribute to the wear and tear on Alaska roads, and voters lobby for new concert halls and sport facilities. To some extent, new families pay for these public costs through property taxes. But in Alaska much of the burden in providing public services is borne by the state government.

A linkage between petroleum development and Alaska's economy often not recognized is through non-profit organizations. This is perhaps the most elusive linkage, but important nonetheless. Petroleum companies are substantial contributors to non-profit organizations that provide social services to local residents. They encourage staff to contribute their talents to funding agencies like the United Way and may provide other in-kind supports like space and equipment. Petroleum companies have also made major contributions to the University of Alaska.

Petroleum development influences the Alaska economy, and the reverse is true as well. State spending accounts directly or indirectly for approximately three out of every ten dollars in personal income (Goldsmith, Gorsuch, Hill, and Leask 1990a). Seventy-nine percent of general fund unrestricted state revenues were attributable to the petroleum industry in 2002 (Alaska Department of Revenue 2003). The State of Alaska taxes the oil and gas industry on the value it adds to the gross national product at about the same rate as other governments tax the industry nationally, about 12 percent (Goldsmith, Berman, Gorsuch, and Leask 1990b). Discussion of increasing the tax rate on the petroleum industry obviously makes the industry nervous. Lobbyists are quick to point out that increased taxation would discourage investment in the state, ultimately lowering production and hurting the state's economy. The state and federal governments can affect the investment climate in many ways in addition to taxation; they can change environmental regulations and leasing policies. In 2003, for example, the Department of the Interior offered leases that do not involve royalties for production of a specified volume of oil, so long as the market price remains below a specified amount. Other incentives offered have included reduced minimum bid levels and sliding scale rentals.

Alaska's unique circumstances also affect the relationship between the petroleum industry and Alaska's economy. Alaska Natives have long used vast tracts of lands surrounding their communities for hunting and fishing. Many communities depend on migrating caribou as a mainstay of their diet. Alaska Natives sought recognition of their land rights through legislation in Congress. Realizing that Alaska Natives' push for a settlement to their land claims could stall development at Prudhoe Bay, the oil industry helped lobby for a settlement (Mitchell 2001). The final land claims settlement, however, did not eliminate Native concerns about loss of their subsistence way of life. As later chapters will explain, Native subsistence concerns have formed an important part of the relationship between the Alaska economy and petroleum development.

The relatively large number of commuting workers constitutes another special feature of Alaska's economy. Most oil field jobs are located in remote enclaves and have a two-week-on, two-week-off rotation. It adds only a few hours of flying time to take "R & R" in Houston, for example, rather than Anchorage. By commuting to an established home outside of Alaska, families can avoid a potentially disruptive move and the higher cost of living in Alaska.

The most difficult special feature of Alaska to quantify is the frontier mindset. Yet its influence on the relationship between the petroleum industry and Alaska's economy is real. People in Alaska are more likely to think that government regulations are an infringement on personal rights than a way to protect the environment. They are more likely to think of Alaska as a storehouse of resources to be used than as a vast wilderness. These attitudes have shaped government policy and legislation.

Finally, Alaska's special circumstances include the fact that the economy is small with limited capability to supply inputs to the exploitation of the natural resources that are the basis for the economy. This lack of backward linkages to other industries makes it difficult for the state to capture much of the economic activity directly associated with petroleum development.

Petroleum Development Scenarios

The initial design of the ESP called for an analysis of statewide economic and demographic impacts of a prospective lease sale. As stated in the first such report, *Beaufort Sea Region Petroleum Development Scenarios: Economic and Demographic Impacts* (ISER 1978b, TR18):

> The objective of this report is to provide the information needed to anticipate the major dimensions of the economic and social impacts of proposed oil and gas developments in the Beaufort Sea. The Institute of Social and Economic Research, as part of the Bureau of Land Management's OCS Studies Program, has provided a series of economic and population forecasts through the year 2000 under several alternative scenarios for Beaufort Sea petroleum development. By contrasting these forecasts with a base case forecast, which does not include the proposed developments, it is possible to assess four major dimensions of the impacts of OCS development – population, employment, income, and state government fiscal impacts (ISER 1978b:3, TR18).

Inputs required to project economic and demographic impacts included:

- Direct construction and petroleum sector employment by year for the life of the field
- Field production estimates, severance tax rates, value of field equipment and facilities, and distribution of reserve ownership, all by year (ibid.)

The initial design of the ESP also envisioned that Petroleum Development Scenarios technical reports would provide these input requirements. In the first such report, *Beaufort Sea Region Petroleum Development Scenarios* (Dames & Moore 1978a, TR6) the authors stated:

> In order to analyze the socioeconomic and environmental impacts of Beaufort Sea petroleum exploration, development, and production, it is necessary to make reasonable predictions of the nature of that development…Particularly important to socioeconomic studies are the manpower, equipment, and material requirements, and the scheduling of petroleum development. The scenarios have to provide a reasonable range of technological, economic, and geographic options so that both minimum and maximum development impacts can be discerned. The primary purpose of this report is, therefore, to describe in detail a set of petroleum development scenarios that are the most economically and technically feasible, based upon available estimates of oil and gas resources of the Beaufort Sea (Dames & Moore 1978:1, TR6).

The *Beaufort Sea Petroleum Development Scenario* technical report was published in April 1978 while the *Beaufort Sea Economic and Demographic Impacts* technical report was published just two months later. Preparation of the two reports was thus largely concurrent. No doubt this presented a challenge to link the two efforts. Over the next two years, the sequencing of the two reports improved:

- North Gulf of Alaska (TR29, TR34), four months apart

- Western Gulf of Alaska (TR35, TR38), five months apart
- Lower Cook Inlet (TR42, TR43), five months apart
- Bering-Norton (TR49, TR50), six months apart

Beyond the challenge of timing were the challenges of developing scenarios and arriving at a reporting format for data inputs to the economic and demographic analysis. The *Beaufort Sea Petroleum Scenarios* report based its scenario development principally on USGS resource estimates and an estimate of the minimum economically viable field size, taking into account a discounted time stream of costs, the price of oil, an assumed rate of return, and the volume of production necessary to support a new transportation system (Dames & Moore 1978, TR6). Based on this analysis, the authors concluded, "two parameters outweigh all others with respect to potential impacts on the Alaska environment and economy: the amount of resource and its location. Consequently, a selection of scenarios which covers the range of locations and of reasonably expected resource deposit sizes should provide a sufficient basis for impact consideration" (ibid., 317). In this case, the authors developed four scenarios, ranging from an exploration only scenario to an unlikely, but large scenario (one percent probability, 1.9 billion barrels of oil, 4.75 trillion cubic feet of gas).

This chapter discusses the actual findings of the set of Petroleum Development Scenario reports later. The intent here is to trace the evolution of methods used to produce the reports. Dames & Moore (1978a, TR6) authors based their Beaufort Sea offshore development labor force requirements on exploration and development at Prudhoe Bay. They argued that this experience was more relevant than offshore exploration and development in the North Sea or elsewhere in the United States. In the *Northern Gulf of Alaska Petroleum Development Scenarios*, however, Dames & Moore used North Sea Petroleum Development as the closest case for comparison. Even here, however, the authors noted that the Gulf of Alaska scenarios involved smaller and fewer oil fields that were much further from highly developed industrial centers (Dames & Moore 1979b, TR29).

Researchers made the work force projections in the *Beaufort Sea Petroleum Scenarios* in units that matched the input requirements for the economic and demographic analysis (annual average employment in the petroleum and construction sectors). They based these aggregate figures on assumptions about crew sizes for the various facilities used in exploration, construction, and operation: drilling rigs, platforms, pipelines, warehouses and shops, operations center, gas conditioning plant, pump stations, flow stations, roads, airstrips, crew camps, harbor and storage areas, and power plants (Dames & Moore 1978a, TR6). Dames & Moore elaborated on this approach in the *Northern Gulf of Alaska Petroleum Development*

Scenarios report (Dames & Moore 1979b, TR29). They produced monthly employment estimates in order to generate the figures necessary to calculate revenue sharing with local municipalities. They added transportation and manufacturing to petroleum and construction as employment sectors. They estimated labor force requirements by task (e.g., helicopter support for a platform). They distinguished between onsite and offsite employment and assigned a number of shifts per day and crew size to each task. Researchers incorporated all of these analytical capabilities in an OCS manpower employment computer model. Appendix A of the *Lower Cook Inlet and Shelikof Strait Petroleum Development Scenarios* (Dames & Moore 1979d, TR43) contains the most detailed description of the model. One of the key conclusions made in the *Northern Gulf of Alaska Petroleum Development Scenarios* report is that experienced workers from such states as Texas and Louisiana were willing to work in Alaska at wage rates prevalent on the Gulf coast of the United States, much lower than those paid to onshore oil field workers in Alaska (Dames & Moore 1979b:121, TR29).

One of the challenges facing authors developing scenarios was to identify economically plausible scenarios that covered a range of development scales. In the case of the Gulf of Alaska, for example, the 95 percent probable case was for exploration only. They concluded that, "No oil field smaller than 110 million barrels at a 10 percent value of money is economic in the Gulf of Alaska with any production system tested in 91 meters (300 feet) of water. At 15 percent value of money the minimum field size is 215 million barrels. Fewer than one percent of oil fields discovered in the U.S. are larger than 100 million barrels" (Dames & Moore 1979b:25, TR29). Dames & Moore authors were even more pessimistic in the *Lower Cook Inlet and Shelikof Strait Petroleum Development Scenarios*: "Even in shallow water, no oil production systems are able to earn 15 percent return on investment with fields of any size in Lower Cook Inlet with a wellhead price of $12.50 and an initial production rate assumed to be 1,000 B/D" (Dames & Moore 1979d:20, TR43).

Making "reasonable and representative predictions" based on petroleum development scenarios remained the objective of the petroleum development scenario report series through the final report in the series, *Bering-Norton Petroleum Development Scenarios* (Hanley, Wade, Harrison, Jones 1980a and b, TR49 and TR49A). MMS replaced this series with petroleum technology assessments, the first of which was *St. George Basin Petroleum Technology Assessment* (Hanley, Wade and Feldman 1980c, TR56). MMS dropped the dual objectives of developing scenarios and making predictions based on those scenarios:

> The principal purpose of this study [TR56] is to identify the petroleum technology that may be used to develop oil and gas resources of the St. George Basin…The second purpose of this study is to assess the economic viability of various development strategies under different reservoir, environmental, locational, and cost assumptions. The third purpose of this study is to estimate the

manpower required to construct and operate the facilities (Hanley, Wade and Feldman 1980c:1, TR56).

The most relevant technology differed by region. The focus in the Northern Gulf of Alaska was on technologies suited to deepwater storm-stressed environments: steel jacket platforms, gravity structures, floating production (Dames & Moore 1979b, TR29). In contrast, the focus in the St. George Basin was on technologies suited to large distances from fields to shore (up to 200 miles) and the possibility of unconsolidated sea ice: shared trunklines to shore terminals, offshore loading, and subsea production (Hanley, Wade and Feldman 1980c, TR56).

The change in approach from petroleum scenarios to petroleum technology assessments shifted the responsibility of developing specific scenarios from researchers funded under contract through the ESP to staff in the BLM Alaska OCS Office. The petroleum technology assessments were "structured to provide 'building blocks' of petroleum facilities, equipment, costs, and employment that can be used by the BLM Alaska OCS Office to evaluate nominated lease tracts" (Hanley, Wade and Feldman 1980c:1, TR56). TR56 included a single scenario based on the USGS mean case, as did the subsequent *North Aleutians Shelf Petroleum Technology Assessment* (Hanley, Wade and Feldman 1980d, TR63). Later reports for the Chukchi Sea (Wilson, Wade, Feldman and Younger 1982b, TR79), Hope Basin (Wilson, Younger, Feldman and Wade 1983, TR81), and Navarin Basin (Wilson, Wade, Feldman and Fausak 1982a, TR83) did not include employment estimates for even a single scenario.

Development of Analytic Models

This section concerns the task of developing the tools necessary to apply annual estimates of direct construction and petroleum sector employment, field production estimates, severance tax rates, value of field equipment and facilities, and the distribution of reserve ownership to the task of projecting population, employment, income, and state government fiscal impacts. What is required is an econometric model that is a mathematical representation of the important economic and demographic relationships (ISER 1978b, TR18).

Development of such an econometric model is a major task in itself, involving basic research to assemble data time series, analyze these data, and mathematically represent all sectors of the Alaska economy and population in a dynamic model. When the social component of the ESP started in 1975, there was already a pressing need to apply an econometric model to petroleum development scenarios. There was no time to invest the years of research necessary for model development from scratch.

Fortunately, however, in 1972 the National Science Foundation funded a long-term research program in response to the prospect of petroleum development. The purpose of MAP was to, "develop analytical techniques that could be used by policymakers to understand and cope with rapid changes in Alaska's economic and social structures" (Kresge, Seiver, Goldsmith, and Scott 1984). The program began at ISER at the University of Alaska. Other institutions contributing to MAP included the National Bureau of Economic Research and the Harvard-MIT Joint Center for Urban Studies. Development of the MAP Econometric Model is described in detail in two books, *Issues in Alaska Development* (Kresge, Morehouse, and Rogers 1977), and *Regions and Resources: Strategies for Development* (Kresge et al. 1984). Given this book's focus on the contribution of ESP Technical Reports, however, the following description is based on the first application of the model within the ESP program: Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts (ISER 1978b:8-11, TR18, Appendix A).

The MAP model in fact consists of three sub-models: an economic model, a demographic model, and a fiscal model. Researchers derived the relationships in the MAP model from historical information. The model simultaneously estimates industrial output, employment, wages and salaries, and real disposable income (ISER 1978b:7, TR18). An econometric model relates production in one industry to another; thus outputs in the petroleum industry influence outputs in other industrial sectors, like services and transportation. Also important to this application is the fact that, in addition to data on the population age and sex distribution and assumptions about fertility rates and mortality rates, the economic model also drives the demographic model. Net migration is a function of employment and real per capita income relative to the U.S. real per capita income. Finally, the fiscal sub-model reflects the central role of the federal, state, and local government sectors in determining the overall level of economic activity in the state.

While MMS did not fund statewide econometric model development separately from model application, over the decade-plus of MMS-funded applications of the MAP econometric model, researchers made several significant improvements as a direct result of the ESP. In 1978, researchers subjected the MAP model to a number of sensitivity tests, a core task in model development (ISER 1978b, TR18). In 1979, researchers developed an approach to determine the share of OCS employment attributed to Alaska residents (Huskey and Nebesky 1979a and b, TR34 and 34A). Researchers paid increased attention to the economic activities included in the base case assumptions. By 1981, they had succinctly laid out these assumptions, along with sources for each assumption. The inclusion of specific economic activities like the Northwest Gas Line and the Susitna Hydroelectric Project as base case assumptions broadened the analytic capabilities of the MAP Econometric Model. Also of special interest were assumptions made about the fishing industry. Following criticism about the assumptions used in the base case in the *St. George Basin* report (ISER 1981b, TR57), the authors of the *North Aleutian Shelf* report included a separate analysis of assumptions about bottomfish harvesting and processing employment (Knapp, Hill and Porter 1982, TR68).

As noted in the first economic and demographic technical report, the use of models that are derived statistically from historical information to forecast economic and population changes relies on the assumption that past relationships will hold in the future. This means that researchers must anticipate and specify how the model will take into account structural changes in the economy, as when services purchased outside Alaska are expected to be purchased within Alaska (ISER 1978b, TR18). In 1982, MMS funded two papers addressing the issue of structural change in Alaska's economy. These two papers became part of a five paper series, *Economic and Demographic Structural Change in Alaska* (Huskey, Nebesky, Tuck and Knapp 1982, TR73). Huskey discusses three of the five papers in Chapter Four; the focus here is on the two papers on structural change in Alaska's economy.

Alaska is a young region with respect to the structure of its economy. With some notable exceptions like canned salmon and Alaska art, almost all retail goods are manufactured outside the state. The same is true for most industrial products. But changes in the location of business activities can occur. Toward the end of the 1990's, for example, companies assembled in Alaska, for the first time, industry modules destined for Prudhoe Bay. One of the five papers in Technical Report No. 73 focused on two ways in which the structure of an economy can change: export expansion, and import substitution (Huskey et al. 1982). To obtain an historical view of structural change in Alaska's economy, Huskey compared changes in the distribution of employment by type of industry between 1970 and 1979 as a function of changes in population and real income, both important to market growth. Four support sector industries showed growth greater than market growth, indicating structural change: communications, finance, business services, and health services. He used this analysis, along with economic base theory, as the basis for projecting structural changes in Alaska.

The rate of increase in Alaska's support sector between 1970 and 1979 could not continue indefinitely. Huskey assumed he could use the structure of the U.S. economy as an upper bound of Alaska structural change. In 1979, for example, trade, transportation, communication, utilities, finance, and services accounted for 52 percent of U.S. non-agricultural employment while the comparable figure for the support sector in Alaska was 40 percent. Huskey noted that the MAP model base projection explicitly includes a projected shift in these support sectors to 42 percent of employment by the year 2000. He concluded that this projection of structural change was reasonable, and conservative by historical growth in Alaska. Interestingly, in 2000 these support sectors actually accounted for 60 percent of employment in Alaska, well above the MAP model estimate and even the U.S. 1979 figure. One only has to look at the corresponding U.S. figure of support sector employment comprising 62 percent of total employment for 2000 to realize that the entire economy has experienced a dramatic restructuring, quite apart from anything unique to Alaska. In addition, an indication of the growth in Alaska's tourist trade is the disproportionate increase in hotel and lodging employment (a 220 percent increase compared with a 170 percent increase in total, non-agricultural employment).

In a second paper in *Economic and Demographic Structural Change in Alaska* (Huskey et al. 1982, TR73), Tuck addressed the question of whether expanded OCS activity could change the structure of the economy as the result of backward and forward linkages. An example of a forward linkage is the petrochemicals industry. An example of a backward linkage is the fabrication of production facilities (as opposed to their operation). Tuck first identified both forward and backward links by industry. Based on a review of U.S. inputs to petroleum production, Tuck concluded that the strongest potential backward linkages were with the manufacturing sector but these had only limited potential for Alaska.

Tuck also concluded that the linkages were likely with highly specialized industries whose introduction to the Alaska economy would not produce significant structural change (but of course would contribute directly to employment and personal income). Forward linkages are extremely specific and limited: refinery and related products, gas production and distribution, and crude oil and natural gas (as inputs to such industries as petrochemicals). Based on an examination of Texas and Alberta economies, Tuck concluded that forward linkages to refining and petrochemical manufacturing had the highest likelihood of emerging in Alaska, but noted that both comparison economies are larger and closer to national markets. We should note that the MAP model handled forward linkages for the petroleum industry as a whole directly, starting with the Beaufort Sea report (Nebesky and Huskey 1981, TR62), the base case economic assumptions included two large scale projects in the southcentral region of Alaska: the Pacific Liquified Natural Gas project and petrochemical development.

In 1983, under the National Science Foundation-funded MAP, researchers conducted a large number of sensitivity tests on the MAP statewide model (Goldsmith, Hull, Huskey, Knapp, Reeder, and White 1983). They concluded that model results were particularly sensitive to assumptions about the labor force participation rate, the response (elasticity) of the support sector to wealth, and parameters in the migration equation. As a result, researchers updated historical data sets and recalibrated economic model parameters. They also re-estimated all the stochastic equations of the model and tested simulated values against actual values. They recalibrated demographic data. Finally, they reviewed MAP model assumptions with 20 experts (Berman and Hull 1984, TR106).

Impacts of Offshore Development on Alaska's Economy

At the inception of the social component of the ESP in 1975, 40 percent of Alaska's gross state product was attributable to the oil and gas industry (ISER statistics cited in McDowell Group, Inc. and Barker 1999, TR162). According to figures derived from the non-OCS base case in the *Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts* (ISER 1978b, TR18), Prudhoe Bay and the related Trans-Alaska Pipeline had already eclipsed the existing Upper Cook Inlet offshore production in terms of mining employment (2.5 times) and oil royalty revenues (6.3 times). It was commonly assumed (mistakenly as it turns out) that a gas pipeline would soon be built from Prudhoe Bay to the lower 48. It is in this context that researchers began to assess the potential economic impacts of OCS development in Alaska.

In analyzing the high discovery Beaufort Sea scenario using the MAP model, ISER researchers concluded such OCS development would change those factors most important to growth: exogenous employment, personal income, and state expenditures. They projected a peak increase in state revenues of $958 million by 1993. This increase reflects the combined total of royalty payments[36], production taxes, and property taxes. It would have represented a 28 percent peak increase in the total state revenues from that forecast in the base case (ISER 1978b, TR18). In terms of population, by 2000 (the end of the projection period) the state's population under the high discovery scenario would increase by 40,000 over the base case, reflecting an increase of seven percent. Personal income would be $1.59 billion higher than the base case, an increase of nine percent.

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[36] Section 8(g) of the Outer Continental Shelf Lands Act Amendments of 1978 provided that the states were to receive a "fair and equitable" division of revenues generated from the leasing of lands within three miles of the seaward boundary of a coastal state that contains one or more oil and gas pools or fields underlying both the OCS and lands subject to the jurisdiction of the state. The states and the federal government, however, were unable to reach agreement concerning the meaning of the term "fair and equitable" until 1985 when they agreed to transfer of 27 percent of federal royalties to the state adjoining the federal leases.

Researchers faced a challenge of how to deal with overlapping prospective OCS developments. The *Northern Gulf of Alaska Petroleum Development Scenarios*, for example, included in the analysis three different base cases, differing principally in assumptions about possible development in the Lower Cook Inlet and the Beaufort Sea (Huskey and Nebesky 1979a and b, TR34 and 34A). They assumed in the moderate base case that OCS development would occur in the Lower Cook Inlet and in the Beaufort Sea. Researchers used the moderate base case as the primary point of comparison. It forecast a statewide population of 789,000 in the year 2000, substantially greater than the high impact case in the previously cited Beaufort Sea analysis (615,000). The Northern Gulf of Alaska mean impact case forecast a statewide population of 805,000, just two percent higher than the moderate base case.

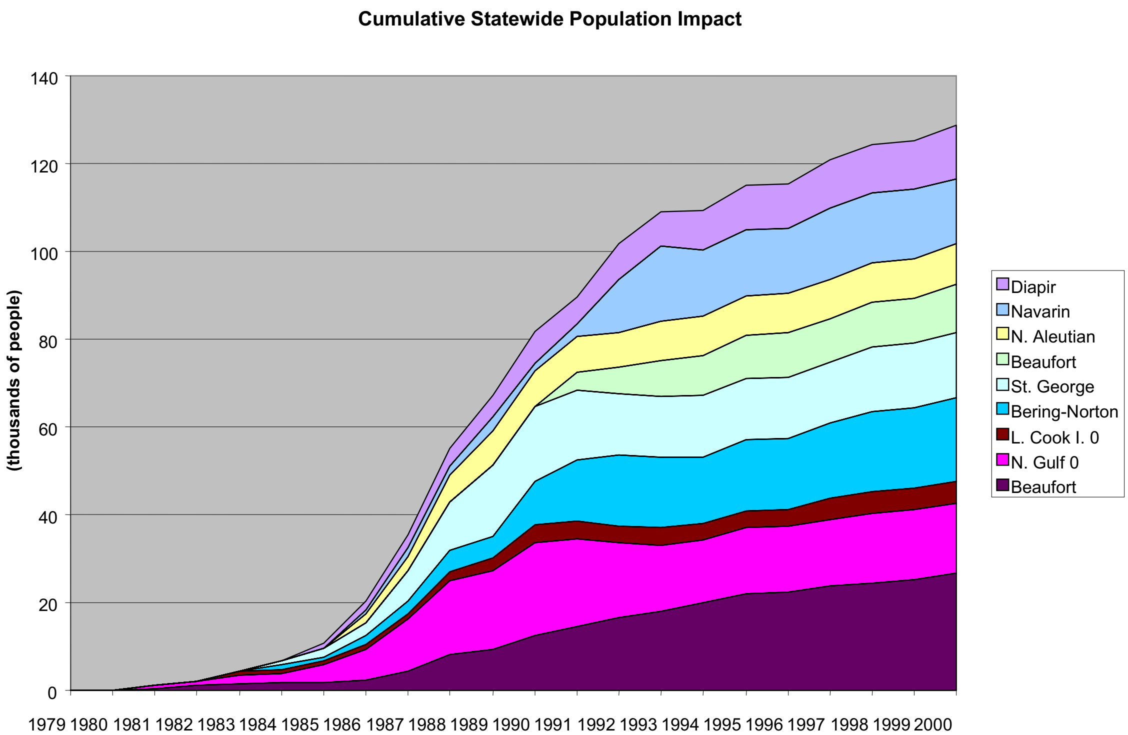
Between 1978 and 1983, economic and demographic technical reports were produced for the following ten offshore prospects (see Figure 3.1):

- Beaufort Sea (TR18) — Sale #BF
- Northern Gulf of Alaska (TR34) — Sale #55 (Sale #39 occurred in 1976)
- Lower Cook Inlet (TR42) — Sale #60 (Sale CI occurred in 1977)
- St. George Basin (TR57) — Sale #70
- Beaufort Sea (2nd sale) (TR62) — Sale #71
- Northern Aleutian Shelf (TR68) — Sale #92
- Bering-Norton (TR50) — Sale #57
- Navarin Basin (TR78) — Sale #83
- Bering Sea (TR80) — TR80 addresses St. George Basin, North Aleutian Shelf, Bering-Norton, and Navarin Basin lease sale areas and not a specific sale.
- Diapir Field (TR88) — Sale #87

The government intended each report to stand on its own. The reports each incorporated the base case assumptions about OCS development discussed in previous reports. The individual reports provide the basis for a rough answer to the question of how big a cumulative impact these 10 individual OCS development prospects could have had on the Alaska economy. Figure 3.2 shows the cumulative projected increases in statewide population based on the “mean” or “moderate” petroleum development scenarios for each case.

Figure 3.1: Lease Sale Areas for Statewide Economic Impact Projections (1978-1983)

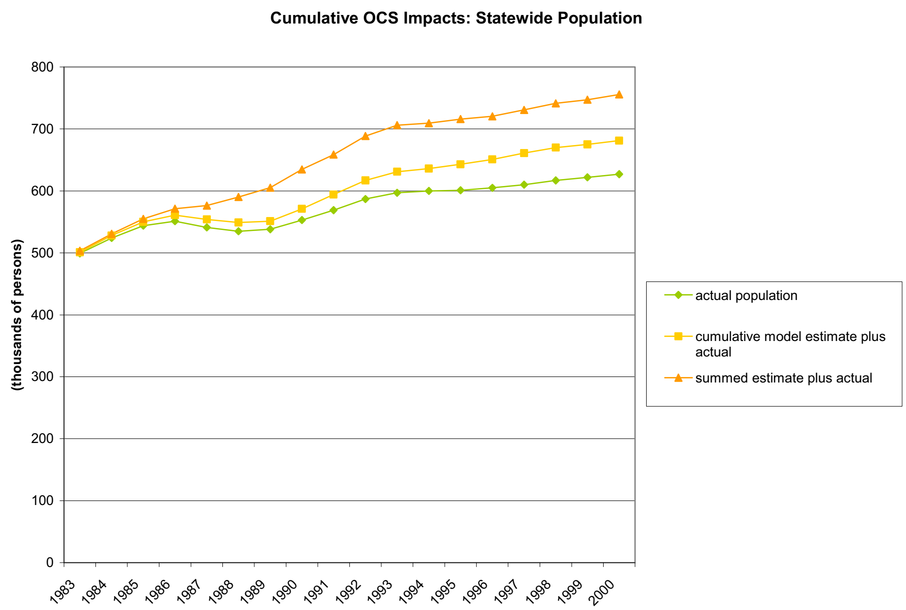
Figure 3.2: Cumulative Projected Statewide Population Impact of Nine Lease Sales



Population is the best single reporting variable as it reflects all the causes of growth. One can quibble with the exact numbers since these figures do not take into account the interactions associated with multiple developments (e.g., calculation of pipeline tariffs), but the order of magnitude is correct. Had all the OCS prospects proved economically viable, researchers projected that the Alaska population would increase by an estimated additional 80,000 over the four year period 1988-1992. As it turned out, none of these 10 offshore prospects proved economically viable. Without any offshore development between 1988 and 1992, the Alaska population actually grew by just over 50,000. Had development occurred at the levels forecast in the mean impact scenarios, OCS development would have more than doubled the statewide population increase for this period.

MMS apparently had the same cumulative increase question in mind when it commissioned a cumulative analysis of potential OCS development, published in 1984 (Berman and Hull 1984 TR106). MMS provided the researchers with aggregate employment and revenue assumptions. ISER researchers in turn used the MAP Econometric Model to project total employment, population, and real personal income, including the OCS mining jobs projection. Comparing the OCS mining employment assumptions with the sum of mining employment expected for the 10 individual lease sale reports, as Figure 3.3 shows, MMS assumed about 4,000 fewer mining jobs in its cumulative development scenario than the sum expected under the 10 medium development cases.

Figure 3.3: Cumulative Projections of OCS Mining Employment

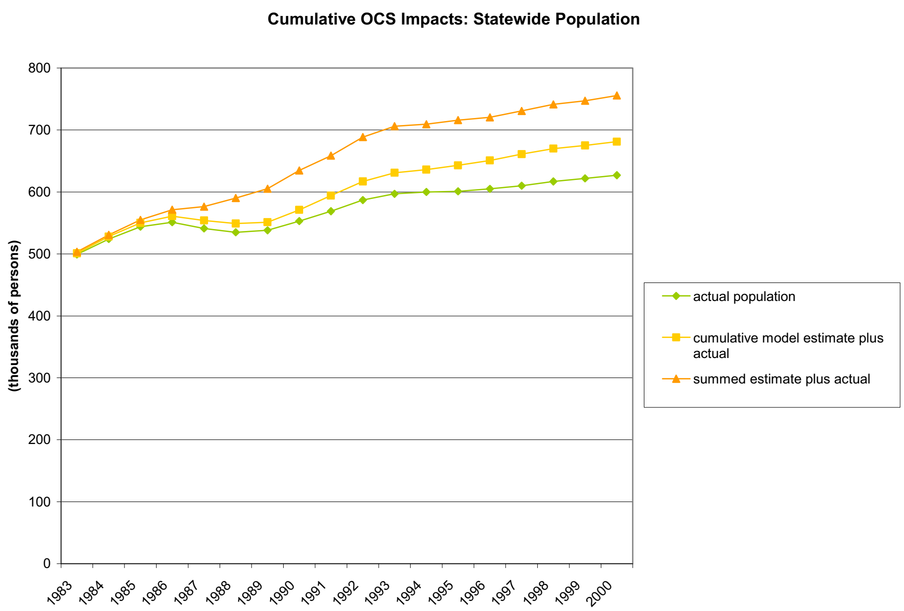


This difference in assumptions translates into a more modest cumulative increase in the statewide population. In Figure 3.4, the projected cumulative increases are added to actual statewide population figures. The result is two hypothetical views of what the state's population growth might have been had OCS development expectations been realized.

The final economic and demographic technical report evaluated the potential cumulative impacts of the MMS five year program for leasing the federal outer continental shelf (Berman, Colt, and Hull 1986, TR124). This analysis projected a cumulative statewide population impact of 15,000 more persons by the year 2000.

Of course, these expectations were not realized. Lease holders did not produce the first oil from the Alaska OCS until 2001. Given the lack of economically viable discoveries, it is easy to see why the projected increases did not occur.

Figure 3.4: Projected Increases in Statewide Population with OCS Development



Comparing Projections and Actual Change Using Onshore Petroleum Activity

How close were the projections made in the 1970s to what actually happened? Converting the base case assumptions about onshore petroleum revenues in the first economic and demographic technical report (ISER 1978b, TR18) to 1995 dollars, one can compare actual petroleum revenues as reported in the *Economic and Social Effects of the Oil Industry in Alaska: 1975 to 1995* (McDowell Group, Inc. and Barker 1999, TR162). As Figure 3.5 shows, Alaska actually received about 10 percent more petroleum revenues than the 1978 cumulative projection of revenues through 1995. Given the large, unanticipated fluctuations in the price of oil and other events over the past quarter century, the projections of petroleum revenues proved to be remarkably close to reality.

Turning to the outputs of the MAP Econometric Model, how well did it predict population change, given the close match of petroleum revenues? The shapes of the population curves are fundamentally the same, and the actual figure in the year 2000 is less than 10 percent higher than the projected figure, and paralleling the difference in actual versus predicted petroleum revenues (see Figure 3.6).

Figure 3.5: Cumulative Projected and Actual Petroleum Revenues

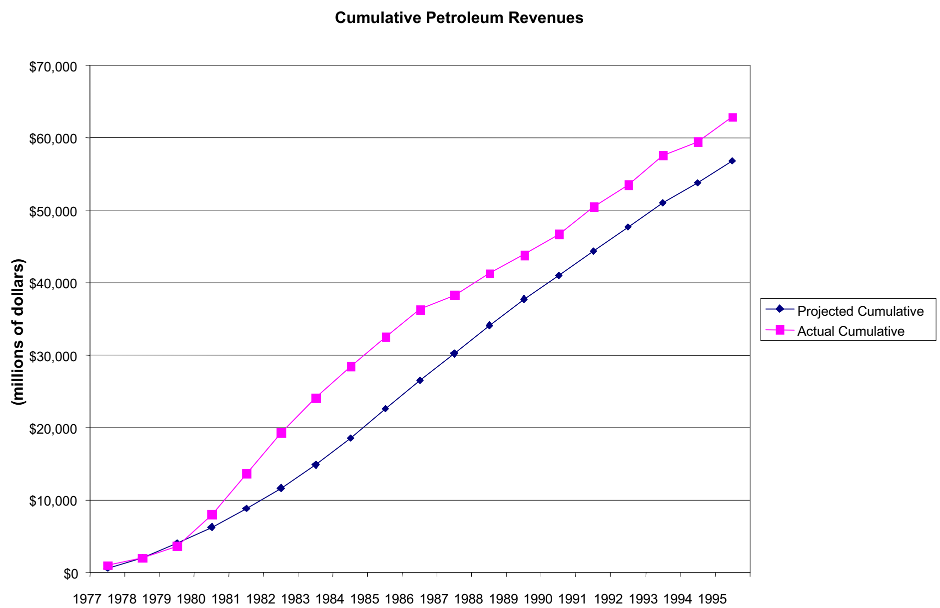
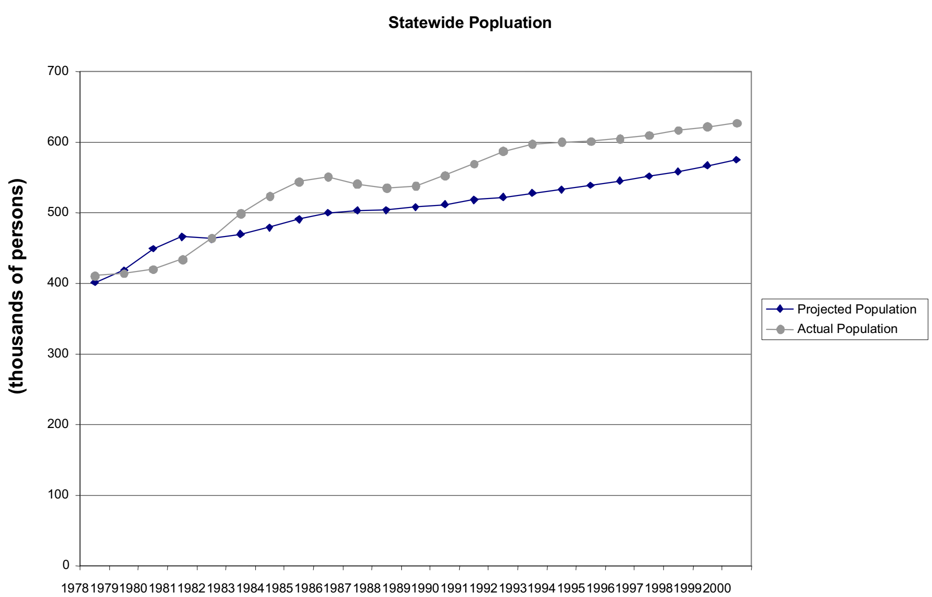


Figure 3.6: Cumulative Projected and Actual Statewide Population Increases



Developers of the MAP Model never intended to predict the future; rather, they sought to provide a consistent analytic environment for examining the effects of different resource and fiscal policies. These comparisons do, however, lend credence to MAP model results.

With that understanding, the discussion can now turn to examining more closely what the economic and demographic analyses revealed about the changing Alaska economy and population. ISER researchers tested the sensitivity of MAP model results in four areas: development plan assumptions, state expenditures, state petroleum revenues, and migration responses (ISER 1978b, TR18). They found that multiple developments would have an effect greater than the sum of individual developments. This finding suggests that the summed impacts in Figure 3.2 understate the cumulative impacts if all 10 OCS developments had gone to production. When looking at the effects of an exploration-only scenario, the researchers found that the state expenditure response to the initial bonus payment accounted for virtually all the significant effects of the initial bonus payment. This finding suggests that, had cumulative, exploration-only scenarios been routinely included in the OCS analysis, the forecasts could have favorably compared to actual changes in the state's economy and population.

ISER researchers also tested different assumptions about state expenditures. One important policy variable for the state was the share of petroleum revenues that the state would save for future use rather than spend on current programs. Researchers found that if the state put 25 percent of petroleum royalties into the vehicle established for this function, the Alaska Permanent Fund instead of the 60 percent assumed in the analysis, the effects on the population and economy were substantial. They also found, however, that the measured impacts of the OCS development itself did not vary substantially by changing the percentage of revenues placed into the Permanent Fund. The lesson is that the state's fiscal policy is much more important to the state's economy than the changes likely induced by offshore development (ISER 1978b:238, TR18).

Looking at the effect of differences in petroleum revenue estimates on model results, the researchers found that, particularly in high discovery scenarios, projected population and employment projections can substantially differ across a range of revenue estimates. This means that if the basis of a revenue estimate proves to be wrong, as for example the percentage of offshore royalties accruing to the state differs, the resulting difference in revenues could substantially alter the results.

Finally, the researchers wondered what the effect might be of differences in migration response to OCS-related jobs from the historical response to employment changes in general in Alaska. One argument was that the highly specialized OCS jobs would not induce migration. When they tested the assumption of no migration response at all, the projected statewide population was three percent different by the year 2000. This analysis shows that the major effect of development is migration induced largely through state spending rather than directly by offshore development.

Tracing through the effects of perturbing the Alaska economy by development tells an interesting story. As ISER researchers explained in their first report in 1978, the expenditures by state and local governments induce more economic activity than the expenditures of those earning wages and salaries from direct OCS employment. The expenditures from both sectors increase incomes, and lead to growth primarily of the support sectors (trade, services, and finance) and these sectors increase their share of total employment. Increased income and employment induces migration to the state, with the result that a short term increase in per capita incomes disappears over the long term (ISER 1978b246, TR18).

Broader Policy Applications

As this chapter has discussed, the underlying relationships in the econometric analyses applied to the question of statewide economic effects of offshore oil development appear to be robust. One can be confident that a great deal is known about what would have happened to the state's economy and population had Alaska offshore petroleum development occurred in the last quarter century. While OCS development did not materialize, the benefits of the ESP-sponsored econometric analysis capability extended beyond projections of the hypothetical impacts of offshore development. Researchers applied the same econometric analysis capabilities to other prospective economic activities such as the Susitna Dam and the Trans-Alaska Pipeline right-of-way renewal. An additional series of publications addressed the more general need for statewide and regional projections of population, employment and income (ISER 2003).

An even more important application of econometric analysis capabilities has been state fiscal policy analysis. Examples of publications based on such analyses include *Where Have All the Billions Gone?* (Leask, Foster, and Gorsuch 1987), *The Alaska Fiscal Gap* (Goldsmith 1989), *Alaska's Dependence on State Spending* (Goldsmith 1990), *Safe Landing: A Fiscal Strategy for the 1990s* (Goldsmith 1992), *From Oil to Assets: Managing Alaska's New Wealth* (Goldsmith 1998), and *Alaska's Budget: Where the Money Came From and Went 1990-2002* (Goldsmith, Leask, Killorin 2003).

Conclusions

Had petroleum companies found commercial quantities of oil and gas offshore Alaska, 100,000 more people might live in Alaska today. Econometric modeling sponsored by the ESP documented the potentially substantial cumulative impact of offshore development on population and employment in the state. Even in the 1980s, however, analysts knew that such large scale development was unlikely. Given high development costs and the likely price of oil, it was difficult to come up with economically plausible petroleum development scenarios. But uncertainty is the watchword of Alaska. Had oil prices stayed at their peak of around $40 per barrel and had some of the optimistic petroleum reserve estimates proved to be true, Alaska would have experienced the kind of growth projected in the ESP analyses.

Instead, the same analytic tools used to project the impacts of offshore development have proven useful in planning for a decline in petroleum revenues from onshore developments. The ESP can claim a share of credit for the fact that Alaskans are able to ground their discussions of alternative spending and wealth management policies on a solid understanding of Alaska's economy.

Chapter 4: Community Effects of Outer Continental Shelf Development

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Introduction

"How will this affect our community?" is likely to be the most significant question asked by residents of coastal communities when they hear news of a possible nearby outer continental shelf (OCS) development. While some may be concerned about possible environmental consequences, the potential social and economic effects of resource development are of greatest concern to residents and government officials (Luton and Cluck 1999). This chapter examines the MMS social and economic studies within the ESP that have attempted to answer questions about the implications of OCS development for Alaska communities.

There are two major challenges to answering the question of "how will this affect our community"? First, the answer is likely to differ by community and there were scores of coastal communities potentially affected by offshore petroleum development. The research method used to answer the question would have to be applied as many times as there were different communities potentially affected. Second, the answer is likely to be subject to large uncertainties. The research method used would have to be able to make a range of projections based on different assumptions. The research method of choice in both instances is modeling. This chapter traces the conceptual approach to modeling, the development of the models themselves, and the results of modeling efforts. A principal focus is on the evolution of the Rural Alaska Model or RAM, as researchers used this model to project community-level population and employment changes.

Conceptual Approach

The potential for dramatic effects caused by accidents or traumatic events, such as EVOS, may capture the attention of many. However, routine activities of resource development are more likely to affect the social and economic life of communities. Changes in the types and levels of economic activity will cause changes in land use patterns, employment opportunities, and population. These changes have the potential for more long lasting effects on coastal communities and existing resource-use patterns that involve commercial fisheries, subsistence activities, tourism, recreation and military operations (Subcommittee on Environmental Information for Select OCS Areas Under Moratoria 1997). The adopted conceptual approach therefore considers the effects of routine activities associated with OCS development and does not consider dramatic effects of accidents or traumatic events.

The people in local communities and government officials at the local, regional, and state levels are likely to have many questions about the consequences of offshore energy development. Residents wonder about how the activity will change their communities. Will there be new jobs for area residents? Will petroleum development conflict with existing industries? Will OCS development bring new residents, change existing social relationships, and put extra pressure on community resources? Government officials wonder about the effect of new activity and residents on existing social services and the local infrastructure. Officials also wonder whether the communities will have the fiscal resources to provide services and infrastructure for any new residents and economic activity. These questions guided the conceptual approach to community effects analyses.

Answers to these questions help communities and states determine their response to MMS lease sale plans. Communities recognize that a disproportionate share of development costs is borne locally while the bulk of the net benefits are dispersed throughout the country (Porter and Huskey 1992). Social science research that addresses questions of local costs and benefits can reduce residents' uncertainty about the future and promote a reasonable debate about the potential for local impact (Luton and Cluck 1999). Research can translate the unknown of OCS development into terms that residents can understand. Researchers can then translate these estimates of the size of the resource deposit into numbers of people and jobs. The unknown impacts can also be limited to a range of possible effects. Finally, social science research can isolate potential issues of concern by examining current and past conditions and by listening to residents.

The conceptual approach to community effects analyses also had to take into account the special circumstances in Alaska communities that provided a challenge for impact assessment as well as an opportunity for research. Five particular characteristics of potential impact communities in Alaska have complicated OCS impact assessment. These are:

- Most Alaska coastal communities are small, such that the changes in population and economic activity brought by development will be relatively large. The future of these communities will not necessarily follow an extrapolation of what they are now; they may become qualitatively different places.
- Most Alaska coastal communities in the likely areas of OCS development have a sociocultural and economic uniqueness. These communities are predominantly Alaska Native communities

with distinctive social relationships. They also have relatively underdeveloped market economies. Subsistence harvesting and sharing are integral components of these communities.

- Outside of the Cook Inlet area, no communities possess the infrastructure that makes one place an obvious choice as a center for development. This adds to any assessment a set of questions about infrastructure and, more importantly, an additional element of uncertainty about where the development will occur. In most cases, development has to occur in enclaves that have little or no direct association with an existing community. OCS workers might travel through a community enroute to the enclave or, as in the case of Prudhoe Bay, fly directly to the enclave. The use of enclave developments means that small communities in the region of the OCS development and even regional centers would not be likely to experience direct population and employment impacts. These impacts would rather be indirect, through expenditures of petroleum revenues by governments and companies providing services.
- Petroleum development has historically affected communities throughout the state even when they are far from the action, because of kinship and social networks. Many workers and their families are likely to live elsewhere and commute to work, even by air. Communities throughout the state also benefit from government revenues resulting from the project. For example, oil royalties from Prudhoe Bay development have partially funded the state budget. The state also has accumulated a portion of its petroleum revenues in a permanent fund. Residents receive annual permanent fund dividend checks. ANCSA also requires resource rich Native Regional Corporations to share part of their revenues with other regional corporations. Recognizing the potential for these indirect effects expands the area of impact and, therefore, the area of potential study. Defining the study area can be an uncertain and arbitrary endeavor as impacts likely extend well beyond the practical reach of research.
- Economic and institutional changes tend to be greater in rural coastal communities than in other areas of Alaska. This makes it difficult to acquire and assess "baseline" data. The state, for example, in response to falling oil revenues, has reduced support for a number of transfer programs. These programs play a relatively large role in the economic health of small communities. They compound the effects of changes in the economics of the salmon market, and alter the economic futures of the communities. The possibilities of these types of inter-related changes provide a challenge for making projections for measuring change.

The special circumstances in Alaska's coastal communities prevent researchers and administrators from simply transferring ideas and models directly from other regions, and provide one reason for funding

Alaska social science research. These special circumstances also create unique challenges for social science research in Alaska's communities.

Two additional factors affecting the conceptual approach are legal mandates and budget. While social scientists explore any number of interesting questions about Alaska communities, mandates and budget constraints limit the research supported by the ESP. Budget constraints mean that not all interesting research can be undertaken. The questions asked must reflect the decision-making requirements of MMS (Subcommittee on Environmental Information for Select OCS Areas Under Moratoria 1997), and they must achieve greater priority than other competing research interests. One mandate-related constraint involves delimiting the study area under analysis. MMS-funded research has focused on those communities in areas where lease sales are scheduled (with the exception of Anchorage, because it was likely to be affected by major developments anywhere in the state). In addition to narrowing the scope of communities under study, the MMS mission also directed the type of questions asked. These questions included: what types of impacts are likely, what is the likelihood and magnitude of these impacts, how might communities respond and thereby change the impacts (or inadvertently add to them), and what steps might mitigate impacts? Even within these constraints, the ESP has produced much valuable information about the social and economic life of small communities in Alaska, including those beyond the area of potential impact.

The overarching concept of community effects analysis has been impact assessment. Impact assessment requires an understanding of the social and economic structure of a community and an identification of the process of change in the community. While similarities exist across studies involving different resources and communities, each assessment has to reflect the uniqueness of the affected communities, the industry, and the set of policies and institutions that govern development (Leistritz, Murdock, Knapp, and Huskey 1985). An assessment of the potential consequences of offshore development involves four parts: (1) developing a baseline understanding of the community; (2) understanding the potential for impact; (3) understanding the causes of change; and, (4) understanding the process of change in the community. We will discuss each of these in turn.

A *community baseline* describes the community as it currently exists and as it would likely change in the future without OCS development. Components include descriptions of the community's economy, demographic characteristics, social relations, public finances, and infrastructure. Baseline studies in small communities help to identify issues and often add to information not available from secondary sources. Examining past changes also helps to identify potential for future responses to offshore development. As described in Chapter One, the ESP research design as initially implemented in the Beaufort Sea Petroleum Development Region called for the following baseline reports: socioeconomic (Peat Marwick & Mitchell [PMM] 1978a, TR11), sociocultural (Worl Associates 1978a, TR9), natural (Dames & Moore 1978b, TR10), and built (Alaska Consultants, Inc. 1978a, TR8) environments. In this chapter, the focus is on economic and demographic changes in communities, so the socioeconomic baselines are the most relevant.

One variable of impact assessments is the likely *potential for change* in a community. The potential for change correlates with the size and pattern of OCS development. For a community, assessing the potential for change would require assumptions about staging and hiring of local labor. Such assumptions are part of the petroleum development scenarios discussed in the previous chapter[37]. For example, in the *Navarin Basin Petroleum Technology Assessment* (Wilson, Wade, Feldman and Fausak 1982, TR83) researchers compared three alternative production/transportation systems: a 150-mile pipeline to St. Matthew Island, a 300-mile pipeline to St. Paul Island in the Pribilofs, and offshore loading into ice-strengthened tankers. Each transportation option would result in differences in the amount of employment, the location of the employment, and the amount of local residents employed. Huskey and Nebesky addressed economic and demographic scenarios in much greater detail in *North Gulf of Alaska Economic and Demographic Impacts* (Huskey and Nebesky 1979a, TR34) than in the initial Beaufort Sea technical report (ISER 1978b, TR18). They suggested that "the nature of the changes from the second generation leases would not necessarily resemble those caused by past petroleum development (Huskey and Nebesky 1979a:2)." They also set two new objectives: an understanding of state and regional economies; and development of a process for economic impact assessment.

The links between possible energy development and the community are the *causes of change*. A resource project can cause change by creating more economic opportunities, which may cause changes in social relationships. OCS development may also change the size and composition of the population as a result of increased migration. Increased population would place pressure on existing public services and infrastructure. Energy development may also change a community through conflicts over resources or infrastructure with existing economic activity. Community research can identify the potential for each of

[37] When MMS uses local impact model (RAM), they assume OCS workers would live in an enclave separated from communities. Rural regional centers and communities have no population increase due to direct OCS activity but only due to indirect and induced employment. (Tim Holder, MMS, personal communication 2003)

these. Again, as initially implemented in the Beaufort Sea OCS Development Region, the ESP research design called for a series of research reports that paralleled the baseline studies: *economic and demographic impacts* (ISER 1978b, TR18), *sociocultural impacts* (Worl Associates 1978b, TR22), *man-made environment impacts* (Alaska Consultants, Inc. 1978b, TR19, and *natural environment impacts* (Dames & Moore 1978c, TR21), plus a *transportation impacts* report (Dennis Dooley and Associates 1978, TR20) and a *Summary of Socioeconomic Impacts* (James Lindsay and Associates 1978, TR23). The focus in this chapter is on the economic and demographic impacts.

The most formal part of impact assessment is modeling the *process of change*. Social scientists often summarize their findings in models. Models are especially helpful when decisions are based on uncertain magnitudes of possible change. Models allow the decision-maker to examine a number of potential changes to isolate the likely range of impacts under various alternatives. Models of the process of change also help to assess impacts by identifying those factors that the government can monitor to see how the community is doing once development occurs. As discussed below, the ESP included a major commitment to modeling community economic and population change.

Impact assessment also includes *measuring change*. As we have already learned in Chapter Two, until recently OCS development in Alaska has stopped at the exploration stage. Since most of the potential socioeconomic impacts occur primarily during the development and production stages, prior to the Northstar development there have been essentially no opportunities to measure change and to compare actual changes with projected changes. Hence this final component of the impact assessment process is not a subject of this chapter.

Model Development

Modeling the socioeconomic impacts of any large scale project is a complex undertaking. Models are abstractions of the real world that isolate the important relationships in the context of the local environment and the public policy needs. In addition to being tools for forecasting, models guide our understanding of the way communities work. Relationships between important dependent and independent variables determine the change in social and economic indicators. Theory and the evidence of community history guide model structures. Modeling also guides the collection of data and information. Knowing how communities have responded to forces of change in the past is necessary, as is knowing the current conditions of the community, since the impacts depend on what currently exists. The modeling process is one way of identifying data that need to be collected, which can be especially important in small Alaska communities where data are not regularly collected.

Finally, the modeling process guides the selection of future research questions. Existing information may not identify even standard relationships, indicating a need for more baseline research. Moreover, as discussed previously, relationships in rural Alaska may differ from the typical structures found in other regions and be less well documented. For example, the importance of subsistence in many communities will influence residents' relation to development projects. Modeling identifies the need to know more about subsistence and how it affects responses. In parts of Alaska where changes caused by OCS development could change the structure of unique relationships, modeling can identify gaps in understanding and directions for further research.

MMS has used a wide variety of modeling approaches in the studies program to forecast likely changes resulting from OCS activity, varying from the ad hoc to the more formal model. The use of different models stems from differences in policy needs, information produced, and the level of analysis. Modeling has evolved in the studies program to reflect changes over the years in policy needs, data availability, and the uncertainty attached to the level of development. The next sections examine the MMS modeling efforts by looking first at the early attempts at community modeling, then examining the evolution of the more formal RAM, and finally looking at efforts to forecast more than simply economic and demographic changes by including social impacts.

Community Modeling

Early efforts at modeling the social and economic response of small communities were part of a more general effort to understand the current situation and likely future of the communities (Alaska Consultants, Inc. 1978a, TR8; 1978b, TR19; 1979a, TR32; 1979b, TR33; 1979c, TR40; 1980, TR46; 1981, TR 59; James Lindsay and Associates, 1978, TR23; and Policy Analysts Limited, 1980a, TR 48, Vol. I; 1980b, TR48, Vol. II; and 1980c, TR53). Researchers based these models on the collection and interpretation of data on economic and social variables, primarily employment and population. They used a simple economic base approach to produce economic forecasts and population per worker ratios to forcast population. As we mentioned earlier in this chapter, most OCS development activity is likely to occur in enclaves rather than being associated with existing communities. This suggests that the projected impacts to communities would likely be small.

The economic base approach is simple both to implement and to understand, strengths that more than outweigh the limits of using these techniques when the possibility of structural change and non-economic factors are important. These studies also projected the effects of OCS development on the community's public infrastructure based on both historic ratios and standards.

The community studies highlight two concerns about uncertainty in socioeconomic impact modeling. First, the effects of OCS development depend on the assumed growth of the community in the baseline, non-OCS future. This forecast asks what the community would be like without OCS development. The disruption caused by OCS development is likely to depend on the development's relative size, which will depend on the growth of the community and the steps local government might take in the future. The uncertainty lies in the wide variety of possibilities for baseline scenarios in rural Alaska communities, which reduces the usefulness of any baseline forecasts.

In part because of this recognition of a moving baseline, and in part because the petroleum development scenarios were hard to pin down, the ESP research design evolved away from community baselines toward "systems analyses" that could take into account both OCS and other drivers of community change. Three consistent types of systems analyses prepared for each Petroleum Development Region have been *Economic and Demographic Analyses* (ISER 1980c, TR42; ISER 1980b, TR50; ISER 1981b, TR57), *Transportation Analyses* (Eakland and Joshi 1980b, TR37; Eakland and Joshi 1980c, TR31; Eakland and Joshi 1980a, TR45; Peat, Marwick, Mitchell & Company and James Lindsay and Associates 1980, TR52; Peat, Marwick, Mitchell & Company and ERE Systems 1981, TR58; Peter Eakland and Associates 1981, TR65; ERE Systems 1982, TR66; Louis Berger & Associates, Inc. 1983b, TR84; Louis Berger & Associates, Inc. 1984a, TR105; ERE Systems LTD. 1984b, TR102; ERE Systems LTD. 1984c), and *Fishing Industry Analyses* (Terry, Scoles and Larson 1980a, TR44; ibid., 1980b, TR51; Earl R. Combs, Inc. 1981, TR60).

Second, the uncertainty of the base case is compounded by the uncertainty about the level of future OCS activity. The potential for development in these studies ranged from only exploration activity to the development of a fully functioning petroleum industrial sector. The number of potential sites and possible locations of development activity also increases the uncertainty attached to any forecast. The early MMS socioeconomic studies handled this uncertainty by examining the range of possible futures through a number of scenarios. While researchers did not intend these projections as forecasts, the wide ranging possibilities hardly helped to meet the objective of reducing residents' uncertainty about the future or of promoting a reasonable debate about the potential for local impact.

The Rural Alaska Model

The RAM formalized the economic and demographic projection models found in the community studies. The RAM is one in a large field of impact assessment models developed to gauge the impacts of large-scale energy projects on communities. It serves to illustrate some examples of socioeconomic modeling in the ESP. The model has changed during its use in the MMS studies program. Changes have reflected the nature of the communities studied, the nature of the OCS possibilities, and the policy needs of MMS. This section examines the structure, use, and evolution of the model.

The RAM grew out of an initial review of existing impact models conducted with the intent of developing a better method of projecting community population effects (Huskey, Serow, and Volin 1979, TR24 and Huskey and Kerr 1980, SR4). MMS sponsored these method development efforts near the start of the ESP. RAM provides an accounting framework that is consistent with a theory of how communities respond to economic change. The choice of an accounting framework means that researchers had to set important parameters for each application of the model. They chose this approach over an econometric framework for two reasons. First, estimating econometric models for each of the potential communities would be expensive; using the general RAM framework reduces the cost. Second, estimating parameters requires both a consistent history and the assumption that the estimated structure will remain the same in the future. Neither of these assumptions is valid for small rural Alaska communities (Huskey and Kerr 1980, SR4). The choice of the accounting framework allows the user a wide range of potential approaches to estimating parameters, which would reflect both available resources and the history of the community. This structure allows sensitivity testing by making the important determinants of change transparent.

The actual RAM structure has changed over time. It has become simpler to use with a reduction of the number of relationships and parameters. One can examine these changes in detail by comparing early reports such as Knapp, Colt and Henley (1986, TR120); Knapp, MarkAnthony, Nebesky, and Wildermuth (1984b, TR111); and Knapp, Zimicki, Hull, Nebesky, and MarkAnthony (1984, TR87) with later reports such as Knapp (1990a, TR144); and Knapp (1990b, TR145). Reducing the number of relationships and parameters more accurately reflects the real limits of information available, the potential for significant change, and the uncertainty about the level of OCS development in any region. The simplified model makes important assumptions more visible and the sensitivity of the model easier to test. Model changes have reflected changes in information requirements, changes in the way the model is used, and changes to reflect specific characteristics of particular communities.

The general structure of the RAM has, however, remained similar. The RAM consists of four component models describing population, employment, migration, and impact. (This review is from Leistritz et al. 1985). The population model uses a cohort survival approach to project population into age, gender, and race categories. Researchers used labor force participation rates for each cohort to estimate the community labor force. The employment model uses an economic base framework to project future employment. They predicted basic sector employment, such as fishing or tourism, outside the model (exogenously). They projected government employment as an external function of state revenue and local population. They projected support sector employment as a function of local resident incomes. The migration model adds population through immigration when labor demand exceeds supply and results in outmigration when the opposite is true. The final model is the impact model, which researchers used to predict the effects of special projects on the community. Those taking project jobs reside in the community, in enclaves, or work as commuters. Each type of project residence has a different impact on the community support sector and population.

An MMS-sponsored technical review of the RAM found it well suited for the types of analysis needed by the MMS ESP (Leistritz et al. 1985). The reviewers found that RAM used both the most appropriate available data and reflected state of the art methods while at the same time reflecting the unique context of rural Alaska. The reviewers also thought that RAM was useful to policy makers. They use the model results in the EIS process to address important socioeconomic issues. The structure of RAM allows users to compare the important assumptions driving the model and to examine easily the effects of changes. The model allows decision-makers to consider multiple scenarios reflecting the wide variety of possible OCS development futures, which is important given the level of uncertainty about actual development.

Leistritz et al. (1985) also examined the results of sensitivity tests conducted using the RAM (see Knapp and MarkAnthony 1984a, TR113). Since the model is an accounting model that does not use historic simulation to develop important parameters, other ways to test the reliability of the model are necessary. Sensitivity analysis examines the behavior of the model in response to changes in significant parameters. The reviewers found that the model's response to these changes was consistent with expectations and with changes observed in other areas. The authors concluded "these findings thus clearly lend support to the validity of the model's structure" (Leistritz et al.1985:317).

The RAM reflects two important and unique characteristics of the rural Alaska economy. First, the model incorporates explicitly the role of state government revenues as part of the basic sector. In all communities, state spending is an important, partially exogenous determinant of growth (Huskey 1992).

Second, the structure of the model reflects the importance of the Alaska Native population in rural regions by including a specific ethnicity component in the population model. Thus, the model can reflect differences in labor force participation and migration between Natives and non-Natives.

MMS also reviewed RAM as part of a general review of the adequacy of the modeling process used to complete the required lease sale EISs (Lawrence Johnson & Associates 1985, SR6). RAM is the fourth step in the modeling process. The process starts with a forecast of the available economic resources in the lease area and converts them into a development scenario and manpower estimates that provide inputs for RAM. RAM provides projections used directly in preparing the EIS. The general conclusion of this review was that the modeling process, including RAM, provided the information required for the EIS. The review called for better understanding of the rural economic and population relationships. Most significantly, the review called for a simplification of RAM, improved clarity in inputs and outputs, and the use of sensitivity analysis. These recommendations were a response to the recognition of the extent of uncertainty in the modeling process.

One additional result of the RAM effort is the definition of important questions for further study. RAM identifies a number of areas where more information about the demographic and economic relationships and structures of rural Alaska would improve forecasts. First, the relatively large size of potential changes in both the base case and OCS development suggests that rural communities might be subject to significant structural change. Thus, the economic and demographic structures from the past may not describe changes in the future (Huskey and Knapp 1983). The multiplier, which describes the relation between employment in the basic sector and the support sector of the economy, may increase as a result of economic growth. This would mean that forecasts would underestimate the impact of OCS development.

Use of RAM also suggests the need for a better understanding of the role of subsistence in the rural economy. The harvesting of subsistence fish and game provides an important source of real income for rural residents (Huskey 1992). Subsistence is a vital part of the economy of these small places that will affect peoples' decisions about when and how much to work in the market economy, and where to live. RAM reflects these decisions in the labor force participation parameters and the assumptions about job-related migration. The importance of local resource based production will be one factor affecting the response of rural residents to OCS development. As discussed below, the ESP sponsored a number of studies designed to understand these relationships more fully[38].

Social Modeling Efforts

One might suspect that the impact in any community will differ even if the size of the external change is the same. The RAM would capture this variability by assuming different values for parameters such as job multipliers and migration rates. Communities differ in their service infrastructure, and in characteristics of their residents such as labor force participation rates and education. The ESP funded two studies that attempted to understand the effects of differing community characteristics on the type of impact experienced in the community: *Developing Predictive Indicators of Community and Population Change* by Kruse, Hitchins and Baring-Gould (1979, TR26), and *A Description of the Socioeconomics of Norton Sound* by the John Muir Institute, Inc. (1984a, TR99).

In the case study *Developing Predictive Indicators of Community and Population Change*, Kruse et al. (1979, TR26) used the development experience of Fairbanks and Valdez during the construction of the Trans-Alaska Pipeline to identify community and individual characteristics that influenced the impact of pipeline construction activities. They reasoned that these characteristics would help to predict the impact of OCS activity on the community. There were two limits to extending the analysis to OCS impacts. First, the types of projects are different; pipeline construction is not the same as offshore petroleum development. Second, Fairbanks and Valdez are not representative of the potential OCS impacted communities. However, the strength of this study was that it made use of historic information from actual energy development community impacts rather than hypothetical projections.

Community facilities and services were the focus of this community change analysis. Using the Fairbanks experience and the opinions of experts, the authors (Kruse et al. 1979, TR26) isolated a number of important factors that influence community response. The facilities included health care, housing, retail sales, schools, and electric and telephone utilities, which the authors noted was not a complete set of

[38] MMS analysts developed a model in-house in the early 1980s called the Manpower Model that was used through the 1990s. This Model takes inputs from exploration and development scenarios to generate estimates of direct OCS employment. The direct OCS employment is used as input to the RAM to generate its demographic outputs. The exploration and development scenarios include the number of wells drilled and the number of miles of pipeline drilled among several other quantified variables based on the estimated resources that can be developed. (Tim Holder, MMS, personal communication 2003)

potential impact areas. They found a community's ability to respond to outside changes depended on the certainty of its knowledge about the project, the size of the community, the availability of local expertise, available land, and the cost of transporting supplies. The researchers turned these variables into measurable indicators of a community's condition. They prepared a survey instrument and tested it in Kenai Peninsula communities.

The individual change component of this predictive indicator study was based on household surveys done in both Valdez and Fairbanks during pipeline construction and attempted to identify the factors associated with differences in personal satisfaction during energy project development. The authors found that personal satisfaction was primarily dependent on two related factors: project work experience and income growth. Residents without project work and income growth were more likely to believe that they were paying the cost of the development. Not all residents were equally likely to work on either the project or on jobs created indirectly by the project. Young married residents without children were more likely to have had pipeline-related work experience. People's tastes also influenced their work experience; people desiring more economic benefits, more community growth and who were not particularly attracted to small town living were more likely to take project-related employment. Importantly, people who said that they wanted to "live an Alaska lifestyle" (whatever that meant to them) were just as likely as others to work on the project. Finally, the project experience did not seem to change residents' attitudes about community growth. The research related a set of community and population characteristics to three measures: personal satisfaction, desire for more growth, and plans to move.

The ultimate objective of the predictive indicators work was to develop a tool to forecast how members of a potential OCS-effected community would respond to external changes brought by development. The tools developed were analytically complex and required expensive survey data that could not be collected without approval from the federal Office of Management and Budget. MMS did not implement the predictive indicator study approach within the ESP, but the demonstration of the approach did provide useful information about the relation between communities and impacts. The impacts described went beyond the changes in population and jobs projected with RAM, to measure changes in the welfare of the local population. Such qualitative analysis is useful for future data collection and understanding residents' response to energy development.

In their ESP core study, *A Description of the Socioeconomics of Norton Sound*, the John Muir Institute, Inc. (1984a, TR99) used a path analysis model to attempt to identify relationships that researchers could use to forecast changes from OCS development. These communities are small, largely Alaska Native, and unlikely to be directly affected by OCS development. The model focused on an indirect type of change. The researchers used both community secondary data and primary key informant and domestic data to identify the relationships.

This effort assumed that, because of the location of potential OCS development, the major impact on these relatively small and isolated communities would be residents taking project jobs. The path analysis develops complex relations between changes in employment and inflation on the one hand and changes in political participation, income, and subsistence activity on the other. Demographic and institutional characteristics of the villages influence these relationships. Once again, the model requires a good deal of data collection but produces a more realistic view of possible futures.

The modeling effort in Technical Report No. 99 identified a link between OCS development and subsistence. Most importantly, the study included changes in subsistence activity as an outcome. Researchers observed income was related positively to the diversity of subsistence protein in the diet. Income also was positively related to investment in subsistence, which in turn also affected the proportion of subsistence protein in the diet and the amount of subsistence protein distributed to other households.

Models play an important role in the EIS process because they help to define potential changes in affected communities. Given uncertainty in the levels and patterns of OCS activity, models that are flexible, simple, and inexpensive to use are probably the best type. These last two models reviewed are more complex and cumbersome than RAM, which limits their use in forecasting. However, researchers also use models to ask questions and teach us about relationships. Each of these studies teaches us about the important ways that development affects communities. While they may not lend themselves to easy forecasting, these modeling efforts directed MMS to useful research questions and gave MMS an understanding of one key response of residents to development.[39]

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[39] MMS has recently completed contract modeling studies and in-house modeling efforts, the products of which are anticipated to replace the Manpower and Rural Alaska Model (RAM). Jack Faucett Associates (2004a and b) completed Arctic and Sub-arctic Economic Impact Models for Petroleum Activities in Alaska (Arctic IMPAK). These models are designed to receive input variables from exploration and development scenarios. The cost data define the multipliers that translate these data into direct OCS manpower and personal income. The outputs from the arctic model are for the North Slope oil economy, the North Slope Borough local economy, the rest of Alaska and the rest of the U.S. MMS has created an in-house model that takes these outputs to forecast indirect and induced workers and their personal income. (Tim Holder, MMS, personal communication 2003)

Understanding Modeled Relationships

The RAM and the social models discussed above describe the *process* of change through the definition of key relationships. These relationships show how external change, such as OCS development, affects variables of interest and the models show the general direction of change. Parameters – numeric values – describe the relationships between external change variables and impact variables. The size of the potential impact will depend on the size of the parameters, which begins to describe the *causes* of change. As was noted above, the current RAM approach is to make assumptions about parameter values for each application. A number of studies done in the ESP are attempts to provide information for improving the assumptions made about model parameters.

The RAM identifies three important types of parameters: migration rates, labor force participation rates, and employment multipliers. Defining values for these parameters raises a number of questions. First, how do the parameters describing labor force and migration behavior differ between the non-Native and Native components of the population? Second, how might these parameters change in response to OCS initiated growth? The following studies provided some insight into changes in parameter values.

Population movement is a historic response to changing economic conditions in rural Alaska (Alonso and Rust 1976; Kruse 1986). The migration response of rural residents will affect both the baseline population and the population response to OCS development. In rural communities with limited employment opportunities, a less mobile population would mean less outmigration in a baseline forecast as well as a greater local labor force for OCS development. Marshall (1993, TR158) examined the causes of migration among North Slope Natives with particular interest in the role of oil industry jobs. Marshall interviewed household residents of Barrow, Nuiqsut, and Wainwright who had moved into or within the Borough between 1982 and 1992. He also interviewed North Slope Natives who worked at the Prudhoe Bay or Kuparuk oil fields.

On the North Slope, people moved for a variety of reasons, including family changes and to improve living conditions. Marshall found that the most important reason both Natives and non-Natives gave for migrating was jobs, including both specific jobs and simply the desire for work. Marshall speculated that job-oriented migration may be slightly less important for Natives than for non-Natives. Migrants tended to be younger and to have lower incomes than the average North Slope resident. Native women had a higher propensity to move than Native men.

Although the sample was small, Marshall identified an interesting pattern of out-migration associated with oil industry employment. About one-third of the 34 North Slope Native oil industry workers interviewed moved from their villages to urban areas of Alaska once they got oil industry work. The oil industry jobs gave them the resources to pursue the broader opportunities and lower cost of living in the city. This type of migration was not unexpected in response to the jobs created by energy development; researchers found the same migration pattern in Canada when jobs were created in northern mines for local Natives (Shrimpton and Storey 1989). This type of migration in Alaska may be small due to the limited involvement of Natives in the oil industry and the high turnover of those who do find jobs.

In 1982, the MMS ESP funded a series of papers on economic and demographic structural change that addressed the questions posed above. These papers appear in the ESP technical report *Economic and Demographic Structural Change in Alaska* (Huskey, Nebesky, Tuck and Knapp 1982, TR73). In his contribution, Nebesky documented migration and labor force parameters. He examined the literature on residency of workers in energy projects throughout the world, as well as the experience on the Kenai Peninsula in Alaska. Local labor force participation on these projects and the movement of people into the region were demand driven; that is, both labor force participation and in-migration appeared to increase in response to new job opportunities. The extent to which these new job opportunities increased the local demand for labor depended on the match of skills required with those of the local labor force. Local labor force demand also differed by project phase; companies were more likely to bring labor from around the world for the exploration and development phases of the project. The migration of workers into the community also depended on the work schedule policies of the companies and the scale of development.

In two other papers in the same volume, Huskey explored the potential for structural change in rural Alaska. Huskey showed that the employment multiplier relationship for small communities in Alaska was unlikely to remain constant with significant external growth. Theory suggests that we should expect employment multipliers to increase. As communities grow, they develop markets for an increasing variety of support sector activities; they produce more of the goods and services that they consume. Evidence of this pattern are comparisons of multipliers across places of different sizes and over time as communities grow. Statistical tests showed that this pattern held for Alaska regions as well as resource counties in the rest of the U.S.; in both cases the population elasticity was greater than one, which meant that a one percent increase in the market size increased support sector employment by more than one percent. This relationship suggests that simple multipliers will change in response to economic growth.

How important is this result for predicting the impacts of OCS development? On the one hand, an accurate prediction of the future would require recognition of structural change, but this accuracy may not be worth the cost. Remember, one characteristic of impact assessment is the high level of uncertainty concerning resource amounts, production locations, and policy responses. Unless the decision maker has some prior knowledge that the effect of structural change on the impact will be relatively large, researchers may simply want to include sensitivity tests of different multiplier assumptions in their analysis.

Huskey also examined the potential for changes in local labor force participation rates. Local residents' response to OCS employment opportunities will affect both the local economy and the amount of migration into the community. Huskey suggested that there was a difference between the desired and actual labor force participation rates in rural Alaska. The "discouraged worker" effect in rural Alaska communities means that many people who would take jobs if they were available did not appear to be in the labor force because they knew (or assumed because of discouragement) no jobs were available. Huskey showed that the "discouraged worker" effect existed widely in rural Alaska. Adding jobs to the local economy could reduce the number of "discouraged workers", increasing the share of the population in the labor force.

The other factor that influences labor force participation is the importance of subsistence. Residents' desire to engage in subsistence activities limits their willingness to work away from the village and their willingness to work during seasons of peak subsistence activities. Huskey presented a model that examined the tradeoff between market work and subsistence and predicted the potential impacts of OCS-type changes on rural labor force behavior. Increases in expected wages and increases in the productivity of subsistence time were likely to increase the desire for work. If OCS employment opportunities increased wages, labor force participation could increase. Data also suggested a potential for change in people's desire to engage in subsistence activities. Younger rural residents and residents of bigger villages showed a higher preference for full-time employment. As the current younger population ages and as the populations of the larger villages grow, one might expect labor force participation to increase.

In sum, current trends suggest that labor force participation rates are likely to increase over time. Consequently, using current participation rates to forecast the response to OCS development will underestimate local employment participation with the effect of minimizing the positive economic effects on the local community and overestimating the required migration into the community. How important will this miscalculation be? For small communities the effect will not be large, but the effect of changing labor force participation appears to warrant sensitivity testing.

The employment effects of petroleum development may be larger if rural Alaska Natives are able to work on the project as employees of Native-owned companies. If so, the extent of Native ownership of the companies involved in OCS development would be a key assumption in the prediction of local impacts. In *Regional and Village Corporation Employment Profiles*, Waring and Smythe (1988a, SR7) examined the employment patterns of Alaska Native-owned corporations using a survey of regional, village, and non-profit corporations. While Waring and Smythe did not attempt to develop a quantitative estimate of the extent of Native employment in these corporations, the data indicate that Alaska Native corporations are significant employers of Native workers. The variable of that ownership of the companies involved in OCS activity may influence the labor force behavior of residents of the affected communities.

Finally, we should note a current study, *North Slope Economy: 1965 to the Present*, in which Northern Economics, Inc. (forthcoming) will use data on employment and local government revenues and expenditures to examine the role of Native corporations in changing the regional economy, and to examine individual and household responses to economic change.

Findings

This section has four parts: coastal village economy baseline studies, impacts on urban communities, commercial fishing studies, and the special case of the North Slope.

Coastal Village Economy Baseline Studies

As described in the introductory chapter, the ESP initially included four categories of core studies: petroleum development scenarios (and technology assessments), baselines (later called system analyses), impact assessments, and monitoring. This section examines the lessons learned from 11 baseline studies done for regions and communities in coastal Alaska. The cumulative geographic scope of these studies is included in Figure 4.1 and Table 4.1 (See Appendix A for the full citations of technical reports referred to in Table 4.1). Before discussing the lessons learned, the section begins with a brief description of these eleven studies.

Figure 4.1: Geographic Scope of ESP Community Studies Discussed in Chapter Four
Legend
Communities Addressed in Chapter Four Studies
ANCSA Regional Corporation Boundaries
Source: Minerals Management Service
Arctic Ocean
Chukchi Sea
Beaufort Sea
Bering Sea
Gulf of Alaska
Pacific Ocean
RUSSIA
CANADA
ALASKA
Arctic Slope Regional Corp
N.A.N.A. Regional Corporation
Bering Straits Native Corporation
Doyon Ltd
Calista Corporation
Cook Inlet Region Inc
Ahtna Inc
Chugach Alaska Corporation
Sealaska Corporation
Bristol Bay Native Corporation
Koniag Inc
The Aleut Corporation
Barrow
Wainwright
Atqasuk
Point Lay
Prudhoe Bay
Kaktovik
Nuiqsut
Point Hope
Anaktuvuk Pass
Kivalina
Noatak
Kotzebue
Selawik
Kobuk
Deering
Buckland
Nome
Gambell
Unalakleet
Fairbanks
Alakanuk
Scammon Bay
Aniak
Bethel
Quinhagak
Platinum
Goodnews Bay
Anchorage
Soldotna
Tyonek
Kenai
Cordova
Ninilchik
Seward
Homer
Kasilof
Port Graham & Nanwalek (English Bay)
Yakutat
Kodiak
Pilot Point
Port Heiden
Nelson Lagoon
Port Moller
Chignik
Cold Bay
False Pass
King Cove
Sand Point
Unalaska/ Dutch Harbor
Akutan
Chernofski
Nikolski
Saint Paul
Saint George
Nushagak River
Koliganek
Nondalton
Iliamna
Pedro Bay
Newhalen
New Stuyahok
Kokhanok
Aleknagik
Ekwok
Igiugig
Iliamna Lake
Togiak
Twin Hills
Dillingham
Levelock
Kvichak River
Manokotak
Portage Creek
Clark's Point
Ekuk
Naknek
South Naknek
King Salmon
Ugashik
0
125
250
500
Miles
Stephen R. Braund & Associates
P.O. Box 1480
Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net

Table 4.1: Chapter Four ESP Technical Reports by Community and ANCSA Regional Corporation Boundary

	Community	Technical Report Number	No. Reports
Arctic Slope Regional Corporation			**10**
	Anaktuvuk Pass	16, 100, 101, 120, 137	5
	Atqasuk	16, 100, 101, 120, 141	5
	Barrow	16, 22, 23, 85, 100, 101, 120, 137, 141, 142	10
	Kaktovik	16, 22, 23, 85, 100, 120, 137, 142	8
	Nuiqsut	16, 22, 23, 85, 100, 120, 142	7
	Point Hope	16, 100, 101, 120, 137	5
	Point Lay	16, 100, 101, 120, 141	5
	Prudhoe Bay	16	1
	Wainwright	16, 22, 23, 100, 101, 120, 137, 141	8
N.A.N.A. Regional Corporation			**4**
	Buckland	148	1
	Deering	137	1
	Kivalina	137, 148	2
	Kobuk	148	1
	Kotzebue	53, 130, 137, 148	4
	Noatak	148	1
	Selawik	148	1
Bering Straits Native Corporation			**9**
	Gambell	132, 137	2
	Nome	53, 76, 97, 111, 131, 137, 144	7
	Unalakleet	137, 138	2
Doyon Ltd.			**2**
	Fairbanks	14, 23	2
Calista Corporation			**4**
	Alakanuk	132, 137	2
	Aniak	137	1
	Bethel	69, 137	2
	Goodnews Bay	103	1
	Platinum	103	1
	Quinhagak	103	1
	Scammon Bay	137	1
Koniag Inc.			**5**
	Kodiak	30, 32, 40, 122, 159	5
Cook Inlet Region Inc.			**9**
	Anchorage	12, 13, 23, 48, 94	5
	Homer	46, 146, 159	3
	Kasilof	146	1
	Kenai	24, 46, 146, 159	4
	Ninilchik	146	1
	Soldotna	46, 146	2

Table 4.1 (cont'd)

	Community	Technical Report Number	No. Reports
Cook Inlet Region Inc (cont'd)			**9**
	Tyonek	146	1
Chugach Alaska Corporation			**6**
	Cordova	30, 32, 33, 159	4
	Nanwalek (English Bay)	146	1
	Port Graham	146	1
	Seward	30, 32, 33, 40, 159	5
Sealaska Corporation			**4**
	Yakutat	30, 32, 33, 159	4
The Aleut Corporation			**13**
	Akutan	83, 92, 97, 118, 138	5
	Chernofski	97	1
	Cold Bay	59, 87, 145	3
	False Pass	71	1
	King Cove	71, 138, 159	3
	Nelson Lagoon	71, 87	2
	Nikolski	92, 137	2
	Port Moller	138	1
	Saint George	87, 92, 97, 118	4
	Saint Paul	59, 83, 87, 92, 97, 118, 132, 137	8
	Sand Point	71, 83, 87, 137, 138	5
	Unalaska/Dutch Harbor	59, 76, 83, 87, 92, 97, 137, 138, 145, 159	10
Bristol Bay Native Corporation			**6**
	Aleknagik	103	1
	Chignik	122	1
	Clark's Point	103	1
	Dillingham	69, 103, 137	3
	Ekuk	103	1
	Ekwok	103	1
	Igiugig	103	1
	Iliamna	103	1
	King Salmon	103	1
	Kokhanok	103	1
	Koliganek	103	1
	Levelock	103	1
	Manokotak	103	1
	Naknek	103	1
	New Stuyahok	103	1
	Newhalen	103	1
	Nondalton	103	1
	Pedro Bay	103	1
	Pilot Point	71	1
	Ugashik	71	1

Table 4.1 (cont'd)

	Community	Technical Report Number	No. Reports
Bristol Bay Native Corporation (cont'd)			**6**
	Port Heiden	71, 138	2
	Portage Creek	103	1
	South Naknek	103	1
	Togiak	103, 137	2
	Twin Hills	103	1

The MMS study *A Demographic and Employment Analysis of Selected Alaska Rural Communities* (Waring and Smythe 1988b, TR137) described the economic and population growth of many coastal communities. Other baseline studies funded by the ESP documented the structure of these community economies and the demographic and institutional patterns at the time of the study. MMS used the baselines as a foundation for impact studies and to provide insight into the types of questions that communities might ask about potential impacts.

The village economy baseline studies reflect the rich variety of places and regions in rural Alaska. They included regions with relatively strong commercial fishing-based economies, such as Bristol Bay and Kodiak (Alaska Consultants, Inc. 1979b, TR33 and 1982, TR69; Impact Assessment, Inc. 1984, TR103; and Cultural Dynamics, Ltd. 1986b, TR122). Smaller communities with fishing economies were also examined (Earl R. Combs, Inc. and Langdon 1982, TR71 and Stephen R. Braund & Associates, Resourecon, Northern Economics, Social Research Institute, and Kirkwood and Associates 1986, TR118).

Studies also examined places with a very limited economy (Impact Assessment, Inc. 1988, TR132), such as the villages of Gambell (on Saint Lawrence Island), St. Paul (on the Pribilof Islands) and Alakanuk (on the lower Yukon River). Studies examined places with a variety of political, social, and institutional organization structures. Two studies of the strong, cohesive structures in the Kotzebue-NANA region included Waring, Burch, Busch, Gal, Gorsuch, Hull, McNabb, Ongtooguk and Rinaldi (1992a and b, TR148) and Waring, McNabb, Busch, Wasserman and Burch (1988, TR130). A study of the more fragmented structures in the Nome-Bering Straits region was conducted by Waring, McNabb, Fischer, Wasserman, Symthe, and Robbins (1989, TR131).

The following paragraphs review the general lessons learned in the village economy baseline studies. The economies of Alaska's rural communities are composed of three important sectors: the market, subsistence, and transfer sectors (Knapp and Huskey 1988 and Huskey 1992). The market sector primarily brings money into the region from the sale of resources outside the region. The subsistence sector includes the harvesting of local fish and game resources for personal use and sharing. The transfer sector is that portion of the economy that depends on money received in the region from government institutions located outside the region. Transfers can affect economic welfare through direct payments, creation of government jobs, and the subsidy of public services.

Each region and village in Alaska has all three of these sectors, but their relative importance varies across regions and places as a function of size and geography as well as the political and social institutions of each place. The relative importance of these sectors will affect how residents of a community react to the potential of OCS development. More market-oriented communities may welcome the possibilities, while communities with significant subsistence economies may be fearful of the potential conflicts between development and subsistence resources. Finally, the relative importance of transfers in small economies makes rules for the distribution of transfer resources important determinants of the reaction to potential development.

Baseline studies reflect a point in time and can therefore lose some of their applicability as time goes by and political, cultural and/or economic changes alter the local economic structure. Researchers completed the most recent ESP baseline study in the Northwest Arctic region in 1992 (Waring et al. 1992a and b, TR 148), but the most recent baseline studies in other regions date from the 1980s. The timing of the studies is significant because many important economic and institutional changes have occurred after the early studies were completed. For example, access to natural resources has changed in several regions. The opening of the Red Dog mine in northwestern Alaska is one example of a regional Native corporation expanding into resource development and local jobs becoming more available. The Community Development Quota program of the federal government has given coastal villages partial ownership of the rich Bering Sea fishery. Income from the salmon industry has declined due to low returns of fish in Southwest Alaska in recent years and also due to the increase in farm-reared salmon outside Alaska, which has lowered prices. Finally, a major institutional change in the management of subsistence resources has taken place with movement of the federal government into the management of fish and game resources on federal lands. Given these changes since MMS published most baseline ESP studies, this review will examine primarily the qualitative findings without making an effort to predict how these changes may affect study conclusions.

Communities included in baseline studies vary in their ethnic make-up, their histories, and the size of their commercial sectors. The baseline studies described above suggest that, despite differences, the regions and communities of rural Alaska have a number of common features that would affect their response to OCS development (Huskey 1992). Four features stand out at the present time. First, the subsistence economy is important, especially to the Native population, regardless of the size of the region's commercial sector. Second, the transfer economy is a large and growing component of the rural economy. Third, institutions influence the local market economy. Finally, population growth is primarily a result of natural increase but migration also influences the demographic structure of the local population. Lessons learned about each of these factors are discussed below.

The Importance of Subsistence in Local Economies

Subsistence harvests are an important component of the real income of Native households across the region, and even more so when commercial opportunities are limited. Research results reported in *Village Economics of Rural Alaska* (Impact Assessment, Inc. 1988, TR132) suggested that in 1986 almost all households participated in subsistence in the remote communities of Gambell and Alakanuk, while over sixty percent engaged in subsistence in St. Paul. Subsistence has also remained important in the Kotzebue region (Waring et al. 1992a and b, TR148) even though the Red Dog Mine presented the potential of a market economy for the region. Subsistence food was used in almost 80 percent of the households interviewed, including residents of both the small villages and Kotzebue. In addition to these examples, several other baseline studies documented the importance of subsistence in local economies (e.g., Cultural Dynamics, Ltd. 1986b, TR122; Earl R. Combs, Inc. and Langdon 1982, TR71; and Stephen R. Braund & Associates et al. 1986, TR118). Authors of ESP baseline studies used a number of approaches to identify the importance of subsistence to local residents, including reliance upon government harvest numbers, key informant interviews, and systematic discussions with a sample of households. The Alaska Department Fish and Game, Division of Subsistence produced a large volume of subsistence data used extensively in ESP studies.

The relative importance of subsistence has reflected, in part, the role of the commercial sector as well as the size of the non-Native population. For example, researchers have observed subsistence harvests to vary throughout the Kodiak region. Researchers estimated that Kodiak village residents consume between 260 and 835 pounds of subsistence food per person while in the road-connected region, with greater commercial activity and a larger non-Native population, consumption averaged only 140 pounds per person (Cultural Dynamics, Ltd. 1986b, TR122). The Nome region provided another example of this pattern; in the 1984 *Nome Sociocultural Monitoring Study*, Waring et al. 1989 (TR131) reported that 32 percent of the Nome population harvested half or more of their food compared with the village figure of 67 percent.

To illustrate the economic value of subsistence in the smallest, most remote communities, Impact Assessment, Inc. researchers compared spending patterns in the community with spending in other regions of the U.S. (Impact Assessment, Inc. 1988, TR132). The evidence, they suggested, supported the notion that subsistence harvests represent a substitute for groceries purchased with cash. The choice of purchasing food versus harvesting subsistence resources depended on the relative opportunities for earning income and the "price" of subsistence goods. Comparing spending and income differences between Gambell, St. Paul and Alakanuk, the authors estimated the value of the subsistence harvest to be between $1.60 and $9.50 a pound.

Subsistence is not simply something residents do if there is no work; it is an integrated part of the modern rural economy. Researchers examined the relation between subsistence production and income in Gambell, Alakanuk, and St. Paul (Impact Assessment, Inc. 1988, TR132). The study compared earned and unearned incomes and subsistence harvests between those households that spent at least as much time in subsistence as in market work with those who spent less time in subsistence. The findings suggested that some human capital quality of households makes certain households more productive than others in all activities, subsistence and employment. One caveat to these conclusions is that researchers based them on samples, which in some cases were relatively small. However, Kruse (1991) reported the same finding in *Alaska Iñupiat Subsistence and Wage Employment Patterns: Understanding Individual Choice*.

Using recent consumption of subsistence food as a measure of its use, studies of the Northwest Arctic region (Waring et al. 1988, TR130 and 1992, TR148) examined the importance of subsistence use by socioeconomic characteristics. Income, employment, and education also seemed to have only a limited relationship to subsistence consumption. Consumption of subsistence foods remained relatively important for households with high income and among Native residents of the region with high levels of education. The pattern of consumption varied by age, with higher consumption of subsistence foods among residents over 40. However, the vast majority of even young residents also consumed subsistence foods. The baseline studies also found that a complex pattern of sharing characterized the subsistence economy. Sharing might reflect a strategy where those with income provide capital goods for those with time. These results suggested that rural residents had developed a stable mix of wage work and subsistence activity.

The Importance of Transfers in Local Economies

For all regions and communities studied, federal and state government expenditures, subsidies, and the direct provision of goods accounted for a significant component of the local money economy. These actions were all in effect transfers of money from outside a region to inside a region. The transfer portion of the economy was large and grew during the study periods covered in these reports. Transfers provided income directly and indirectly through employment based on transfers to institutions, especially government agencies and non-profits under contract with the government to provide services. Government subsidies of goods and services like schools, housing, and energy were also important components of the transfer economy. The direct provision of goods and services by state and federal governments influenced the overall mix of goods and services consumed in rural communities from what it would have been if based solely on market and subsistence sectors. And transfers, like subsistence, reduced the willingness of rural residents to move from the community for jobs (Knapp and Huskey 1988).

The remoteness of Gambell, Alakanuk, and St. Paul limited local commercial possibilities. The private sector in 1986 provided a maximum of 31 percent of household income in Alakanuk but only 10 percent in Gambell. The higher share for Alakanuk reflected the community's commercial salmon industry. In many rural communities, government wage and salary employment accounted for a large share of total wage income; in St. Paul and Gambell, government wage and salary income accounted for more than 50 percent of the total wage income. Government employment was also an important source of income for communities with a strong market sector. Government grew as a source of wages in both Kodiak and Bristol Bay during the study periods. The transfer economy (including government wage and salary employment) provided the majority of the total cash income in all of the communities. In two communities, Gambell and St. Paul, transfers provided 80 percent or more of the household income.

Direct transfer income (as opposed to indirect transfers through employment) on a per household basis — net of the Alaska Permanent Fund Dividend paid annually to Alaska residents — was less than the average for the U.S. in these small communities. The poorest communities did not receive proportionately larger shares of direct transfer income. For example, transfer income made up the smallest share of household income for Alakanuk, the community with the lowest household income of the three rural communities.

Growth of Northwest Arctic's transfer sector was the main source of the regional economy's improvement during the study period. Government employment accounted for two-thirds of the wage work in the region. This figure included employment with the regional non-profit corporation, Maniilaq. The non-profit was the second largest employer at the time and operated many service programs funded by the state and federal government. In the Northwest Arctic region, transfer payments made up an increasing portion of regional incomes over the study period, growing by almost six percent from 1971 to account for over 30 percent of personal income in 1987. Almost a quarter of the transfer income in 1987 was from the Alaska Permanent Fund. The Permanent Fund Dividend played a relatively large role in most communities examined (Waring et al. 1992a and b, TR148).

Non-monetary government transfers also increased the real income of rural Alaska communities. The relatively low share of income spent on housing and health care in these communities was one indicator of substantial government in-kind transfers. Local governments received relatively high levels of intergovernmental transfers as a source of revenue. Government also subsidized housing, education, electricity and fuel. When non-monetary transfers were considered, transfer payments accounted for almost half of the real income in the money economy of the Kotzebue region (Waring et al. 1992a and b, TR148).

Influence of Institutions on Local Economies

The baseline studies also showed that government institutions affected the local economic base of rural Alaska communities through regulation. Rules and regulations restricted local residents' access to resources for commercial use and could be especially challenging for the very smallest communities with limited opportunities. These small communities had little political clout or ability to influence the types of decisions that affected their economic life (Impact Assessment, Inc. 1988, TR132).

External decisions by state and federal governments affect the choices confronting even the most remote places. Gambell, for example, opted to take title to its former reserve lands (i.e., federal lands reserved for use by Native Americans) rather than participate in a regional corporation formed under ANCSA. Because of this choice, they also could not participate in the land claims regional corporation cash settlement, resulting in fewer funds for managing their new ownership responsibilities. Similarly, the Marine Mammal Protection Act (1972) and the Endangered Species Act (1973) prohibited the commercial use of walrus meat and raw ivory and eliminated a potential source of commercial revenue for Gambell residents (Impact Assessment, Inc. 1988, TR132).

The most dramatic example of public policy effects has been in St. Paul. Federally managed and subsidized seal harvests were the base of the St. Paul economy from 1911 to 1983. The government sold seal pelts and provided the islanders with wages and services. Changes in federal and international law starting in 1983 meant the federal government got out of the seal harvesting business and suspended commercial seal harvests. The change in laws significantly changed the community's economy and delivery of public services (Impact Assessment, Inc. 1988, TR132).

The state's Limited Entry salmon program was a major institutional change that affected access to salmon by residents of many rural communities. The baseline studies outlined a number of positive changes resulting from this program, such as increased investment in technology and increased independence from canneries (Impact Assessment, Inc. 1984, TR103). Residents also raised concerns about the program because the Limited Entry program allowed rural residents to sell their permits. A major structural concern in the salmon fishery was the high percentage of non-resident resource use; between 50 and 75 percent of the earnings in the Bristol Bay fishery went to non-residents during the study period (Impact Assessment, Inc. 1984, TR103).

Residents were concerned that the program placed a barrier to entry to future community residents who needed to fish to live in the communities. The state's Limited Entry salmon fishing program has reduced the size of the commercial economy in Alakanuk. Since obtaining a permit became more expensive under limited entry, the program placed a barrier to entry for local residents (Impact Assessment, Inc. 1988, TR132). There has been a tendency for rural communities to lose permits over time (Cultural Dynamics, Ltd. 1986b, TR122).

Demographic Change

Finally, these baseline studies suggested that population growth in rural communities was generally a result of rapid rates of natural increase (for example see Waring et al. 1988, TR130 and 1989, TR 131). Birth rates were high enough to overcome outmigration and cause the population to increase. Population growth patterns differed across the communities, but most communities experienced modest population growth during their respective study period. Only in St. Paul was the outmigration great enough to make population growth negative.

Researchers found migration to be primarily related to employment. However, in certain instances communities experienced in-migration as a result of infrastructure change. For instance, Alakanuk experienced relatively rapid population growth in the post-ANCSA period, reflecting the expansion of housing in the village and in-migration from surrounding communities (Impact Assessment, Inc. 1988, TR132). Employment-related migration accounts for the differential growth of the local non-Native population in some communities. The small communities with limited job opportunities (e.g., St. Paul, Alakanuk, and Gambell) had relatively little turnover of their population and over 88 percent Native population.

Job-related migration into the regions has consisted mainly of young males with limited attachment to the region who filled jobs that local residents could not fill. The Bering Straits region, for example, experienced significant population growth, over 30 percent, between 1970 and 1985. During this time, unlike other regional centers, Nome's share of the region's population remained relatively constant, but the ethnic composition within Nome's population changed: the percentage of Alaska Natives fell from 64 percent in 1970 to 59 percent in 1980; this was part of a trend that started in 1960.

Nome had relatively high unemployment rates and low labor force participation rates. In 1980, labor force participation rates were only 65 percent in Nome. Natives in Nome had lower labor force participation and higher unemployment than non-Natives. Kotzebue shows this same pattern. In 1980, the labor force participation of rural Native residents was low relative to the state and the nation and their unemployment rates were relatively higher. One explanation of this phenomena is the "discouraged worker" effect, which reduces labor force participation when the probability of finding a job is low. The Kotzebue baseline study suggested that low labor force participation also resulted from workforce immobility, inappropriate job skills, and the competing demands of subsistence activities (Waring et al. 1988, TR130). Low rates of high school completion complicated the problem of employment in the region. One interesting question is how the resident Native population would respond to work opportunities in OCS projects. If Native labor force participation rates remained low, in-migrants would take these jobs.

The response to employment opportunities at the Red Dog mine may be an indicator of the willingness of Northwest Arctic region residents to take industrial jobs in the OCS. Northwest region residents seemed willing to take jobs in a workforce attitude survey done in 1989 as reported in the *Hope Basin Socioeconomic Baseline Study* (Waring et al. 1992a and b, TR 148). Almost 70 percent of residents surveyed desired training for jobs. More significantly, residents were willing to move or do shift work to secure a job. Almost 75 percent were willing to take a rotation or shift work job. More people were willing to move within the Borough for work (62 percent) than were willing to move outside of the Borough (50 percent), but the willingness to move signaled a desire to work. Residents in the smaller villages were more willing to move within the Borough and to take shift work than residents of Kotzebue. The region's residents have shown a past disposition for working temporarily outside the region, based on relatively heavy representation in Trans-Alaska Pipeline jobs, firefighting jobs, and NANA corporate jobs in other regions of the state.

Patterns of migration found in these baseline studies were also interesting. Data indicated significant population churning, meaning many people moved out as others moved into a community. For example, 30 percent of the Kotzebue population lived in the community for five years or less, which exceeded the net increase in population. This churning included the movement of non-Natives and residents of smaller villages into Kotzebue. Even with the churning, the population of Kotzebue continued to grow relative to the rest of the region with an increasing share of migrants. A second type of churning was regional residents moving out of and back to the region. The non-resident percentage of NANA shareholders was stable between 1977 and 1982. Key informant reports supported the interpretation that people were moving back and forth with the non-resident share remaining stable (Waring Associates et al. 1988, TR130).

Another demographic phenomenon observed in rural communities was a gender imbalance of more males than females. Waring et al. (1989, TR131) found that in 1980 this imbalance in Nome was ethnically linked. The non-Native population was predominantly male and older, while the Native population was younger and more evenly distributed between men and women. The non-Native population consisted largely of relatively older men coming into the region for work. Nome had a significant share of nonresident workers (13 to 15 percent) as well as workers who migrated for employment at the time of the study.

Impacts on Urban Communities

Development of petroleum resources in the OCS will have impacts in Alaska that reach beyond communities in the area of development. Researchers examined communities outside of the development area in studies on the consequences of development on the state's major cities. The ESP treated Anchorage impacts as part of the set of ESP core studies while the ESP addressed Fairbanks impacts as a case study.

In Alaska, petroleum development does not take place near the state's larger communities, but development would affect the economy and population in these places. Oil developments distant from the state's cities can affect them in four ways. First, certain types of administrative or technical jobs associated with development may be located in the urban area. Second, because most petroleum jobs allow shift work, workers may choose to live and spend their earnings in the urban area. Third, the industry may purchase goods and services used in the petroleum development in the urban area. Finally, the state spends government revenues raised from the petroleum development throughout the state, including its urban areas. This pattern has been the state's experience with the Prudhoe Bay development on Alaska's North Slope (Huskey 1995).

Of particular concern in the MMS funded studies of the state's urban places was the capacity of Fairbanks and Anchorage to absorb population growth generated by petroleum development. Early in the history of the ESP, Department of the Interior funded the *Alyeska-Fairbanks Case Study* (Wordsmiths 1978, TR14). The Fairbanks study reviewed both data and opinion surveys that examined the period of the construction of the Trans-Alaska Pipeline. Fairbanks was unprepared for the population increase produced by the pipeline and the general attitudes of the Fairbanks population constrained preparatory activities. Given the fact that a population decline followed the boom, however, the limited infrastructure response may have been appropriate.

The federal government treated Anchorage impacts as part of the evolving set of ESP core studies. In 1978, the Department of the Interior commissioned the *Anchorage Socioeconomic and Physical Baseline* technical report (Ender, Gehler, Gorski and Harper 1978a, TR12) and the *Anchorage Impacts of the Beaufort Sea Petroleum Development Scenarios* (Ender, Gehler, Gorski and Harper 1978b, TR13). Researchers completed a second pair of Anchorage studies for impacts related to potential OCS activities in the Gulf of Alaska and Lower Cook Inlet Petroleum Development Regions (Policy Analysts Limited, 1980a, TR 48, Vol. I; 1980b, TR48, Vol. II). In 1984, Kevin Waring Associates completed the *Diapir Field Anchorage Impacts Analysis* (TR94). The 1984 Anchorage study suggested that two factors would limit the impact on Anchorage of OCS development. First, the relative size of any population impact would be small compared to expected Anchorage growth. Second, the experience of the Anchorage region suggested few constraints to expansion of public services and housing. Constraints could develop if OCS development came during a period of relatively rapid economic growth. The other limit on the ability of Anchorage to respond to OCS impacts reflected the large share of municipal funding that came from the state. State revenues depended heavily on oil production and the value of oil; the instability of oil prices could translate into an instability in the Anchorage public sector budget.

Commercial Fishing Studies

The seas surrounding Alaska provide both the frontiers for OCS development and an area of abundant fish harvests. Fish harvests are the primary livelihood for many communities on Alaska's coasts. Consequently, the impacts of OCS development on fishing sectors and communities have been of concern to residents and MMS. The initial research design of the ESP called for paired sets of baseline and impact studies. Ideally, the government would use information developed in the baseline studies and petroleum development scenarios as the basis for the impact studies. As with the other components of the core studies, this design did not prove to be practical for the fisheries industry component because the initial baseline studies did not adequately address this sector. The first lease sale took place in the Gulf of Alaska Petroleum Development Region. The government held subsequent lease sales in the same region in 1980 and 1981. MMS added the fishing industry to the ESP core studies based on concerns raised by residents and scientists during these lease sales. As a result, the ESP commercial fishing component was in a "catch up" mode. The first commercial fishing study was an impact study, not a baseline study: *Northern and Western Gulf of Alaska, Commercial Fishing Industry Analysis* (Alaska Sea Grant Program, Oregon State University and Frank Orth & Associates 1980, TR30).

The ESP ultimately included a mixture of fishing industry analyses and impact studies (see Table 4.2). In the same year that the Gulf of Alaska study was completed, two fishing industry analyses were published: *Lower Cook Inlet Commercial Fishing Analysis* (Terry, Scoles and Larson 1980a, TR44), and *Western Alaska and Bering-Norton Commercial Fishing Analysis* (Terry, Scoles and Larson 1980b, TR51), followed immediately by *St. George Basin and Northern Aleutian Shelf Commercial Fishing Analysis* (Earl R. Combs, Inc. 1981, TR60).

Table 4.2: ESP Fishing Industry Studies

	Beaufort	Northern Gulf of Alaska	Western Gulf of Alaska	Lower Cook Inlet	Bering-Norton	Bering-St. George Basin	Kodiak-Aleutian	Navarin Basin
Commercial Fishing Industry Analyses		TR159	TR159	TR44	TR51	TR60	TR60	
Commercial Fishing Industry Impacts		TR30	TR30	TR146	TR97			TR82

In the *Unalaska: Ethnographic Study and Impact Analysis*, Impact Assessment, Inc. researchers (1983c, TR92) assessed the likely socioeconomic impact on Unalaska Island of forces for change other than petroleum development in the Bering Sea. The researchers expected that the sociocultural system of Unalaska would experience consolidation in the 1980s, despite the growing groundfish industry, but increase dramatically in the 1990s from the same source (Impact Assessment Inc. 1983c:201). They expected the community of Unalaska to lose some of its "frontier" or "boomtown" character and assume a more permanent context. They expected increasing competition between Unalaska and Akutan and the Pribilof Islands as those places developed their own facilities for groundfish processing.

MMS followed these early fishing industry analyses by two studies initiated to describe the industry and its importance for the communities involved in the Bering Sea and the Gulf of Alaska (Northern Economics, John Isaacs & Associates, ResourcEcon, and Resource Valuations 1990, TR138 and 1994, TR159). These studies also developed a forecasting model to estimate the community economic dimensions of the fishing industry.

They described a region that stretches from Yakutat on the Gulf of Alaska to St. Paul in the Bering Sea and Unalakleet in Norton Sound. Fishing provided the major source of employment and income in the coastal communities of the region. Fishing activity also funded the local public sector through property, sales, and raw fish taxes. Fishing was relatively more important for the economic and community base of smaller, more remote communities. Fishing created economic activity through harvesting and processing, although workers who were not residents of the communities tended to dominate the harvesting sector of the industry.

Variety of target species is an important characteristic of the fishing industry. While researchers found that most small community economies were dominated by the salmon fishery, larger fishing communities such as Unalaska/Dutch Harbor and Kodiak fished and processed a wider variety of species. Harvesting also took place using a number of different methods. One important factor identified in the study was that the industry at the time of the study was already fully utilizing the valuable resources. They also found fishing to be subject to a variety of regulatory bodies and approaches. As is true in a number of baseline studies, changes in the conditions and regulatory environment in the industry since the completion of these studies may limit their future usefulness.

MMS also followed the early sequence of commercial fishing analyses with two impact studies in which the authors predicted the effects of OCS development on area fisheries associated with the Navarin Basin and Bering Sea (Centaur Associates, Dames & Moore, and LZH Associates 1983, TR82 and 1984, TR97). These studies examined a number of possible conflicts between OCS development and the fishing industry. Establishment of oil and gas rigs and platforms may result in a loss of access to fishing grounds. This effect may be limited since loss of fishing grounds may not mean loss of catch. An additional impact may come from the loss and damage to gear. Increasing OCS supply boats in fishing areas may also result in increased collisions. Careful planning and provision of information would limit these types of impact.

Competition for resources is another source of potential impact identified by these studies. Few ports could serve the oil industry. In these ports, competition for dock and storage space could be a problem. Labor is another sector in which competition could affect the fishing industry. If workers move to higher paid OCS jobs, fisheries could lose labor. The general mobility of labor would at least partially offset this effect; workers would move into the industry from other areas. Also reducing the drain of labor from the fishing industry is the requirement for special skills in the OCS industry.

The prospect of OCS oil and gas development in Cook Inlet presents some potential for conflict with local fishermen, especially the commercial driftnet fishery. Placement of stationary drilling rigs could create obstacles where fishermen typically drift their 150 fathom long nets. In particular, drift gill net fishers ("drifters") often focus their efforts near turbulent rip tides because they know salmon concentrate in these areas. The presence of an oil platform in favorable fishing areas could pose a navigational hazard that could result in diminished access, loss of harvest resulting from premature net release, or gear entanglement. A study completed in 2004, *A Study of the Drift Gillnet Fishery and Oil/Gas Industry Interactions and Mitigation Possibilities in Cook Inlet* (Impact Assessment, Inc. TR167) explored and defined specific ways to mitigate these potential conflicts and analyzed the significant tradeoffs of reasonable alternative proposals.

To better understand the economic consequences of an oil spill, MMS commissioned the technical report, *Economic Impacts of the S.S. Glacier Bay Oil Spill.* This spill occurred in Cook Inlet in 1987 (Northern Economics, Stephen R. Braund & Associates, Jon Isaacs & Associates and ResourcEcon 1990, TR146). Recognizing that no two oil spills are the same, the authors of the study attempted to identify the potentially affected activities and develop an approach to quantifying the impacts. They examined government reports and conducted key informant interviews to identify the types and monetary value of impacts. They identified five potential groups suffering economic losses: the petroleum industry, governments, commercial fishing, sport fishing, and subsistence users.

The study identified losses and expenditures in each of the five groups as the economic impacts of the spill. Impacts originated from loss of resources, costs of clean-up, and additional costs of conducting business. The study found no measurable impacts in sport fishing or subsistence. The attempt to measure costs was constrained by the length of time between the spill and the study, coupled with the fact that parties were still in litigation. Researchers could not simply sum estimates of the total economic expenditures across groups to estimate total impacts, since a portion of the expenditure in the petroleum industry was compensation for expenditures in other sectors. The study's primary benefits were identifying the process of economic impact from these types of events and establishing a protocol for calculating future impacts.

The North Slope: A Special Case

The North Slope region of Alaska is a special case for the ESP. As Alaska's major petroleum producing region, the North Slope illustrates the potential ways that large-scale energy development may affect Alaska's rural communities. The existing Prudhoe Bay and Kuparuk development infrastructure reduces the cost of future oil exploration, development, and production in the region. For this reason, the potential for future OCS development off the coast of this region is greater. (The relationship of oil development and subsistence on the North Slope is discussed more thoroughly in Chapter Seven.)

The number of studies done for this region reflects its special importance. Early studies in the program provided baseline information for the region (Peat, Marwick, Mitchell, and Co. 1978, TR11) as well as descriptions of the unique industry enclave features of petroleum development (CCC/HOK, Inc. 1978, TR4) and the North Slope Borough government (Morehouse and Leask 1978, TR16). Studies also include three additional baselines of the communities and region (Kruse, Baring-Gould, Schneider, Gross, Knapp and Sherrod 1983a and b, TR85; Alaska Consultants, Inc., Courtnage and Stephen R. Braund & Associates 1984, TR101; and Impact Assessment, Inc. 1990a, TR142 and 1990b, TR141). Finally, researchers modified the RAM to reflect the special nature of the North Slope economy (Knapp and Nebesky 1983, TR100). Knapp and Morehouse (1991) provided an overview of the North Slope economy based largely on this work.

Two features define the pattern of impact of North Slope oil production on the communities of the region. First, oil development historically has taken place in isolated industrial enclaves. Workers in these enclaves are, for the most part, residents of other regions working in shifts on the North Slope. This industrial geography has limited direct impacts on local communities. Secondly, the North Slope Borough is a regional government created with the primary purpose of capturing the economic rents generated by oil development. The taxing and spending of these tax revenues has been the primary path of impact on the local communities.

Recognizing the importance of industrial enclaves, MMS sponsored a study of enclave developments, *Forecasting Enclave Development Alternatives and Their Related Impact on Alaskan Coastal Communities as a Result of OCS Development* (Louis Berger & Associates, Inc. 1982, TR76). The researchers constructed a model of ideal industry/community impacts and determined a predictable sequence of OCS development events. The researchers attempted to predict the nature and extent of both the direct and indirect impacts, depending on whether the development took the form of an enclave or it was integrated with the coastal community. They included such variables as the openness of a company's management style, the alternative sites that might be available, and the short and long term nature of a company's interests. They also noted relevant community characteristics, including land use regulations, quality of community leadership, and cohesiveness of community attitudes about development (ibid., 8-9).

The enclave nature of petroleum development minimized both the positive and negative direct impacts on the local communities. According to Impact Assessment, Inc. (1990a, TR142) the North Slope oil production complex accounted for almost 85 percent of non-government employment in the Borough in 1987. The size of the petroleum enclave was almost equal to the population in the remainder of the region in 1987. The relative importance of the non-resident component of North Slope oil production is demonstrated by the fact that total earnings in the region were almost five times the earnings of residents.

Iñupiat participation in the oil industry has been low. In 1988, only two percent of the total employment of village residents was in the mining industry. This statistic typifies the documented experience over the history of petroleum development on the North Slope. Knapp and Nebesky (1983, TR100) offer a number of reasons for this low participation. One constraint in hiring Iñupiat for oil field work was the lack of required skills in the North Slope's resident population. Many Prudhoe Bay jobs require particular skills and the oil industry hired for these skills in a national market. The way companies filled jobs may also have limited Iñupiat employment. Union jobs filled through Fairbanks and Anchorage union halls put North Slope residents at a geographic disadvantage. Union membership could also be expensive for people working only a short time. To the extent jobs came by way of personal referrals, limited connections to oil field workers would limit Iñupiat job opportunities. Another constraint was that oil field work schedules may not have been flexible enough to allow residents to pursue important subsistence opportunities. Finally, and perhaps most important, the availability of jobs in the villages allowed residents to work at home rather than at remote enclaves. These local jobs, often short-term construction work, provided workers the greater flexibility to pursue subsistence activities. Jobs in the villages also required fewer social adjustments.

During the period studied, jobs have been available in the North Slope communities. Most local jobs have been directly or indirectly (through contractors) created by the North Slope Borough government. The

Borough and its privilege to tax have been the major connection between oil development and local communities.

North Slope residents won their fight to create the North Slope Borough in 1972. At the time, it was unique as a Native-controlled local government in the North. The Borough was the vehicle used by the North Slope Iñupiat to capture and use the oil wealth of Prudhoe Bay for the local population, and has had clear economic and political benefits locally. In 1991, Knapp and Morehouse (1991) revisited North Slope issues, building on their prior research under the ESP and the MAP programs. A summary of their findings follows.

Native leaders on the North Slope saw the creation of a Borough government as a way to capture a share of the Prudhoe Bay oil wealth and moderate the environmental impacts of oil development. While ANCSA allowed North Slope Natives to claim only a portion of the land in the region, the Borough could tax economic activity on state owned land. Borough incorporation would generate more income than could be obtained under ANCSA. Both the state and the oil companies challenged the creation of the North Slope Borough and its authority to tax; Alaska courts upheld the Borough's authority.

Borough tax revenues funded a significant capital improvement program (CIP), which brought schools, housing, water and sewer, and other amenities to the villages. The CIP also created jobs for community residents, as did government operations. Borough spending in the 1980s became the most important source of economic growth in the region. Residents of the Borough enjoyed a virtually full employment economy. A decline in the tax base and a resultant decline in Borough revenues and spending threatened the economic growth driven by Borough expenditures in the late 1980s. A rising population will also limit the ability of this single source economy to provide enough jobs.

Borough spending was primarily responsible for an increase of about 50 percent in employment in the villages during the 1980s. Government jobs – including the Borough - were responsible for about two-thirds of the total throughout the time period. In 1988, only about two percent of all jobs were with the state or federal governments. During this time period, labor force participation rates of working age Natives rose and unemployment rates fell. According to the Borough census, unemployment rates fell significantly from 24 percent in 1980 to around five percent in 1988.

Jobs and improved infrastructure are the best measures of the success of the Borough's economic program. Concerns existed, however, about its long-term potential based on continued threats to the

Borough's ability to raise revenues. Knapp and Nebesky (1983, TR100) suggested that reductions in the tax base were unlikely to affect the level of spending as much as state challenges to the Borough's ability to tax. The rapidly increasing population imposed another constraint. In 1988, 43 percent of the Borough's Native population was under the age of eighteen, and it would be difficult to increase government spending fast enough to create jobs as this cohort reached working age.

One impact of the Borough's spending program was an increase in the non-Native population in the Borough. Between 1980 and 1988, a period when the regional population grew by 41 percent, the Alaska Native share of the population fell from 79 percent to 74 percent. Most non-Iñupiat residents lived in Barrow. This population also was primarily male and adult, suggesting they were migrant employees. Non-Native households had relatively higher incomes than Native households.

During the period of job growth, subsistence remained important to the region's residents. As in other regions, the availability of jobs and wage income did not reduce the role of subsistence. Higher incomes among residents were associated with greater reliance on subsistence food. Residents pursued a mix of wage work and subsistence that allowed them to invest in subsistence equipment (Kruse 1991).

Iñupiat leaders placed a high social and economic value on subsistence; they put in place Borough job policies that allowed for subsistence leave. The Borough has also supported subsistence through regulatory and political efforts, such as its aggressive support of whaling, including opposition to OCS activity. The Borough has pursued a more moderate response to petroleum development on land. Oil development is the source of revenues required to provide services and jobs through the Borough government.

The story of the North Slope Borough illustrates one major way OCS development might affect local communities. The creation of the Borough allowed Iñupiat residents to benefit from oil development without directly participating. Taxing, spending, and regulating the oil industry allowed the Borough to provide jobs and public services to the region's residents and protect the region's subsistence resources. State public policies, as well as the decline of oil production on the North Slope, will affect the long term financial health of the Borough.

In 2002, MMS initiated a study entitled *North Slope Economy: 1965 to the Present* (Northern Economics, Inc., forthcoming). This study will present data on local government revenues and expenditures, structure of the North Slope economy (by employment classification), role of Native Corporations in shaping the

North Slope economy, and individual and household economic responses to change. The final document is anticipated to be available in 2005.

Conclusions

The studies funded under the ESP provide perspective on community impact from two points of view. The modeling efforts focusing attention on the potential consequences of OCS development were a forecasting exercise. The major contributions of these studies were on the methods used to predict the future of small Alaska communities. These studies also isolated the factors MMS could track over the period of development. The RAM can describe the economic and demographic impacts of OCS development. Uncertainty is an important variable associated with any projection. Uncertainty results from the unknowns surrounding resource development as well as the unknowns surrounding the non-OCS-related futures of Alaska's coastal communities. In modeling, simple structures that are easy to understand and allow testing of a wide variety of scenarios are most effective.

The baseline studies provided a second point of view, focusing attention on existing conditions in the likely areas of impact and identifying interesting questions and areas of concern. Figure 4.1 highlights the comprehensive geographic scope of the community economic and demographic studies. Alaska's coastal communities are special places. Their small size and remoteness limit the market potential of local resources. The Native population continues to rely on the economic and cultural importance of subsistence. Economies previously based almost entirely on subsistence have evolved to include government transfers and commercial income. These rural economies will undergo further transformation from both changes in market conditions and in government programs. These potential changes will create a need for ongoing baseline research in areas of potential OCS activity.

Chapter 5: Sociocultural Research

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Introduction

The federal government expanded the social research component of the ESP based on its assesment that Alaska's human environment is unique, warranting a program of additional research in order to meet the mandates of NEPA and the Outer Continental Shelf Amendments Act (Banks 1986). In 1970, 17 percent of Alaska's population considered themselves Native Americans. These 50,605 Alaska Natives lived in over 200 villages as well as in the state's regional centers and larger cities. The diets of many centered on harvests of marine mammals and fish potentially affected by OCS development. Related onshore developments could bring employment opportunities to remote areas but also could disrupt access to caribou and other land-based subsistence resources. In short, much of what is unique about Alaska's human environment has to do with the large Native population living there. Sociocultural studies are the most direct reflection of Alaska's unique human environment within the ESP.

Sociocultural baseline studies, later revised in scope and called sociocultural systems analyses, formed part of the core studies in the social component of the ESP. They are the focus of the first section of this chapter. The second section addresses seven types of thematic sociocultural studies: social indicators, institutional monitoring, subsistence-based economies, subsistence harvests, subsistence harvest disruptions, bowhead whaling, and traditional knowledge. The chapter concludes with a discussion of research themes and key research findings.

The sociocultural studies are a broad and varied subset of ESP research. Some of the variation reflects the MMS scope of work, while some reflects the different theoretical approaches and research and report writing styles of the researchers. Most of these sociocultural researchers were anthropologists. Their dedication to thorough ethnographic documentation and identification of the organizing principles and systems within a culture, combined with exhaustive scopes of work from the MMS, made for what were usually very detailed and lengthy technical reports. The researchers also used a variety of reporting styles. A challenge for this chapter's synthesis was to not lose sight of the contributions of those researchers who were less inclined to summarize their findings.

In addition to synthesizing the ESP sociocultural studies, this chapter examines the program's record as applied social science. How did the sociocultural studies evolve within the ESP program? How is the sociocultural research relevant to the mandates of MMS? What has this sociocultural research accomplished? In reviewing ESP sociocultural research, a consistent theme emerges from the researchers' findings: despite much change in rural communities in the second half of the twentieth century, the cultural value of subsistence has persisted as an essential organizing element of Native culture and community. Given that OCS development is an activity that uses and potentially impacts natural resources, subsistence – the traditional harvest and distribution of natural resources mainly for food - is the crucial nexus between OCS development and Native culture.

Sociocultural Core Studies

As described in the introduction and earlier chapters, the initial design of core studies called for impact projections based on petroleum development scenarios and baseline studies. While the responsibility for developing offshore petroleum development scenarios shifted from researchers to federal staff, the focus of many of the socioeconomic studies (discussed in Chapters Three and Four) continued to be on projecting impacts. This consistent focus on population and employment projections shaped the course of socioeconomic research studies to include a strong emphasis on modeling. The evolution of sociocultural core studies is quite different.

To begin with, sociocultural research in Alaska that pre-existed the ESP was cumulatively of insufficient geographic scope to serve as a basis for impact analysis. As discussed in Chapter Four, the impacts of OCS development can differ widely from one type of community to another. Whereas many of the socioeconomic studies could focus primarily on the development and application of models that could draw on existing community and regional data (e.g., census data), the lack of relevant data required sociocultural studies to focus on primary data collection.

The task confronting sociocultural researchers was further complicated by the fact that methods for projecting sociocultural impacts were relatively undeveloped. Prior studies (e.g., Chance 1966, Sonnenfeld 1956, Spencer 1959, Hughes 1960, Nelson 1969, Milan 1964, and VanStone 1962) focused on general increases in wage employment and other western influences, not on the potential sociocultural effects of OCS development in particular. What the ESP needed, then, was a geographically comprehensive set of sociocultural studies whose research would yield a grounded understanding of each

Petroleum Development Region[40] and could cumulatively develop and apply an effective approach to understanding the processes that would change the society and culture of coastal residents as a result of OCS development. Based on this assessment of the status of sociocultural research, the ESP therefore funded an unprecedented amount of sociocultural research in Alaska. In just a few years, the ethnographic record of coastal Alaska went from just a handful of contemporary studies to an abundance of baseline data. Table 5.1, presents the sociocultural Technical Reports by region and community, and Figure 5.1 shows communities represented in the ESP sociocultural studies discussed in this chapter (See Appendix A for the full citations of technical reports referred to in Table 5.1).

Combined Sociocultural Baseline and Impact Studies

The discussion of core sociocultural studies begins with an initial set that combined baseline and impact analyses. Worl Associates produced *Beaufort Sea Sociocultural Systems* (1978a, TR9), the first sociocultural study in the ESP series of social science technical reports. The report provided an extensive cultural history of the peoples of the North Slope and then used political systems, subsistence and interethnic relations as the foci for the ethnographic analysis of present-day Iñupiat society. The authors stated, "The report attempts to demonstrate that the social, cultural, and psychological values are as important as the economic values of the environment to the regional population" (Worl Associates 1978a:1, TR9). The report described the persistence of core cultural values rooted in people's relationship to their environment throughout the modern era of contact with non-local cultural and economic systems.

During the decade preceeding Worl's research, oil was discovered at Prudhoe Bay, Congress enacted ANCSA, and the Iñupiat successfully formed the North Slope Borough. The International Whaling Commission and the Alaska Department of Fish and Game also imposed harvest restrictions on two key subsistence resources: bowhead whales and caribou. Some of the changes observed by Worl Associates researchers were, in addition to a decline in resources or access to them, an increase in social and mental health problems (e.g., substance abuse, domestic violence), a decline in local autonomy and isolation (which had both served as insulation from outside pressures), a stronger economy

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[40] As described in Chapter 1 (see Figure 1.4), the ESP first technical report organized the coastal areas (including adjacent inland areas) into seven Petroleum Development Regions (PDRs) "to guide data collection and to facilitate the research necessary to perform other program tasks" (PMM et al. 1978b:1, TR1).

Table 5.1: Sociocultural ESP Technical Reports by Community and ANCSA Regional Corporation Boundary

	Community	Technical Report Number	No. Reports
Arctic Slope Regional Corporation			**27**
	Anaktuvuk Pass	9, 142, 151, 153, 154	5
	Atqasuk	101, 141, 142	3
	Barrow	9, 5, 15, 22, 64, 85, 101, 116, 117, 125, 126, 133, 135, 141, 142, 149, 151, 153, 154	19
	Deadhorse	4	1
	Kaktovik	9, 5, 15, 22, 85, 117, 126, 142, 151, 153, 154, 160	12
	Nuiqsut	22, 64, 85, 96, 126, 142, 151, 153, 154, 160	10
	Point Hope	9, 15, 101, 141, 151, 153, 154	7
	Point Lay	101, 116, 139, 140, 141	5
	Prudhoe Bay	4	1
	Wainwright	9, 22, 91, 101, 117, 126, 136, 141, 147, 151, 153, 154	12
N.A.N.A. Regional Corporation			**10**
	Ambler	74	1
	Buckland	74, 148, 151, 153, 154	5
	Candle	74	1
	Deering	74, 151, 153, 154	4
	Kiana	74, 77	2
	Kivalina	74, 116, 148, 151, 153, 154, 160	7
	Kobuk	74, 148	2
	Kotzebue	74, 77, 116, 130, 148, 151, 153, 154, 160	9
	Noatak	74, 77, 148	3
	Noorvik	74	1
	NW Alaska	15	1
	Selawik	74, 77, 148	3
	Shungnak	74	1
Bering Straits Native Corporation			**12**
	Bering Strait Region	15	1
	Brevig Mission	54	1
	Council	54	1
	Elim	54	1
	Gambell	15, 54, 89, 132, 152, 153, 154	7
	Golovin	54	1
	King Island	54	1
	Koyuk	54	1
	Little Diomede	54	1
	Nome	54, 116, 127, 131, 152, 153, 154	7
	Saint Michael	54	1

Table 5.1 (cont'd)

	Community	Technical Report Number	No. Reports
Bering Straits Native Corporation (cont'd.)			**12**
	Savoonga Shaktoolik	54, 89 54	2 1
	Shishmaref	54, 152, 153, 154	4
	Stebbins	54, 72	2
	Teller	54	1
	Unalakleet	54, 90, 116, 152, 153, 154	6
	Wales	54	1
	White Mountain	54	1
Cook Inlet Region Inc.			**6**
	Homer	47	1
	Kenai	47, 155, 156, 157, 160	5
	Ninilchik	47	1
	Seldovia	47, 155, 156, 157, 160, 163	6
	Soldotna	47	1
	Tyonek	47, 155, 156, 157	4
Ahtna			**1**
	Copper Center	7	1
Calista Corporation			**10**
	Akiachak	70	1
	Akiak	70	1
	Alakanuk	54, 70, 72, 132, 151, 153, 154	7
	Aniak	151, 153, 154	3
	Atmautluak	70	1
	Bethel	70, 151, 153, 154	4
	Chefornak	70	1
	Chevak	70	1
	Eek	70	1
	Emmonak	54, 70, 72	3
	Goodnews Bay	95, 103	2
	Hooper Bay	70	1
	Kasigluk	70	1
	Kipnuk	70	1
	Kongiganak	70	1
	Kotlik	54, 70, 72	3
	Kwethluk	70	1
	Kwigillingok	70	1
	Mekoryuk	70	1
	Mountain Village	70, 72	2
	Napakiak	70	1
	Napaskiak	15, 70	2
	Newtok	70	1
	Nightmute	70	1
	Nunapitchuk	70, 151, 153, 154	4

Table 5.1 (cont'd)

	Community	Technical Report Number	No. Reports
Calista Corporation (cont'd.)			**10**
	Nunivak Island	15	1
	Oscarville	70	1
	Pilot Station	70	1
	Pitka's Point	70	1
	Platinum	103	1
	Quinhagak	70, 95, 103	3
	Saint Mary's	70	1
	Scammon Bay	70, 151, 153, 154	4
	Sheldon Point	54, 70, 72	3
	Toksook Bay	70, 151, 153, 154	4
	Tuntutuliak	70	1
	Tununak	70	1
Koniag Inc.			**12**
	Akhiok	41, 121, 160, 163	4
	Kaguyak	41, 163	2
	Karluk	41, 121, 155, 156, 157, 160, 163	7
	Kodiak	39, 41, 122, 152, 153, 154, 155, 156, 157, 160, 163	11
	Larsen Bay	41, 121, 160, 163	4
	Old Harbor	41, 121, 152, 153, 154, 155, 156, 157, 160, 163	10
	Ouzinkie	41, 121, 160, 163	4
	Port Lions	41, 121, 160, 163	4
Chugach Alaska Corporation			**7**
	Chenega Bay	160, 163	2
	Cordova	36, 155, 156, 157, 160, 163	6
	Eyak	36	1
	Nanwalek (English Bay)	47, 160, 163	3
	Port Graham	47, 160, 163	3
	Seward	36, 163	2
	Tatitlek	155, 156, 157, 160, 163	5
	Valdez	155, 156, 157, 160, 163	5
	Whittier	163	1
Sealaska Corporation			**1**
	Yakutat	15	1
The Aleut Corporation			**15**
	Adak	126	1
	Akutan	92, 118, 126	3
	Atka	126, 128, 151, 153, 154	5
	Cold Bay	93	1
	False Pass	71, 75	2
	King Cove	71, 75, 77, 116, 123	5
	Nelson Lagoon	71, 75	2
	Nikolski	77, 92, 151, 153, 154	5

Table 5.1 (cont'd)

	Community	Technical Report Number	No. Reports
The Aleut Corporation (cont'd.)			**15**
	Saint George	77, 92, 118, 126	4
	Saint Paul	92, 118, 126, 128, 132, 151, 153, 154	8
	Sand Point	71, 75, 128, 151, 153, 154	6
	Shemya	126	1
	Two Aleut Villages	15	1
	Unalaska	77, 92, 116, 126, 128, 151, 153, 154	8
Bristol Bay Native Corporation			**18**
	Aleknagik	103	1
	Chignik Bay	67, 75, 121, 122, 155, 156, 157, 160, 163	9
	Chignik Lagoon	75, 121, 163	3
	Chignik Lake	75, 121, 150, 160, 163	5
	Clark's Point	67, 103	2
	Dillingham	67, 103, 116, 150, 152, 153, 154	7
	Egegik	67	1
	Ekuk	103	1
	Ekwok	103	1
	Igiugig	67, 103	2
	Iliamna	67, 103	2
	Ivanof Bay	75, 121	2
	King Salmon	67, 103	2
	Kokhanok	67, 103	2
	Koliganek	103	1
	Levelock	103	1
	Manokotak	67, 103, 152, 153, 154	5
	Naknek	67, 103, 150, 152, 153, 154	6
	New Stuyahok	67, 95, 103, 116, 150	5
	Newhalen	67, 103	2
	Nondalton	67, 103, 150	3
	Nushagak	15	1
	Pedro Bay	103	1
	Perryville	75, 121, 163	3
	Pilot Point	67, 71, 75	3
	Port Heiden	67, 71, 75, 150	4
	Portage Creek	103	1
	South Naknek	67, 103	2
	Togiak	67, 95, 103, 150, 152, 153, 154	7
	Twin Hills	103	1
	Ugashik	71, 75	2
		Total Sociocultural Reports:	62

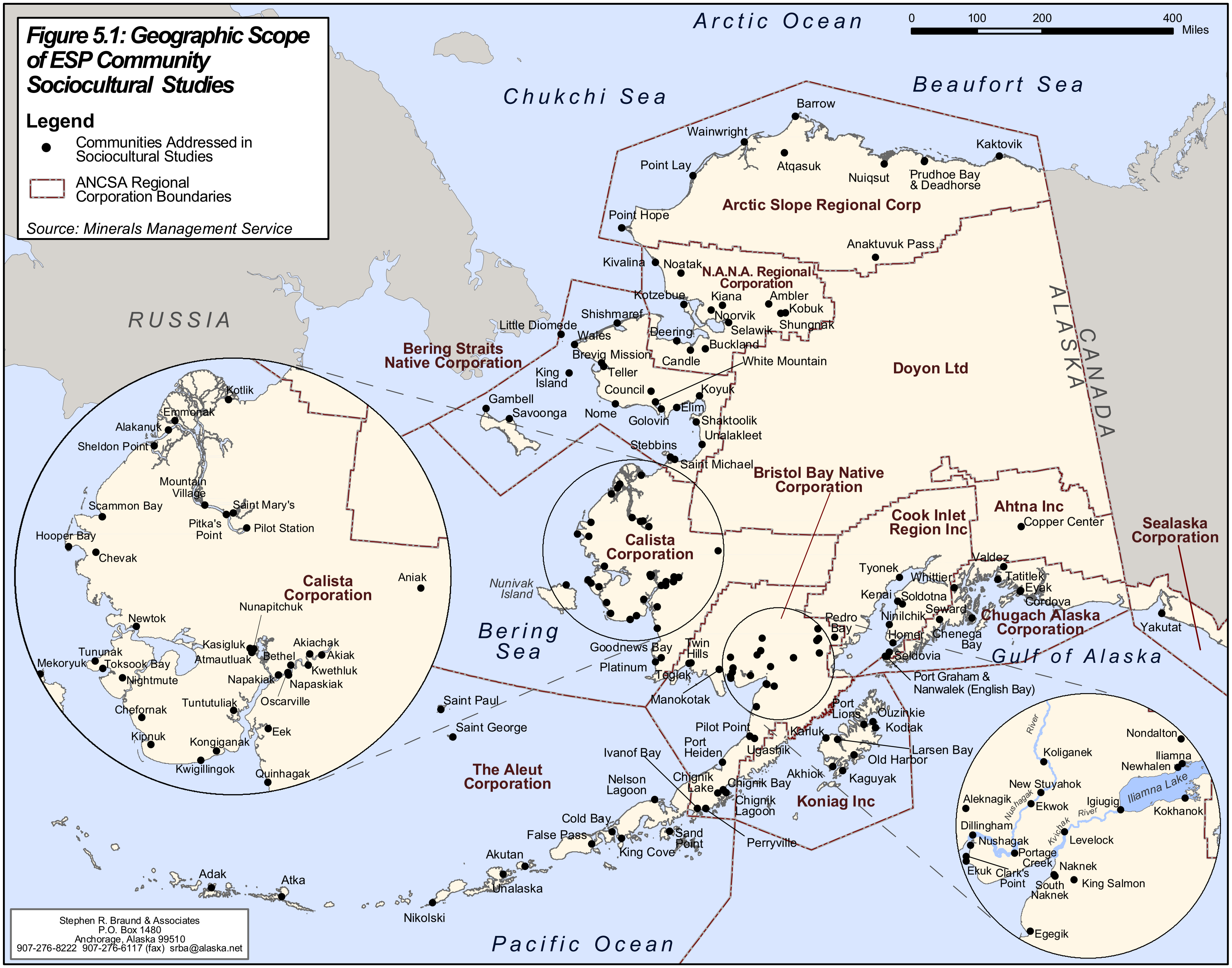

Figure 5.1: Geographic Scope of ESP Community Sociocultural Studies

(allowing residents to stay in the region to support themselves), and, in the face of changes and outside pressures, emergent solidarity and leadership. Additionally, the challenges of modernization spurred the institutionalization of traditional subsistence values in modern Iñupiat society. The Iñupiat ability to respond with western-style institutions to external and internal pressures was an important strategy for maintaining core values through changing times, although the institutions were not necessarily a perfect tool. The formation of the North Slope Borough was cited as an example of forming a political institution to address new demands from outside the region. In 1976, North Slope Borough Mayor Eben Hopson represented his people as being strongly opposed to the risks of offshore oil exploration because of the elemental importance of marine mammal hunting, particularly bowhead whaling, to the cultural survival of the Iñupiat people (Worl Associates 1978a:101-102, TR9). "The Iñupiat believe that their cultural survival is based on a direct and intimate relationship with their environment" (ibid., 109). The authors repeatedly showed that, despite many changes since contact with non-Iñupiat people and exposures to new technology and complex systems, Iñupiat whaling culture has persisted (ibid., 3).

In the above report, the authors examined in depth a select set of key systems (e.g., social organization, political development, and subsistence elements). Then, in *Sociocultural Systems Impacts of the Beaufort Sea Petroleum Development Scenarios*, Worl Associates (1978b, TR22) introduced a more linear method of analysis that emerged from the need to hypothesize impacts from petroleum development scenarios. The researchers ethnographically described all major sociocultural systems in the Beaufort Sea region: subsistence, cultural values, political, interethnic relationships, social health, and family relationships. They then analyzed the potential impacts to each of those systems under four OCS development scenarios (Camden-Canning, Prudhoe Bay-Large Scale, Prudhoe Bay-Small Scale, and Cape Halkett) and under no OCS development. The authors observed:

> The tenacity of Iñupiat cultural survival has been attributed to their continued relationship to the land and their environment and the continuation of their traditional social organization in the family and community. The Iñupiat participate to varying degrees in a monetary economy, but they largely remain directly dependent and emotionally attached to their environment and its natural resources (ibid., 11).

Formation of political and economic institutions focused on protecting traditional values and practices associated with subsistence, the Iñupiaq language, cooperation and sharing strengthened an already strong sense of Iñupiat identity. The authors noted that the Iñupiat people had managed to selectively adopt changes while retaining traditions. They switched from dog teams to snow machines as a primary mode of overland transportation, for example, but retained their tradition of sharing harvests. However, rapid change had incurred social costs at the individual level such as increases in violent behavior and substance abuse. The authors wrote that OCS development could increase pressures and accelerate the pace of change, exacerbating these problem areas and promoting cultural disruption.

The Beaufort Sea sociocultural baseline and impact reports established a method that subsequent ESP researchers followed to produce the early sociocultural studies, most of which included OCS development scenario impact analyses. In *Northern Gulf of Alaska: Sociocultural Impacts*, Bennett, Heasley & Huey (1979, TR36) described the communities of Cordova-Eyak and Seward in the North Gulf of Alaska Petroleum Development Region. Their 15 impact categories were the most divergent from the other sociocultural studies. They included, among numerous other categories: community isolation, wilderness setting, cohesiveness, community age distribution, degree of political integration with higher levels of government, and child-rearing practices. These categories reflected the sociological perspective of the researchers. The report included an analysis of impacts from three OCS development scenarios (low development [95 percent probability case], medium development, major development [five percent probability case]) and a non-OCS development scenario. The researchers characterized Cordova as a community strongly tied to the land and sea and its commercial fishing way of life, valuing its independence and isolation from outside forces. These characteristics made the community vulnerable to negative impacts from development. Indeed, an impending lease sale had already generated observable community and individual stress. Bennett, Heasley and Huey described Seward, in contrast, as having a more ambitious, growth-oriented set of values that would absorb change from OCS development more readily.

Payne (1980, TR39) described the sociocultural systems of Kodiak non-Natives while Cultural Dynamics, Ltd. (1979, TR41) addressed the sociocultural systems of Kodiak Natives. The Kodiak area is part of the Western Gulf of Alaska Petroleum Development Region. Payne's impact categories included: the maritime adaptation, cultural values and personality characteristics (including subsistence), political and governmental organizations, social health, family relations, and the town environment. He described the maritime adaptation as the basis of the sociocultural system of Kodiak. Payne identified the values of independence, tolerance, hard work and dealing with challenges, adaptability, sharing, and pride as outgrowths of the maritime adaptation and a commercial fishing lifestyle based on working in that natural environment.

Cultural Dynamics, Ltd. researchers (1979, TR41) identified socioeconomic (fisheries, forestry, tourism, and OCS) and sociocultural (subsistence, intra-island relationships, church relationships, health, and response capacity) components as the basis of empirically identified systems that they would describe ethnographically. The villages of Kodiak reportedly shared strong values of autonomy and the centrality of subsistence; natural resource harvesting in both subsistence and commercial fishing were deeply embedded in the way of life. In some villages, roads and canneries had decreased autonomy and increased competition for resources and interethnic tensions. A more positive change was the strengthening of inter-village ties under the emergence of the regional Native for-profit (Koniag, Inc.) and non-profit (Kodiak Area Native Corporation [KANA]) corporations. Both studies included three OCS development scenarios and a non-OCS scenario.

Braund and Behnke (1980, TR47) prepared an ethnographic baseline and impact analysis based on hypothetical OCS development scenarios for the lower Cook Inlet region, *Lower Cook Inlet Petroleum Development Scenarios: Sociocultural Systems Analysis*. They identified the following impact categories: economic adaptations (which included subsistence), land and environment, small town social relationships, politics and response capacity, and social health. Braund and Behnke considered cultural materialism to be the most relevant theoretical concept for the ESP. They reasoned that the ESP program assumes that oil and gas development will more likely cause changes in nearby communities than in communities distant from the development. They also started with the premise that the initial source of sociocultural impacts would be population and economic changes. In the cultural materialist view, the social organization and ideology of a given culture are adaptive responses to changes in the economic base, including the subsistence and cash sectors (see Harris 1968). Thus, changes in either the subsistence environment or market economy would likely, in the long term, generate changes in the social organization and ideology of rural Alaska communities.

Communities were already experiencing changes, such as increased competition for resources from recreational users on the Kenai Peninsula, the presence of the oil industry, and increasing complexity in local communities due to growth, modernization, and ANCSA. The authors depicted a number of conflicts arising from outside pressures on traditional values. They observed Kenai and Soldotna as being more receptive to OCS development because of values more aligned with growth and development, while they observed Homer to be supportive of economic growth only if it was consistent with the high value placed on the land and sea and the small town quality of life. The smaller villages in the region were experiencing rapid changes which, while creating problems, were also causing residents to articulate and strengthen their cultural identity. For example, changes such as the implementation of ANCSA, land transfers, economic development, and pending oil and gas development, reinforced to villagers their continued value of subsistence activities, kinship and reciprocity, and close-knit village life. Braund and

Behnke assessed the potential sociocultural effects of three OCS development scenarios (exploration, medium find, and high find) as well as a non-OCS scenario.

Ellanna's *Bering-Norton Sociocultural Systems Analysis* (1980a and b, TR54) was consistent with the theoretical orientation of Braund and Behnke. She identified the following impact categories/sociocultural systems: sea and land (values, utilization and control); economic systems (subsistence, cash and their interrelationships); social systems (family, community and regional levels); political systems; interethnic attitudes and relationships; and indicators of response to change (positive and negative). Ellanna considered sea and land (i.e., natural environment) as the primary system because "the cultures of the Native groups composing the majority population of the study area are prehistorically, historically, and contemporarily organized primarily around the relationship of these people to their sea and land environments" and the "economic and political power within the study area today, as in the past, are directly related to access to and control of the sea and land and their respective resources" (1980a:213, TR54). At the time of Ellanna's research in the Bering Strait region, governmental bodies in general had little ethnographic understanding of the Native peoples of rural Alaska; moreover, a common Western perspective was that the Natives would modernize, leave behind their primitive ways, and assimilate into the Western capitalist society. Consequently, conclusions like Ellanna's about Native cultures, which may seem obvious to non-Natives now, were noteworthy at the time. Identifying the primacy of the cultural connection to land and sea required that Western institutions revise their understanding and approaches to these rural communities. Resource management policies based on allocation of harvest rights to individuals (based on the principles of private property), for example, contradicted traditional practices in which one individual would often plan his harvest to meet the needs of multiple households (base on the concept of common property).

Ellanna analyzed impacts to the sociocultural systems under four projected OCS development scenarios (exploration, low find [95 percent probability], mean find [50 percent probability], high find [five percent probability]) and a non-OCS case. She anticipated that the sea would remain the primary focus of subsistence, economic, recreational and values systems, and that subsistence would remain the major and most stable adaptation for the majority of Iñupiat and Yup'ik in the study area (ibid., 62) under the various scenarios. In addition, the extended family system provided the basis for social organization and was the key to community adaptability to change (ibid., 36). However, she concluded that contention would increase as threats to the marine environment and subsistence practices increased from OCS development (ibid., 225-6). Government decisions affecting the environment, resources, and the population could also cause a rise in stress and a sense of powerlessness in communities. Native corporations (regional and village) were providing support and a voice for local concerns, but their success as advocates would depend on the shareholders' (i.e., Native residents') ability to relate to the Native corporations, which were relatively new at the time (ibid., 436). This report was the last in this series of sociocultural technical reports to include impact analysis from prescribed OCS development scenarios.

Sociocultural Systems Analyses

As mentioned in the introduction to this chapter, the OCS lease schedule accelerated at such a rate in the early 1980s that the old approach of combined studies providing a baseline of a core study component (e.g., transportation, fisheries, socioeconomics, and socioculture) and forecasting impacts from petroleum development scenarios was no longer practical. The main problem was that other researchers, working with the government lease sale planners, were repeatedly revising the development scenarios. Any given set of scenarios would likely be out of date by the time the contracted sociocultural systems analysis was completed (Banks 1986). Consequently, the ESP focused research on filling specific gaps in a component baseline or on updating earlier sociocultural reports.

The *Beaufort Sea Sociocultural Systems Update Analysis* (Worl, Worl and Lonner 1981, TR64) represented a shift in approach by explicitly hypothesizing changes in baseline conditions over time without examining impacts from several OCS development scenarios. The authors forecast trends in sociocultural systems under the hypothetical assumption that no OCS development would occur from Lease Sale 71. They retained most of the analysis categories of Worl Associates' earlier work (1978, TR22). This research, however, incorporated the original category "subsistence" within the broader category "economic systems." This approach was similar to that taken by Braund and Behnke (1980, TR47) and Ellanna (1980a and b, TR54). In analyzing changes since 1978 (Worl Associates 1978b, TR22), the authors made the overall observation of the "remarkable persistence and tenacity of Iñupiat culture" (Worl, Worl and Lonner 1981:I, TR64). Pressures on cultural traditions, particularly those associated with subsistence, heightened the cultural value of those activities (e.g., the bowhead whaling moratorium) (ibid., 193). Researchers expected impacts reducing abundance or access to wildlife to directly affect cultural norms, ideologies and values and the social organization of the Iñupiat (ibid., 196); practices such as sharing, cooperative behavior, ceremonies, and one's relationship to wildlife were such entrenched aspects of the subsistence and extended family values as to be formalized. The authors observed significant political and institutional efforts to protect selected aspects of their culture, with institutions reflecting a mix of traditional and Western values. They noted that the influence of elders appeared to decline with the rise of institutions intended to carry cultural systems forward (ibid., 80-81).

In the face of rapid change, many elders adopt a "radical conservatism," rejecting participation in the new institutions and thereby losing power to manage change. On the other hand, adapting to change can violate traditional values. Some of the new institutions contained cultural inconsistencies between their Western structure (e.g., assuming responsibility for individual and general welfare) and their expressed traditional values (e.g., reliance on self and family) (ibid., 205). Such inconsistencies raised questions about what future directions these institutions might take, and what the resulting cultural ramifications might be.

Payne and Braund developed a baseline sociocultural description of the Bristol Bay region which appeared as the *North Aleutian Shelf Sociocultural Systems Baseline Analysis* (1983, TR67). Payne and Braund divided the Bristol Bay and Alaska Peninsula study area into seven subregions based on the concepts of: geographic proximity; common transportation routes and modes; common ancestral, historical or religious backgrounds, and inter-community social interactions; shared subsistence areas and subsistence items; and orientation of each community toward Dillingham, King Salmon or Kodiak.

Within these seven subregions, the authors provided detailed discussions on 15 communities. Payne and Braund identified the following impact categories: economic systems (cash and subsistence), political systems, social health, social organization, and land and environment. The authors found that subsistence played a vital role in the sociocultural system, and that any threats to subsistence would pose a threat to the core of the culture. Commercial salmon fishing, a more recent expression of a reliance on natural resources, was also integral to the way of life. The limited entry permit system, however, constrained access to the fishery (see Chapter Four). Payne and Braund characterized these communities as being independent, technologically innovative and self-reliant but undergoing a loss of autonomy with the growth of the salmon industry and the presence of canneries in and near villages. At the time of the study, villages were regaining some autonomy with passage of ANCSA and other social and economic changes (ibid., 364). This study did not include OCS development scenario projections or a non-OCS case projection; it was strictly a baseline ethnographic study.

Fienup-Riordan (1982, TR70) and Davis and McNabb (Cultural Dynamics, Ltd, 1983, TR74) organized the *Navarin Basin* and *Chukchi Sea* sociocultural systems baseline analyses similarly. Fienup-Riordan provided an ethnographic baseline of the Navarin Basin region (in the Kuskokwim area). She organized data into the following sociocultural systems "potentially affected by OCS lease sales" (ibid., 3): social, cultural, political, and economic (including subsistence, cash, and the interface between the two). She observed, "the most striking feature of the study area is the fundamental dependence of its inhabitants on the products of the rivers and the sea, both traditionally and at present” (ibid., 488). Not only did subsistence persist as a fundamental cultural system, but so also did the traditional social structure, language, and even settlement patterns despite modern nuclear family housing. One change that had penetrated the sociocultural systems was that formal education had supplanted and, to some extent, invalidated traditional knowledge and its transferal. Another change to the traditional sociocultural systems was the introduction of formal authority networks (i.e., western institutions), which had undercut traditional authority.

Davis and McNabb’s *Chukchi Sea Sociocultural Systems Baseline Analysis* (Cultural Dynamics, Ltd. 1983, TR74) was also exclusively an ethnographic baseline study. The organizational framework for the analysis used the following categories: social organization, services and facilities, political organization, and economic organization (subsistence, jobs). Unlike most prior reports in this section, this study did not use the term “impact category.” The researchers found that family and kinship continued to organize Iñupiat life, with strong village identities and inter-village ties persisting (ibid., 3). Subsistence and the relationship to the land were pervasive values that united residents of the region and directed their political priorities. They concluded their report with the observation that as more outsiders and development interests moved into the NANA region, the Iñupiat were responding with a heightened awareness of their cultural identity and traditional values. They were also recognizing the need to modify some aspects of their identity in a culturally consistent manner in order to modernize successfully (ibid., 358).

In *North Aleutian Shelf Sociocultural Impacts, Non-OCS Forecast Analysis*, Impact Assessment, Inc. researchers implemented a systems model to make a 20-year forecast of change under a scenario assuming no OCS development (1982, TR75). Their study presented a baseline description of the systems operating at the regional and subregional levels for the North Aleutian Shelf region including the communities of Sand Point, King Cove, Nelson Lagoon, False Pass, Chignik Bay, Chignik Lake, Ivanof Bay, Port Heiden, Pilot Point/Ugashik, Chignik Lagoon and Perryville. The systems model consisted of three main elements: input (the ecological, extrasocietal, and intrasocietal environments), structure (patterned behavior and the rules that organize that behavior including values and economic, social, political, religious, educational, health care, and recreational organization), and output (economic, social, political, religion, education, and health care). Additionally, their method of using feedback loops allowed for more than one direction of change – i.e., the systems respond to variables in the environment, but their adaptations may cause modifications to the environment as well as to the structures themselves. Impact Assessment, Inc. researchers analyzed change by region, sub-region and community. A primary factor which they found would influence development was ANCSA, by decreasing the inflow of the non-Native population, due to lack of access to land title. A second factor was the salmon fishery, which they expected to remain stable; they correctly assumed a significant decrease in the crab fishery. Another one of their findings was that the increasing importance of commercial fishing in the region and consequent wealth had caused traditional subsistence activities to decline in importance as measured by the cultural value placed on the investment of time and resources. They projected that traditional means of subsistence would likely continue to decline in priority in the future (Impact Assessment, Inc. 1982:vii). The authors also anticipated an increase in formal, western institutions and a decline in informal, traditional social structures (ibid., viii). Overall, the researchers anticipated increasing replacement of traditional culture with modern American material and social culture.

Impact Assessment, Inc. researchers extended this forecasting element of their study design in two reports on the Aleutian region hubs, Unalaska (Impact Assessment, Inc. 1983, TR92) and Cold Bay (Impact Assessment, Inc. 1983, TR93), by including OCS development impacts. The Unalaska report analyzed change over the remainder of the twentieth century under scenarios that varied the levels of development of two major prospects: groundfisheries and OCS-related development. The researchers observed that the community exhibited three different value systems within the diverse population: traditional (mostly aligned with the Aleut population and including subsistence and rural orientation, reciprocity patterns based on kinship, respect for elders, and authority); frontier (typical of the commercial fishermen who have come to an isolated location to try to earn a high income from the natural resources); and modern (urban-oriented, with status conferred by education, employment, income, and community involvement). The Cold Bay study examined three scenarios ranging from no OCS development to major development of oil facilities adjacent to the community. Cold Bay was a mostly non-Native community in which most residents were present because of work and maintained strong ties to “the larger sociocultural system” (i.e., mainstream U.S.) where they came from and expected to return within a brief period. These are the only sociocultural reports in this post-Petroleum Development Scenario series of studies that hypothesized impacts from OCS development.

Though not a “sociocultural” study, *A Description of the Socioeconomics of the North Slope Borough*, (Kruse, Baring-Gould, Schneider, Gross, Knapp, and Sherrod 1983a, TR85) merits discussion here. In this study, the researchers developed a socioeconomic forecasting methodology in which subsistence figured prominently. Acknowledging the key role of subsistence in the local economy and social and cultural values, the researchers noted that some of the most significant impacts were likely to be where subsistence and petroleum development overlapped in some manner, or where local residents perceived them to overlap. The researchers mined voluminous public testimony, mainly on oil development, to identify perceived threats to subsistence and cultural values (see Chapter Seven). The researchers associated these perceived threats with social stresses (Kruse et al. 1983a:29, TR85). They also conducted key informant interviews and coded them, along with prior testimony, to document impacts and perceived impacts as well as social and cultural values. An appendix to the report (Kruse et al. 1983b, TR85A) contains the transcripts of the new key informant interviews conducted for this study.

This socioeconomic study came to the same essential finding of many of the ESP sociocultural studies: subsistence was at "the core of their [North Slope Iñupiat, in this case] existence" (Kruse et al. 1983a:33, TR85) and, as a "land use" issue (broadly including marine as well) and a resource use issue, was directly threatened by petroleum development. This socioeconomic study also contained seeds that germinated in future ESP sociocultural studies. The report addressed the need for a survey methodology to document well-being and impacts to it (Kruse et al. 1983a:41-42, TR85). Additionally, Kruse et al. (1983a, TR85) called for location-specific documentation of the extent and intensity of Iñupiat subsistence land use (ibid., 26). The *North Slope Subsistence Study* (Stephen R. Braund & Associates and ISER 1993a, TR149 and 1993b, TR147) in the late 1980s (which Kruse also worked on) was a major step to fill this observed gap in the ESP sociocultural studies.

This concludes the review of ESP core studies focused exclusively on the sociocultural environment. Throughout the combined baseline/impact studies and the systems analyses synthesized above, the researchers categorized components of the sociocultural system and used them to organize descriptions within the study area and, in the early studies, to assess the potential for impacts. Although the analytic categories varied from study to study, they generally covered three systems: the political system, the economic system, and the social system. Researchers usually considered subsistence as part of the economic system. Some researchers singled out themes for analysis such as marine orientation, land and sea, land and environment; these themes reflected cultural and economic values that pertained to subsistence and other economic pursuits. Authors of the systems analyses series of studies were fairly consistent in using the three system approach (political, social, and economic systems), occasionally highlighting a subsystem for analysis (e.g., religion, health care, and social health). Whether this consistency is a product of how the MMS defined the scope of work in that series, or whether it is a reflection of research trends at the time, the systems approach replaced the more eclectic categorizations implemented in the earlier ESP sociocultural baseline and impact studies. In this manner, the growing body of sociocultural research sponsored by the MMS contributed to the refinement of research methods.

In 1984, the MMS sponsored a project entitled *Review of Cumulative Impact Assessment Literature and North Slope Borough Development Projects* (Dames & Moore, Maynard & Partch, and Stephen R. Braund & Associates 1985, SR5). This project reviewed impact assessment literature from academia and applied arenas in other parts of the world, and reviewed methodologies within the ESP body of social impact assessment (SIA) research in Alaska. With regard to the ESP social studies, the authors of the memorandum concluded:

> While these sociocultural studies produced good ethnographic baseline data, there are a number of inherent limitations. First, with the exception of subsistence activities, socioeconomic aspects of the study communities are not discussed. Second, the number of communities included (as many as 30) and other scope of work requirements often resulted in generalized overviews of many important issues. Third, the qualitative nature of much of the data made the impact of a given effect difficult to trace through the entire sociocultural system.
>
> In summary, the early socioeconomic and sociocultural studies, while fruitful first levels of analyses, have certain limitations. In terms of forecasting future conditions these studies were dependent on the quality of the initial petroleum development scenarios. The early sociocultural studies demonstrated the importance of the economic subsystem within the smaller communities, while at the same time the early socioeconomic studies identified that subsistence production and other sociocultural subsystems are active in the regional centers. For these reasons, and others, there has been a re-emphasis in SESP research. Analysis of the economic and cultural aspects of society have now been united and research efforts are more closely integrated (Dames & Moore et al. 1985:127-128).

Integrated Socioeconomic and Sociocultural Core Studies

Starting in the mid-1980s, the ESP began a series of studies called “socioeconomic and sociocultural descriptions” (Earl R. Combs, Inc. and Langdon 1982, TR71; Research Foundation of State University of New York [RFSUNY] 1984, TR96; Alaska Consultants, Inc., Courtnage and Stephen R. Braund & Associates 1984, TR101; Impact Assessment Inc. 1984, TR103 and 1989a, TR139; Stephen R. Braund & Associates, ResourcEcon, Patrick Burden & Associates, Social Research Institute, and Kirkwood and Associates 1986, TR118; and Cultural Dynamics, Ltd. 1986a, TR121 and 1986b, TR122). This shift apparently reflected MMS’ recognition that the socioeconomics of the small communities were integral to the sociocultural analyses and required a more explicit presence in the scope of work of community baseline descriptions.

Nine studies conducted in the mid-1980s represented the merging of two previously segregated ESP research topics: the socioeconomic systems and the sociocultural systems of a region. The series began when Earl R. Combs, Inc. and Langdon (1982, TR71) prepared the *Alaska Peninsula Socioeconomic and Sociocultural Systems Analysis*. This region’s communities (Pilot Point/Ugashik, Port Heiden, Nelson Lagoon, False Pass, King Cove and Sand Point) all were heavily engaged in commercial fisheries. The title of this study indicates a shift in the ESP. Until this point, the ESP research design segregated socioeconomic and sociocultural baseline analyses, with the former focusing on the larger regional hubs and the latter focusing on primarily rural communities. The earlier sociocultural studies had demonstrated that rural Alaska communities existed and persisted because of natural resource harvesting, at least for subsistence and, in some cases, also for commercial purposes. Combs and Langdon's scope of work included socioeconomic as well as sociocultural systems, reflecting the tight linkage between the two systems. This shift may have been due to the dominance of commercial fisheries in most every aspect of life in these communities, but may also reflect a general shift in direction at the ESP.

The report presented entire chapters on study area salmon fisheries and sub-regional salmon harvests, followed by one long chapter in which Combs researchers described all communities in terms of their economics, subsistence, social and political organization, and sociocultural organization (which subsumed language, ethnic identity, religion, socialization, and values). This report contained no forecast scenarios. The researchers noted that core values included subsistence, fishing as a livelihood, responsibility to kin, and local determination, and that these values had persisted.

A second report in this series, often called the *Nuiqsut Case Study*, is officially cited as the *Ethnographic Study and Monitoring Methodology of Contemporary Economic Growth, Socio-Cultural Change and Community Development in Nuiqsut, Alaska* (RFSUNY 1984, TR96). The stated purpose of the study was to provide a baseline of ethnographic data against which future monitoring studies could measure change. It was, therefore, in large part a research methods development study. A major component of the study, however, described the social history, demography, cash and subsistence economies, sociopolitical structures, health and well-being, values, and suggested a framework for assessing change.

The authors (Galginaitis, Chang, MacQueen, Dekin and Zipkin) explored the issue of monitoring change over time through the observation of indicators of change and suggested a monitoring methodology. They identified five core traditional Iñupiat values: kinship (described as the central organizing principle), egalitarianism (expressed through sharing, conflict avoidance and other behaviors), seniority and respect, Iñupiat identity, and subsistence (ibid., 337). Nuiqsut residents strongly held these values. While the context had changed in recent years, values had persisted (ibid., 364). The impacts of development would depend on the extent to which the development would be consistent with Iñupiat values (ibid., xi). Rapid changes were causing some social stresses (ibid., 365). The researchers noted, “New adaptations are necessary, as the application of traditional Iñupiat solutions will not protect Iñupiat interests in what has become a much wider social and economic context” (ibid., 366). Onshore oil development was the source of much of the community's economic support through oil property tax revenues paid to the North Slope Borough. Nuiqsut residents saw onshore oil development as interfering with subsistence both in terms of the numbers of animals available and access to the animals (ibid.). Chapter Seven contains an extensive treatment of Nuiqsut's experience with petroleum development.

The next socioeconomic and sociocultural study also focused on the North Slope: *Barrow Arch Socioeconomic and Sociocultural Description (*Alaska Consultants, Inc., Courtnage, and Stephen R. Braund & Associates 1984, TR101). Geographically, the Barrow Arch lease area is in the Chukchi Sea; therefore this study included the communities of Barrow, Atqasuk, Wainwright, Point Lay, and Point Hope as well as a regional overview. The stated objective of the report was to:

> …develop an understanding of current conditions and to analyze changes and trends in the socioeconomic and sociocultural structure and organization of the Chukchi Sea communities of the North Slope Borough. This effort is seen to be essential for the later development of forecasts and analyses of potential localized impacts and changes resulting from OCS oil and gas activities in the Barrow Arch lease sale area" (Alaska Consultants, Inc. et al. 1984:iii, TR101).

Researchers organized each community description into the following categories: population, economy (including subsistence), political organization (formal and informal), land use and housing (including subsistence land use), community facilities, and utilities. The regional overview also included sections on transportation, social organization, and values.

A brief section at the end of the report identified areas to focus on in forecasting impacts from OCS development, and data limitations in such an endeavor. The main economic force in this region was the oil and gas industry from which the North Slope Borough derived income that significantly influenced sociocultural and socioeconomic systems at the local and regional levels. With an increase in employment and income, subsistence practices had changed. People had less time to hunt and fish because of jobs, but were attempting to hunt more efficiently with the purchase and use of all-terrain vehicles, faster snowmachines and bigger boats and motors. Subsistence – along with sharing and kinship – remained central Iñupiat values (ibid., 139).

Impact Assessment, Inc. researchers prepared *Sociocultural/Socioeconomic Organization of Bristol Bay: Regional and Subregional Analyses* (Impact Assessment, Inc. 1984, TR103), focusing on an area economically dominated by commercial fisheries. Impact Assessment, Inc. researchers acknowledged subsistence as a major socioeconomic system as well. While focusing primarily on the socioeconomic systems, the researchers organized their findings according to three themes: (1) the importance of non-economic aspects of the social system in understanding economic activities; (2) the interaction between the indigenous and outside socioeconomic/sociocultural systems and how this interaction influences the management of change; and (3) subregional variations in the management of change (Impact Assessment, Inc. 1984:5-6, TR103). The study area included Dillingham and five outlying areas.

Impact Assessment, Inc. researchers observed that the pre-existing sociocultural framework was intact in the present. They characterized the system as a cultural adaptation to a cyclical resource utilization pattern. The core values emerging from that framework also were operational: interdependence between individuals through kinship and reciprocity ties, and interdependence of residents and their environment through patterns of resource use. Increasing social differentiation was reportedly causing some social stresses (substance abuse, crime, political, and ethnic conflict). However, residents were managing change fairly successfully overall, despite some points of conflict that had deleterious effects (ibid., 388).

In *Description of the Socioeconomic and Sociocultural Systems of the Aleutian-Pribilofs Region*, Stephen R. Braund & Associates, ResourcEcon, Patrick Burden & Associates, Social Research Institute, and Kirkwood and Associates (1986, TR118) produced a report that addressed the regional economy along with community specific profiles for Akutan, St. Paul and St. George. For each community, they described demography, the local economy, land use and housing, community facilities and services, and the sociocultural overview, which included social organization, domestic economic structures, and political systems. Each sociocultural section summarized values associated with the above systems. The report also summarized trends and anticipated developments in the local economy. Outside commercial and/or governmental interests that brought or attracted Aleuts to settle as a work force and thus had long associations with outside influences formed the three communities. The researchers characterized the communities as having a strong marine orientation. Fisheries and, on the Pribilofs, fur seal harvests formed the basis of their cash economies. Subsistence also depended primarily on marine resources (but also included birds and terrestrial resources). Among Aleut residents, kinship ties were highly valued (ibid., 3-4).

Two companion studies described the socioeconomic and sociocultural systems of the Kodiak/Shumagin region: *A Sociocultural Description of Small Communities in the Kodiak/Shumagin Region* (Cultural Dynamics, Ltd. 1986a, TR121) and *Description of the Social and Economic Systems of the Kodiak/Shumagin Region* (Cultural Dynamics, Ltd. 1986b, TR122). Cultural Dynamics, Ltd. researchers profiled each of 11 villages on the Kodiak Islands and the southeastern Alaska Peninsula, focusing on the social, political, and economic (including subsistence) organization and values, particularly in relation to

OCS development (Cultural Dynamics, Ltd 1986a, TR121). They observed that in most villages the mixed cash/subsistence economy was well established and that traditional family patterns continued. In the 1980s concerns about competition for resources from sportsmen and tourism replaced earlier concerns about OCS development. Residents generally supported oil and gas development. In *A Description of the Social and Economic Systems of the Kodiak/Shumagin Region*, Cultural Dynamics, Ltd. researchers authored chapter-length analyses of commercial fishing, subsistence, patterns of change in the regional economy, the public sector of the regional economy, outdoor recreation and tourism, infrastructure investment, and sociocultural systems of Kodiak City. They identified the primacy of commercial fishing, tracing it as a source of economic growth followed by economic downturn in Kodiak. As commercial fishing was a longstanding economic cornerstone of the community, residents were accustomed to constant changes in resource abundance. However, social stresses accompanied the downturn of the 1980s. Cultural Dynamics, Ltd. researchers documented that these social stresses, while not definitively caused by the economic problems, were thought by Kodiak professional human service providers to be causally linked (Cultural Dynamics, Ltd. 1986b:iv).

The integrated socioeconomic and sociocultural core studies ended back on the North Slope where it began. In *Barrow: A Decade of Modernization*, otherwise known as the *Barrow Case Study,* Chilkat Institute researchers sought to describe current sociocultural and socioeconomic conditions in Barrow, offer an historical context, and contribute to the understanding of OCS development effects on the socioeconomic and sociocultural systems in Barrow (Chilkat Institute 1986:2, TR125). The researchers analyzed the period of rapid social and economic change from 1975 to 1985, singling out the extended family for particular study in terms of change and persistence. They organized the results of literature and agency research as well as ethnographic field research under the following topics: history, Barrow today, population and migration, and economy (including subsistence, household economic organization, extended family groups, and extended families and the development of social services). Onshore oil development at Prudhoe Bay had funded the North Slope Borough which, in turn, had invested heavily in infrastructure, housing, services and cultural/historical endeavors, greatly expanding the wage economy in the process. The proliferation of new institutions, both within the Borough and outside it, diversified the social and political organization of Barrow. “The Iñupiat demonstrated a remarkable ability to incorporate the innumerable new organizations into their society and to utilize formal institutions to promote their political, social, and economic welfare” (ibid., 372). While observing many demographic, political, economic, and social changes in Barrow, the authors observed that traditional values persisted and continued to influence choices in Barrow. For example, extended family relationships continued to be “centered around the harvest and distribution of Native food” (ibid., 386).

The final integrated sociocultural and socioeconomic core study is the *Point Lay Case Study* (Impact Assessment, Inc. 1989a, TR139). This study was an ethnography of the village, covering history, household demography and population, kinship, social organization, religious organizations, formal institutions and leadership, social control, traditional values, beliefs and ceremonies, sociocultural change, language, socialization, village economics and household income, subsistence, and a comparison of Point Lay with Point Hope. In addition to providing an ethnographic baseline description, this study examined the dynamics of change historically and contemporaneously. The comparison to Point Hope was drawn for the purpose of isolating those conditions in Point Lay that might be generalizable to other communities on the North Slope. The companion volume, *Point Lay Biographies*, contains transcriptions of biographical oral histories of four Point Lay residents (Impact Assessment, Inc. 1989b, TR140). North Slope residents appear to particularly enjoy these biographies, and they incorporated them into the local school curriculum. Impact Assessment, Inc. researchers had intended to draw on the biographies to perform chronological analysis as part of the Point Lay Case Study. However, the oral histories contained too many gaps and inconsistencies to use as data without a level of labor effort that was beyond the constraints of the project. According to Impact Assessment, Inc., due to time and resource constraints, "It became obvious in the process of this project that it was not possible… for the same researcher to combine the collection of life histories with the collection of other information, at least not on the North Slope" (Impact Assessment, Inc. 1989b:v). This finding is noteworthy for the development of effective sociocultural research methods.

Two more studies should be mentioned under our examination of integrated sociocultural and socioeconomic core studies: *Village Economics* (Impact Assessment, Inc. 1988, TR132); and *Hope Basin Socioeconomic Baseline Study* (Waring et al. 1992a and b, TR148). Though economic in name and primary focus, these two studies examined subsistence in depth as part of the economy. Both studies analyzed how the social systems functioned in terms of economic production, both wage and subsistence. The *Hope Basin Socioeconomic Baseline Study*, in particular, described the sociocultural systems extensively, including social and political organization, social problems, institutions and values. This report (volume III) also includes transcriptions of interviews, meetings and the NANA Elders Conference. Chapter Four more fully addresses these reports.

Other Sociocultural Core Studies

In addition to the baseline, impact, and systems analysis types of core studies, MMS also sponsored several sociocultural studies that fall into the core study categories of monitoring, research methods and case studies.

Sociocultural monitoring studies include: *Barrow, A Decade of Modernization* (Chilkat Institute 1986, TR125); *Kotzebue Sociocultural Monitoring Study* (Kevin Waring Associates, McNabb, Busch, Wasserman, and Burch 1988, TR130); and *Nome Sociocultural Monitoring Study* (Kevin Waring Associates, McNabb, Fischer, Wasserman, Smythe and Robbins 1989, TR131). A particular subset of monitoring studies were the series of institutional monitoring studies. The series began with the Chilkat Institute's *Monitoring Methodology and North Slope Institutional Change: 1979-1983* (1985, TR 117) and Impact Assessment, Inc. conducted the remainder of the studies in this series (Impact Assessment, Inc. 1985, TR126; 1987, TR127; 1987a, TR128; 1990, TR141; 1990, TR 142).

MMS research method studies included the sociocultural study, *Historic Indicators of Alaska Native Cultural Change* (Cultural Dynamics, Ltd. 1978, TR15). The above mentioned *Monitoring Methodology and North Slope Institutional Change* (Chilkat Institute 1985, TR117) is a research methods study in that the Chilkat Institute set out to define a method of monitoring institutional change. We discuss this study, and subsequent methodological shifts in institutional monitoring, within our treatment of monitoring studies. Similarly, the social indicators studies began as research methods studies in the early 1980s and matured to field research studies in the 1990s (Louis Berger & Associates 1983, TR77; Stephen R. Braund & Associates, ISER, and University of Michigan 1985, TR116; Human Relations Area Files, Inc. 1992a, TR151; 1992b, TR152; 1993a, TR153; 1993b TR155; 1994a, TR154; 1994b, TR156; 1995, TR157). The category of ESP Case Studies included an early sociocultural work, *Case Study of Copper Center*, *Alaska* (Reckord 1979, TR7).

Thematic Sociocultural Studies

After more than a decade of sociocultural core studies, MMS began to shift the focus of the sociocultural component of the ESP to thematically organized research initiatives. Having started the program with little existing research, the ESP built, virtually from scratch, an extensive body of information on the sociocultural characteristics of communities in the coastal and insular areas of the Alaska OCS region, as described in the previous sections of this chapter. With this foundation of baseline data, those at MMS who prepared EIS documents and steered the research direction of the ESP shifted their research priorities to answer more specific questions. For example, what would happen to a small fishing community on the

Alaska Peninsula if some kind of disaster interfered with residents' ability to harvest for a significant period of time? Or, how can researchers measure changes in the well-being of coastal communities and how can they distinguish change caused by OCS activity from other sources of change? Given consistent references to significant traditional and contemporary reliance on subsistence harvests and uses of wildlife and marine resources, can researchers quantify this dependence? To address these and other questions, MMS initiated four research themes: social indicators studies, institutional monitoring studies, traditional knowledge studies, and subsistence studies. The subsistence theme included four sub-themes: subsistence-based economies studies, subsistence harvest disruption studies, subsistence harvest studies, and bowhead whaling studies

Social Indicators

Louis Berger & Associates researchers reported the initial phase of ESP social indicators research methods development in a three-volume technical report (Louis Berger & Associates 1983, TR77). The concept underpinning this methods development initiative was to use primary ethnographic baseline research and a compilation of secondary data sources to identify a meaningful set of indicators that could measure community well-being over time with particular regard to OCS impacts. Berger & Associates researchers focused on the NANA region (Kotzebue/Northwest Alaska) and the Aleutians-Pribilof Islands region. They conducted field interviews that consisted of focused discussions following an interview protocol. Researchers developed quantitative measures from the semi-structured interviews.

In a second social indicators research methods development study, *A Social Indicators System for OCS Impact Monitoring,* researchers from Stephen R. Braund & Associates, ISER, and the University of Michigan's Institute for Social Research took a different approach (Stephen R. Braund & Associates, ISER, and University of Michigan 1985, TR116). They developed a hierarchical system of social goals building on previous international quality of life research and modified through ethnographic fieldwork conducted during the study. At the top level, the researchers identified four "goal families": Continued Existence of Traditional Culture; Individuals and Families That Are Able to Function Well in Society; Command Over Goods and Services; and, Social Opportunities and Participation. Two additional levels identified more specific goals. For example, under the first goal family, they identified three goals: continued harvest of renewable resources, continued traditional social relationships, and continued cultural supports. Within the goal of continued social supports, they identified the sub-goals: Continued Use of Native Language; Continued Oral History Tradition; Continued Transfer of Traditional Skills; Continued Production of Traditional Arts and Crafts. The researchers then developed operational measures of the most detailed level of social goals. Wherever possible, they based measures on existing data series meeting their criteria for measuring change over time. Such data were extremely limited, however. The researchers therefore added a system for generating social indicators that utilized a structured sample survey. With the exception of the jointly funded subsistence harvest survey described earlier in this chapter, the ESP had expressly excluded survey research in its requests for proposals prior to the development of the social indicators system. MMS did not want to constrain its research schedule to meet the requirement that the federal Office of Management and Budget approve surveys conducted, or contracted, by the federal government. MMS was concerned that delays in the approval process could bog down the productivity of the ESP and jeopardize the lease sale schedule (Stephen R. Braund & Associates et al. 1985:10, TR116). The idea in the social indicator study was to get one-time Office of Management and Budget approval for the final monitoring instrument, paving the way for researchers to use the instrument in an ongoing manner to monitor OCS impacts on well-being. The researchers collaborated with ESP staff to obtain successfully Office of Management and Budget approval in 1985 of the Alaska OCS Social Indicators System (AOSIS).

The MMS awarded a contract to implement AOSIS to the Human Relations Area Files, Inc. This study team applied the AOSIS instrument along with key informant protocols in 30 Alaska communities (Human Relations Area Files, Inc. 1992a, TR151; 1992b, TR152; 1993a, TR153; 1993b TR155; 1994a, TR154; 1994b, TR156; 1995, TR157). The researchers conducted pretest interviews in 1987 and 1988. Then EVOS occurred in March of 1989. Human Relations Area Files, Inc. incorporated the oil spill into their research design by altering the key informant protocol and the structure of the communities sampled, among other modifications. They administered the AOSIS questionnaire to two samples of respondents in a pretest, two re-surveys, and a post-test (Human Relations Area Files, Inc. 1993a). The researchers dropped a number of AOSIS variables, leaving a subset of the original AOSIS indicators in the survey instrument for future applications.

One of the findings from the social indicators study was that “Native subsistence economies remain quintessentially subsistence economies in their organizations of productions: ownership, control, labor, distribution, consumption. They are directly linked to procuring food and shelter for the maintenance of life itself. It is the social fabric in which the subsistence economy is embedded that is crucial within and among communities” (Jorgensen 1996a:13). Being Native or non-Native was found to be a strong predictor of whether a household participated in traditional subsistence activities, with subsistence strongly and positively correlated with being Native (ibid., 16). Researchers also found significant differences between Natives and non-Natives in terms of their relationship to the natural environment, with Natives having long-term, ancestral ties to local places and to the continuing reliance upon the resources for subsistence (ibid., 25). Many traditions that characterized their forebears persisted among modern Natives in the study (e.g., marine mammal hunting, sharing and visiting), although the traditional activities may have been modified somewhat by modern technology. Jorgensen noted that, “Traveling to work at the post office astride a snowmachine, then, shouldn’t fool us into thinking that Alaska Native Claims Settlement Act… and oil have transformed Native societies to a variant of Western society” (ibid., 20).

According to one of the social indicators senior field researchers, Joanna Endter-Wada, land and natural resource issues “drive what happens” in the study areas (Endter-Wada, Robbins, Levine, Boxberger, Nohalty, Jorgensen, and McNabb 1992b:24, TR150). People expressed concern about issues of ownership, control, and access to resources with regard to their future ability to conduct subsistence activities. Residents observed increased competition over natural resources and frustration in dealing with external influences such as state and federal government, the private sector, and sports and recreational interests (ibid., 26). Researchers characterized these conflicts as “culture clash” rooted in different values with regard to the natural resources. Rural Alaskans, especially Natives, experienced a sense of powerlessness in these matters (ibid.).

In discussing the usefulness of the social indicators study, Endter-Wada contended that the study results have a longer “shelf life” in terms of utility to agency policy development than many social research studies. She stated,

> The project is significant in terms of identifying indicators that can be used to monitor change over time throughout a large portion of Alaska…. In addition, the project provides valuable documentation of conditions and trends obtained over a four-year period of time through repeated visits to study communities and through reliance on multiple sources of data. Such documentation is important for ongoing and future assessments of the stability and change that will occur over even longer periods of time…. The Social Indicators Project is one of the best examples of the sophistication that can be achieved in social science research and of its usefulness for monitoring change over time (ibid., 29).

Picou, Formichella, and Arata discuss the products of Human Relations Area Files, Inc. social indicators research as it applies to EVOS in Chapter Nine. Jorgensen discusses a synthesis of key findings from the Social Indicators Monitoring Studies in Chapter Ten.

Institutional Monitoring

In the mid-1980s, the ESP initiated another line of research which focused on monitoring indicators within institutions. At least as perceived by Impact Assessment, Inc. researchers, the institutional monitoring studies were expected to be a more effective tool to measure change and attribute causality than any of the three previously initiated approaches: core study baselines and impacts; social indicators; or harvest disruption studies. The idea was that the institutional monitoring studies could produce observations of change on an ongoing basis with the ability to discern OCS-related community change from non-OCS change (Impact Assessment, Inc. 1987:3)[41].

As Impact Assessment, Inc. researchers explained:

> The baseline studies… lacked the detail and analytical precision useful for assessing social change. Moreover, they lacked the precision necessary to assign causality to OCS or any other external factor suspected of generating change. The MMS, in response, began a series of ethnographic studies which sought to provide the necessary level of detail… These studies pointed out that changes in rural Alaskan villages were occurring at an unprecedented rate… These changes were the result of a vast number of social forces which were, in most cases, unrelated to the MMS OCS leasing program… [e.g., tourism, education, regional center growth, in-migration from villages seeking employment] (Impact Assessment, Inc. 1987:1-2, TR127).

Impact Assessment, Inc. researchers continued:

> In response to the limitations of the "baseline/update" approach, MMS also began a series of studies which focused on "social indicators"… in an attempt to correlate these social changes with OCS development. To date, this series of studies has not successfully assigned causality for these changes. However, in earlier phases, these studies did demonstrate the extreme range of adaptive responses to change among rural Alaskan villages… (Impact Assessment, Inc. 1987:1-2, TR127).

Impact Assessment, Inc. researchers discounted the harvest disruption studies as well, reasoning that the chances of the disruption event affecting a particular village were slim and the impacts not generalizable (Impact Assessment, Inc. 1987, TR127).

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[41] The MMS launched the institutional monitoring studies around the same time as the Social Indicators AOSIS survey was about to be implemented, also under the ESP. This chronology, with the research history summarized by Impact Assessment, Inc. above, raises the question: had MMS staff intellectually abandoned the social indicators approach to obtaining the information they needed, even while continuing forward with it, and shifted its intellectual commitment to institutional monitoring methodologies?

By this time (the mid-1980s), the MMS apparently had determined that OCS activity was most likely to be concentrated in the Bering Sea, Chukchi Sea, and Beaufort Sea regions, potentially affecting communities in the Aleutians, Pribilof Islands, the Nome area and the North Slope. MMS opted to begin the institutional monitoring effort on the North Slope because it would be "the most institutionally complex OCS region" (Impact Assessment, Inc. 1985:3, TR126), and selected Chilkat Institute to lead the methods development phase of the Monitoring Project, as they called it. As reported in *Monitoring Methodology and North Slope Institutional Change*, Chilkat Institute researchers developed a standardized approach for monitoring sociocultural change in institutions of the North Slope (Chilkat Institute 1985, TR 117). They identified five areas for institutional monitoring: population, political control, wage employment/business development, housing, and land. Within each area, they identified several institutions for monitoring over time. They focused on "cultural processes in terms of institutional behavior" and defined institutional behavior as "any patterned, regularized behavior. Patterned behavior refers not just to the units defined by a specific institution or organization, such as a corporation or a church, but also includes the recurring behavior marking cultural institutions like sharing, showing respect, and socializing the young" (ibid., 4). The researchers also identified seven cultural domains deemed, "significant in the development and change of the social, cultural, economic and political institutions within the North Slope region" (ibid., ix). These domains were: the whaling complex; family; leadership; other cultural institutions; land and sea; economic development; and social differentiation. For example, researchers could monitor social differentiation on two planes: growth and differentiation of the population; and incidence of social and economic differentiation within the Iñupiat population in terms of age and sex. Measures of these indicators would include, for example, population distribution data by age, sex, and ethnicity (ibid., 493). The monitoring methodology was "designed to assess the interrelationships of the seven domains within the institutions" (ibid.). These cultural domains were specific to the region and would need to be adapted for the Aleutian-Pribilof and for the Bering Sea region. The researchers made specific suggestions as to how these cultural domains might be adapted, but how they expected to operationalize the cultural domains was not clear. Concerned that five years was too long a monitoring period given all the change going on, Chilkat Institute researchers recommended reducing the monitoring period to three years.

Impact Assessment, Inc. took the lead in Phase II of the Monitoring Project. Impact Assessment, Inc. applied the Phase I monitoring methodology in Nuiqsut as a test of the methodology, revised the approach and applied the revised methodology in the Aleutian-Pribilof Islands region. In the process of revising the method, Impact Assessment, Inc. added sociocultural institutions (e.g., kinship, religion), health and education to the institutional monitoring categories already developed by Chilkat Institute's researchers (population, land, political control, and economy) and eliminated Chilkat Institute's housing category (Impact Assessment, Inc. 1985, TR126; 1987a, TR128). These revised monitoring categories are reminiscent of the early sociocultural system/impact categories. Technical Report No. 126 (Impact Assessment, Inc. 1985) contains the workshop proceedings documenting and discussing Impact Assessment's Nuiqsut field test of their institutional monitoring methodology and anticipating their application of the subsequently revised methodology in the Aleutian-Pribilof region. Technical Report No. 128 reported findings from the institutional monitoring effort in the Aleutian-Pribilof region (Impact Assessment, Inc. 1987a).

Impact Assessment, Inc. designed the institutional monitoring methodologies so that researchers could implement them retroactively. The researchers gathered the secondary data for the five year period of study and conducted fieldwork (using interview protocols) to provide ethnographic data. Impact Assessment, Inc. researchers described their approach in three stages: (1) describe the institutions as they were at the beginning of the monitoring period; (2) identify changes in these institutions over the study period (from secondary sources and field interviews); and (3) explain the changes (specifically, in terms of interactions of the sociocultural system and its environment) (Impact Assessment, Inc. 1987a). Impact Assessment, Inc. identified several processes of change, which occur as a society becomes more complex: linearization, centralization, formalization, promotion, social stratification, and social differentiation (Impact Assessment, Inc. 1985:119). In comparing the four communities in the Aleutian-Pribilof region, the researchers noted that two variables strongly influenced the rate and direction of change in each community: differences in sociocultural systems and differences in the environment.

Following the Aleutian-Pribilof application, Impact Assessment, Inc. went on to apply their methodology for monitoring sociocultural change in institutions in: Nome (1987, TR 127); the Chukchi Sea communities of Atqasuk, Barrow, Point Hope, Point Lay, Wainwright, and the North Slope Borough Region (1990, TR141); and the Beaufort Sea communities of Anaktuvuk Pass, Atqasuk, Barrow, Kaktovik, Nuiqsut, and the North Slope Borough region overall (1990, TR 142).

Subsistence-based Economies

In 1981, Robert Wolfe prepared the *Norton Sound/Yukon Delta Sociocultural Systems Baseline Analysis* for both the Alaska Department of Fish and Game and the MMS (Wolfe 1981, TR72). The approach Wolfe used departed methodologically from other sociocultural studies described thus far. Rather than using the typical organizational framework for describing and analyzing the sociocultural systems in the above studies (i.e., using the impact category or systems approach), Wolfe approached his sociocultural baseline entirely through the lens of resource harvesting, which was typically regarded as an economic activity. In addition to ethnographic interviews to gather qualitative information, he sampled an average of 20 percent of households in the six communities in the study region, asking household respondents to provide detailed harvest records that quantified their resource use. According to Wolfe (personal communication 2001), the teaming up of the Alaska Department of Fish and Game and MMS for this study was an effort to measure systematically baseline conditions for a number of subsistence-related variables (such as productivity, household participation rates). Thus, in the event of a re-study of the same community, quantitative measures could be compared for change over time. Prior to this study, there was little quantitative, reliable data on subsistence variables in the literature. MMS and Alaska Department of Fish and Game could both benefit from the information, and they jointly funded the Yukon Delta study in order to pilot test the methodology and to gather information directly related to a possible Norton Sound Oil Lease Sale. Under the collaborative study arrangement, the Alaska Department of Fish and Game funded the harvest survey questions while MMS funded the key respondent interview data. The methods used in this study for collecting harvest data became the standard approach employed at Alaska Department of Fish and Game throughout the 1980s to the present. Follow-up studies for diachronic analysis have been an element of the long term Alaska Department of Fish and Game research program, particularly following EVOS (Fall 1990).

Wolfe’s theoretical assumption, that one can address the sociocultural environment by focusing on commercial and subsistence harvests, production units, food sharing and cultural concepts of resource utilization, was unique within the ESP to date. Implicit in this approach was the primacy of natural resource harvesting (a mixed economy in which cash and subsistence are profoundly interdependent), and the formative influence that these essential activities had on the sociocultural organization of the study communities. Wolfe adhered to this theoretical assumption to the degree that he discussed little outside the context of resource harvests. In his findings, Wolfe stated that “the people of the Yukon delta comprised a strong and growing cultural group because of their success in utilizing local resources of the land, rivers and sea” and that most production occurred within kinship groups (Wolfe 1981:11, TR72).

Three years later, Wolfe led a team of researchers in the study *Subsistence Based Economies* (Wolfe, Gross, Langdon, Wright, Sherrod, Ellanna, Sumida, and Usher 1984, TR95). As in the case of the *Norton Sound/Yukon Delta Sociocultural Systems Baseline Analysis,* Alaska Department of Fish and Game and the MMS jointly sponsored this project. The central focus of this study was the relationship between money and subsistence and, more specifically, the effects of increased monetization of village economies.

A common notion among government officials was that jobs and money would transform local economies away from "traditional" subsistence activities and toward "modern" economic activities (Wolfe, personal communication 2001). The study compared four southwest Alaska communities with differing levels of involvement in the cash sector, analyzing how cash and subsistence interacted and how this interaction was associated with continuity and change. The study concluded that increased involvement in the cash economy did not necessarily reduce involvement in the subsistence economy. In fact, people used money in ways that supported traditional subsistence (Wolfe et al. 1984:561), and there was some indication "that higher levels of cash income are often associated with higher levels of subsistence production and exchange" (ibid., 496). Subsistence harvesters reinvested cash in technologies to more efficiently harvest wild foods (e.g., fishing nets, motorized boats, and snowmachines). While potential OCS development effects were not formally part of the analysis, such potential effects were relevant to the assessment of impacts of potential jobs and incomes in rural communities brought by OCS development. The researchers concluded that the main threat to the local balance between cash and subsistence (at least in the study area) was likely to be the loss of control over access to resources through external regulatory structures such as ANCSA and limited entry commercial fisheries. Increased competition for resources from outsiders and stratification of the essentially unstratified village systems were also possible threats to the economic balance in rural communities.

Subsistence Harvest Studies

In the mid-1980s, the MMS called for research proposals to collect subsistence harvest data for North Slope communities as a baseline for evaluating the possible impacts of OCS activity. The *Norton Sound/Yukon Delta Sociocultural Systems Baseline* study conducted by Wolfe for the MMS and Alaska Department of Fish and Game (1981, TR72) was a forerunner of the *North Slope Subsistence Study*. Wolfe's study used a sample of households to estimate community subsistence harvests as well as measures of harvest distribution and participation in subsistence activities. Stephen R. Braund & Associates and ISER designed and implemented the *North Slope Subsistence Study*, collecting detailed harvest quantities and locations for three years (1987, 1988, and 1989) in Barrow (1988, TR133; 1989a, TR135; and 1993a, TR149) and two years (1988 and 1989) in Wainwright (1989b, TR136; and 1993b, TR147). The study employed a sample stratified by levels of harvest activity in Barrow and a census of households in Wainwright. The *North Slope Subsistence Study* was unique in Alaska subsistence research in four ways: (1) collection of harvest data for more than one year (three years in Barrow and two years in Wainwright); (2) household respondents reported harvest activities throughout the year, rather than reporting a year's harvest activities at the end of a reporting year; (3) mapping of harvest sites; and, (4) use of a full-time researcher on location and locally hired research assistants. In addition to documenting subsistence harvests and locations, the *North Slope Subsistence Study* documented the historical context, land use patterns, and the seasonal round of subsistence activities. Accompanying the harvest data were ethnographic descriptions of how households conducted, used, and distributed the harvests, as well as descriptions of the cultural significance of the products and the activities.

The *North Slope Subsistence Study* focused on subsistence harvest sites with little documentation of the areas used, traveled, or hunted. The sampling methodology allowed researchers to generalize harvest amounts to the entire community, but researchers could not reliably generalize harvest locations given the sample size. Since hunters in different households tend to use different hunting areas it was possible that non-sampled hunters used some harvest areas not captured in the reports of sampled hunters. Thus, the North Slope Borough funded Stephen R. Braund & Associates to conduct a key informant mapping project in Barrow and Wainwright. Researchers interviewed Barrow residents who were not in the original sample to increase geographic coverage. These interviews focused on areas where residents hunted and traveled and not simply harvest sites. Stephen R. Braund & Associates researchers collected the data and began preliminary analysis. Braund and his colleagues did not complete this project due to lack of Borough funding after data collection, but the approach has been revived in the MMS sponsored GIS (Geographic Information System) Mapping Study (Stephen R. Braund & Associates, North Slope Borough Department of Wildlife Management, ESRI-Northwest, Encompass Data & Mapping, Kruse, and Johnson, forthcoming).

A special category of subsistence harvest studies are those contributing to an assessment of the effects of the March 1989 EVOS. Ocean transport of the oil posed a severe threat to subsistence to communities in the Prince William Sound, Lower Cook Inlet, Kodiak Island, and Alaska Peninsula regions. Unfortunately, there had been no MMS-sponsored subsistence harvest baseline studies that researchers could use to measure the effects of the spill on subsistence. At the time MMS conceived of a series of subsistence harvest studies, the agency understandably focused on coastal regions thought to be the most likely to experience OCS development: the Bering, Chukchi, and Beaufort sea regions. There was, however, an alternative set of baseline studies. As mentioned in the review of research concurrent with the ESP, the Alaska Department of Fish and Game initiated its own program of subsistence harvest research in 1978. By the start of 1989, the Alaska Department of Fish and Game Subsistence Division had published 169 technical papers. Included in this published research were subsistence harvest studies in 15 Alaska Native communities in the Prince William Sound, Lower Cook Inlet, Kodiak Island, and Alaska Peninsula regions.

Following EVOS, the MMS funded subsistence harvest data collection in a cooperative effort with the Alaska Department of Fish and Game to conduct a three-year study of the long-term social and cultural consequences of EVOS that was published in six volumes under the common title, *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska* (Fall and Utermohle, editors 1995, TR160, volumes 1-6). The title of this report series reflects the rationale that MMS believed that an examination of the effects of EVOS would inform assessments of the potential effects of outer continental shelf petroleum development. At the same time, it is important to keep in mind that the *Exxon Valdez* was transporting oil produced onshore and that the spill was of a magnitude beyond any scenario considered by MMS. The study analyzed impacts from EVOS, using two instruments: a harvest survey questionnaire and a social effects questionnaire. The social effects questionnaire was a follow-up of the social indicators surveys and included questions about visiting patterns, sharing of subsistence foods, concerns about contamination, participation in traditional activities, elders, leadership, and significance of place, to name a few of the topics covered. The Alaska Department of Fish and Game also compared pre- and post-spill research data. These data were reports of all harvests for the past year made during a single year-end interview. While some of the spill-affected communities' harvests had rebounded to pre-spill levels, other communities continued to harvest lower amounts of subsistence foods. Reasons included concerns about contamination, reduced animal populations, and concerns about the health of the ecosystem (Alaska Department of Fish and Game 1995a:iv-v). (See also Chapter Eight.)

Fall, Miraglia, Simeone, Utermohle, and Wolfe of the Alaska Department of Fish and Game prepared *Long-Term Consequences of the Exxon Valdez Oil Spill of Coastal Communities of Southcentral Alaska* (2001, TR163) with the objective of analyzing and integrating time-series subsistence, economic and sociocultural data from previous Alaska Department of Fish and Game/MMS cooperative studies, and communicating results to local communities and organizations. In addition to several other significant components (discussed more fully in Chapter Eight), this report summarized data on subsistence activities over time, analyzing subsistence effects from the oil spill on different types of households. The Alaska Department of Fish and Game reports are discussed in more detail in Chapters Six (Wolfe), Seven (Pedersen, Kruse and Braund) and Eight (Fall).

In the 1980s and 1990s, researchers conducted only one MMS-sponsored subsistence harvest study in an area other than the North Slope and the *Exxon Valdez* spill-affected communities. Social Science Research Associates researched and wrote the *Bristol Bay Subsistence Harvest and Sociocultural Systems Inventory* (Endter-Wada, Robbins, Levine, Boxberger, Nohalty, Jorgensen, and McNabb 1992b, TR150). The purpose of this study was to describe and analyze the harvests and uses of wild resources in the

Bristol Bay region. The researchers incorporated a broad and detailed ethnographic and historical narrative with a statistical analysis of subsistence resource harvest and sharing within and between the communities of Bristol Bay. Social Science Research Associates researchers analyzed eight years of Alaska Department of Fish and Game Division of Subsistence harvest data as well as their own data collected in seven communities in 1990.

Using multivariate statistical techniques including cluster analysis, Fourier plots, and Guttman-Lingoes multidimensional similarity structure analysis, the researchers compared two main variables: the percentage of households harvesting a given resource, and the average pounds per household harvested. Going beyond the analyses available using Alaska Department of Fish and Game, Division of Subsistence data, Social Science Research Associates collected information on the ethnicity of resource harvesters for comparison within the sampled community residents. The researchers also collected data regarding social networks within and between communities for sharing and exchanging harvests and labor. Social Science Research Associates analyzed these social networks' relationship to kinship and geography in order to better organize subregions within the Bristol Bay region based on quantified measures of closeness. Social Science Research Associates' analysis showed that subsistence resource gathering involved the most cooperation and exchange of harvested products, while commercial fishing involved the least. However, the researchers found a positive relationship between commercial fishing and involvement in subsistence, indicating the two activities are integrated. It is a common practice of commercial fishers, for example, to remove part of the catch as subsistence take, and often commercial boats and equipment are also used for subsistence harvests. Social Science Research Associates also demonstrated the continued importance of subsistence to Native people connected by social and kin networks over a wide geographic distance, with cash income supporting further subsistence activity and not the replacement of subsistence resources with commercial foods.

In 2001, the MMS funded a subsistence harvest mapping study to develop a new GIS methodology that will describe contemporary subsistence patterns in Barrow, Nuiqsut, and Kaktovik for selected resources (Stephen R. Braund & Associates, North Slope Borough Department of Wildlife Management, ESRI-Northwest, Encompass Data & Mapping, Kruse, and Johnson, forthcoming). The project will collect new data for use in the GIS and will enable researchers to use existing and future data for time series analysis within the new GIS system. The mapping variables or attributes include: hunting/fishing area and range; hunting/fishing camp location; travel routes; preferred hunting/fishing destination; travel method (e.g., boat/snowmachine); number of participants; gear used; duration of hunt; harvest locations; harvest amount information by resource; and normal months of activity (key seasons). By gathering data for “most recent seasons” and “most recent hunt”, researchers will be able to assess geo-spatial changes in subsistence use patterns over time (as future data are collected). This project represents a comprehensive and integrative mapping of subsistence on the North Slope. The North Slope Borough is a study team participant in this project.

Harvest Disruption Effects Analyses

The early sociocultural baseline studies produced a substantial amount of research that drew attention to the importance of subsistence and commercial harvesting of resources in rural Alaska. What would happen in these communities if the residents experienced a disruption to these harvests? In the early 1980s, the MMS funded four studies to analyze the impacts on local communities of a hypothetical harvest disruption[42]. The ESP harvest disruption study areas were St. Lawrence Island (the communities of Gambell and Savoonga), Norton Sound (Unalakleet), Chukchi Sea (Wainwright), and the Aleutians (King Cove). Researchers with the John Muir Institute conducted the studies of Gambell (Little and Robbins 1984, TR89), Unalakleet (Jorgensen 1984, TR90) and Wainwright (Luton 1985, TR91). Stephen R. Braund & Associates and LZH Associates conducted the King Cove study (1986, TR123). The scope of work for this series of studies called for an ethnographic baseline of each community followed by an analysis of the impacts of various harvest disruption scenarios. Thus, these studies were analogous to the earlier OCS development scenario studies with a key difference. The earlier studies considered a broad range of impacts arising from routine OCS development activities (i.e., not from major oil spills). These new studies analyzed impacts of disruptions of renewable resource harvests, regardless of the cause of the disruption (e.g., weather, tanker traffic, or an oil spill). That MMS funded this cluster of studies is significant as an acknowledgement by the federal government that resource harvesting is central to the culture of coastal communities in the OCS regions.

Given the resource harvest focus of these studies, the baseline descriptions devoted considerable detail to the subsistence and commercial uses of local resources. Typically, the studies examined the seasonal round of harvests, species harvested and their uses, the social organization of wild food harvesting, production and distribution, and the cultural significance of the land and water. All four of the studies

[42] During the same time period, Fienup-Riordan (1983) conducted a fifth harvest disruption study in the Yukon Delta. Although MMS originally proposed this study, the agency decided not to fund it because of recent socioeconomic studies in the area (e.g., Fienup-Riordan 1982, TR70). The Alaska Council on Science and Technology funded this study.

emphasized the importance of subsistence uses of renewable resources as food and as key factors in community social organization and values. In addition, these studies described (variously) the cash economy, political organization, social organization, and belief systems. The studies predicted that events that disrupt residents' ability to harvest preferred resources would, depending on the disruption severity and duration, have multiple effects on the community (e.g., lower harvests, fewer preferred resources harvested, and additional time, money, and effort required to harvest resources due to lowered efficiencies, increased food transfers from other communities, and increased federal transfers). Only one of the studies (Luton 1985 TR91) predicted contamination concerns related to an oil spill and none of the studies anticipated an event as large as the 1989 EVOS (that was not related to offshore development). The harvest disruption studies are discussed further in Chapter Eight, *Long-Term Consequences of the Exxon Valdez Spill for Subsistence Uses of Fish*.

Bowhead Whaling Studies

As discussed earlier in the chapter, subsistence is the crucial nexus between OCS development and Native culture. No single subsistence activity better illustrates this nexus than bowhead whaling. After 25 years of OCS leasing, in 2001 BPXA's Northstar facility represented the first oil production from an offshore platform. The fact that the platform is in bowhead habitat may present the ESP with a true test of the research program's relevance and effectiveness. To provide some context for understanding the ESP's bowhead whaling-related work, past and current, the following briefly describes the history of whaling and oil development.

The Eskimos have hunted bowhead whales for food for at least two millennia in the Bering Strait region and for more than a thousand years in northern Alaska (Bockstoce 1977, 1976). The Eskimos of northern Alaska shared a presumably stable ecosystem with the bowhead whales until 1848 when European whalers discovered the rich bowhead whaling grounds north of the Bering Strait (Marquette and Bockstoce 1980). From that time until approximately 1914, Yankee whalers hunted the animals for their oil and baleen. The oil, rendered from whale blubber at sea and stored in wooden casks, was used for illumination and lubrication. The fashion industry used the baleen as corset stays and to buoy out full skirts (Bockstoce 1986). During the 66 year period, commercial whalers harvested over 19,000 bowhead whales from the Bering, Chukchi, and Beaufort seas (Bockstoce 1978, 1980), depleting the Western Arctic bowhead population to near extinction levels.

The high prices paid for whale oil and later baleen provided huge profits to the adventurous captains from San Francisco and New Bedford and, by 1852, more than 200 whaleships operated in the vicinity of

Bering Strait (Bockstoce 1977). Between 1848 and 1914, more than 2,700 whaleships had passed through the Bering Strait (Bockstoce and Botkin 1983). One medium-sized bowhead yielded 100 barrels (31-1/2 U.S. gallons per barrel or 3,150 gallons per bowhead) plus 1,500 pounds of baleen (Bockstoce and Botkin 1983). Thus, the 19,000 bowheads killed by commercial whalers supplied approximately 60 million gallons[43] of oil to the "lower 48" states between 1848 and 1914. Bowhead whales harvested in the nearshore and offshore areas of the Bering, Chukchi, and Beaufort seas were once important sources of oil for the "lower 48."

In the early twentieth century, just as the bowhead became a scarce resource, subsurface petroleum was discovered in the U.S., replacing the bowhead as a source of oil. Then, as commercial exploitation depleted this oil resource, onshore petroleum development filled the gap in supply. Spring steel replaced baleen (in the fashion industry) and Yankee whalers abandoned Arctic waters, leaving the Eskimos to continue harvesting a now-scarce food resource. The decades of the 1920s through 1960s were characterized by poverty and illness among Eskimo populations, by limited commercial activity (e.g., fur trapping), and by the settlement of the Iñupiat semi-nomadic peoples into permanent communities. Nevertheless, coastal Eskimos continued to organize their lives around the traditional subsistence seasonal round and harvest natural resources to eat.

The 1970s were also significant years in the histories of both bowhead whaling and oil development. By that time, bowhead population numbers had significantly recovered from the effects of unconstrained Yankee whaling. Native communities were simultaneously recovering from poverty and illness. Native communities entered an era of cultural revitalization, forming cultural and political organizations to support the perpetuation of traditional ways in a time of much pressure to "modernize" and abandon the old ways. The Iñupiat of the North Slope formed the North Slope Borough in 1972 and taxed the onshore oil infrastructure associated with Prudhoe Bay oil (discovered in 1969). The construction and development of onshore oil facilities at Prudhoe Bay supplied new wealth to the Borough and its residents.

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[43] By comparison, the M/V *Exxon Valdez* spilled about 11 million gallons of North Slope crude oil into Prince William sound when it hit Bligh Reef on 24 March 1989 and the Trans-Alaska Pipeline System transports over 42 million gallons of oil daily in 2004, about one-half of its peak in the late 1980s.

With the return of the bowhead whale and a renewed commitment to their Native traditions (of which bowhead whaling was most highly valued), Eskimo whaling communities pursued bowhead whales at higher levels. The number of whaling crews proliferated as did the number of whales landed and the number of whales struck and lost. The International Whaling Commission, concerned about the population status of the bowhead under these increased harvest levels, imposed a moratorium in 1977 on Alaska Eskimo bowhead whaling. The whalers protested. Thus began the process by which the Eskimo whale hunting communities organized themselves to protect their tradition of bowhead whaling, forming the Alaska Eskimo Whaling Commission. The Alaska Eskimo Whaling Commission initiated a bowhead census through the North Slope Borough Department of Wildlife Management, and convinced the U.S. government to support Eskimo whale hunting. The International Whaling Commission ultimately granted Alaska Eskimo whalers a limited harvest quota for the 1978 season. The basis for changes in the quota was, and continues to be, ongoing assessments of the bowhead population status coupled with an assessment of the Alaska Eskimos' cultural and subsistence need for bowhead whales (including the number of strikes and landed bowheads) (Braund 1992; Braund, Stoker and Kruse 1988).

Meanwhile, the U.S. underwent the national energy crisis of the early 1970s. The U.S. was highly dependent on the Middle East for oil, and oil embargoes in the early 1970s resulted in domestic shortages. In an effort to increase domestic supply, the federal government looked to its offshore waters and launched the OCS leasing program. As described in Chapter One, the federal government initiated the ESP nationally in 1973 and initiated the social component of the ESP in Alaska in 1975. The purpose of the social component of the ESP is to advance our understanding of potential impacts to local coastal communities from OCS development and to mitigate these impacts. The first offshore lease in Alaska was in 1976, and the first Beaufort Sea OCS lease was in 1979. In 2001, after 26 years of research consistently noting the primacy of subsistence to social and cultural health (epitomized by bowhead whaling in northern coastal regions), the first oil flowed out of the OCS on October 31. The location of this first productive well is the Northstar site, located offshore about 12 miles northwest of Prudhoe Bay in the Beaufort Sea[44] – in and near waters that bowhead whales migrate through in the spring and fall. As the synthesis throughout this chapter illustrates, research conducted under the ESP has gradually honed the

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[44] The Northstar pipeline, connecting the offshore man-made island to the Trans-Alaska Pipeline, is the first buried subsea pipeline in the Arctic used for full-time production. The pipeline is buried 7-11 feet below the seafloor to avoid ice impacts. The Northstar project includes three federal and five state leases.

focus of the social component of the ESP to the relationship between subsistence hunting in traditional communities and OCS development. Thus, both oil and the subsistence hunt of the bowhead whale are again, 150 years later, at the center of our attention. As OCS oil production has converged with subsistence whaling, the MMS has responded with ESP studies specifically focused on bowhead whaling.

Of all subsistence resources in this area, the bowhead whale is arguably the most significant for several reasons. First, the bowhead whale provides the most subsistence food in most whaling communities (Stephen R. Braund & Associates and ISER 1993a and b; Braund and Moorehead 1995). In terms of sheer biomass, the bowhead can be a huge subsistence harvest that feeds not only the successful crew that harvested the whale but also the entire community and households in other communities as well. For example, the MMS-sponsored multi-year subsistence harvest study in Barrow, *North Slope Subsistence Study - Barrow 1987, 1988, 1989*, conducted by Stephen R. Braund & Associates and ISER (1993a, TR149) documented that bowhead whales comprised 38 percent of Barrow's total subsistence harvest, as measured by usable pounds, during the three study years (1987-1989). This percentage is likely low as Braund and his colleagues conducted this study during years when the International Whaling Commission bowhead quota was lower and substantially limited the Barrow Iñupiat (and other Alaska Natives) bowhead harvests. During the three study years, Barrow averaged nine landed bowheads annually whereas in later years the number of bowheads landed in Barrow has increased more toward the level of documented need (see Braund, Stoker, and Kruse 1988). The change was due to a relaxation of IWC quota restrictions, which in turn was largely the result of the North Slope Borough bowhead census program documenting a larger stock than previously known. In recent years, it is not uncommon for Barrow whalers to land 20 to 25 or more bowheads in a year, weather and ice permitting.

Second, and related to its large size, is the high level of community cooperation required to hunt the bowhead. Because of its size and habitat, hunting the bowhead is a high-risk activity. Hunters operate in crews consisting of several men, usually kin of the crew captain. Hunting methods vary from village to village, but generally in the spring hunt, crews camp for weeks along an open lead in the sea ice, ready to pursue a whale on a moment's notice, harpoon it, kill it, and, with the help of other crews, tow it back to shore. People of all ages then come from the village to help land the whale, and many residents linger while the animal is being butchered and distributed according to a specific traditional protocol that dictates who gets what part of the whale. The butchering and distribution activities are an informal community gathering of a celebratory nature. Other more formal gatherings will occur as a result of the bowhead harvest, such as the captain's open house and the *Nalukatuq,* or blanket toss festival. Additionally, successful captains save portions of their harvested bowhead to serve to the community at

Thanksgiving and Christmas feasts. No other subsistence food inspires the community to gather to celebrate to the extent that the bowhead does. Nor does any other subsistence food require such an intensive cooperative community effort to harvest and consume. The successful captain and crew gain considerable status from the harvest; nevertheless, the entire community supports the hunters' efforts, assists, and also benefits from the harvest in terms of food received, community cohesion, and community pride.

Third, the bowhead whale is an important cultural symbol to the Iñupiat and Siberian Yup'ik Eskimos and internationally. The bowhead whale hunt, harvest and distribution are the most ritualized of any subsistence species. Iñupiat residents of the North Slope have stated that no other species can substitute for the bowhead whale in terms of cultural importance (Alaska Consultants, Inc. and Stephen R. Braund & Associates 1984). Several studies have documented the cultural, subsistence and nutritional need for bowhead whale among the villages that harvest this species (Braund, Stoker, and Kruse 1988; Stephen R. Braund & Associates 1991, 1992, 1994, 1997). When the International Whaling Commission raised concerns in the mid-1970s about the subsistence hunt for bowheads in Alaska due to an apparently declining bowhead population and proposed a hunting moratorium[45], Eskimo residents rallied to defend their right to harvest the bowhead based on cultural need. The Eskimos also claimed that, based on their observations, the bowhead population was considerably larger than the International Whaling Commission supposed. Thus, subsistence hunting for bowheads in Alaska became an international issue, with animal protectionists taking one side and supporters of subsistence whaling taking the other. Fighting this issue galvanized Eskimos to form the Alaska Eskimo Whaling Commission and the North Slope Borough to fund an ongoing, scientific bowhead population census. The controversy may have also heightened the status of the bowhead as a cultural symbol for the Iñupiat and Yup'ik communities that depend on these animals for sustenance.

Fourth, the bowhead whale appears to be the most vulnerable species with regard to OCS development in the Beaufort Sea. Iñupiat hunters have long maintained that the bowhead is very sensitive to noise and can be easily deflected from its migratory path by unnatural noise. According to Iñupiat whalers, seismic activity offshore has already negatively affected the bowhead fall subsistence whale hunt in the Beaufort

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[45] The IWC did, in fact, impose a moratorium on Alaska subsistence bowhead whale hunting in 1977 (for the 1978 season), but in a special meeting in December 1977, rescinded that decision, and instituted, instead, a quota of 12 landed or 18 struck for the 1978 season.

Sea. Because of the difficulty and danger of hunting these animals (in the ice in the spring and in the open ocean in the fall), any deflection could not only cost the whales considerable energy but could also cost hunters access to the whales. The bowhead is also considered vulnerable to the effects of an oil spill with potential morbidity and/or mortality repercussions.

Fifth, Alaska's bowhead whale population follows a specific migratory pattern. In the spring, the whales travel north through the Bering and Chukchi seas and east through the Beaufort Sea. They spend the summer feeding in Canada's Beaufort Sea waters. Then in the fall, the whales head west and south along the Alaska coast to the Bering Sea. Ten coastal communities, from St. Lawrence Island in the Bering Sea to Kaktovik on the Beaufort Sea near the Canadian border, attempt to intercept the bowhead with their boats and harpoons each year as the whales migrate past the Native hunters' communities. With oil drilling now occurring along the bowhead migratory path, whalers are concerned that the bowhead migration could be disturbed by industrial noise, or the bowhead population could decline from direct impacts of oil development (such as collisions with supply vessels or an oil spill). Any impacts to the bowhead population and migration, with consequences for hunters' ability to harvest the whales, are a major sociocultural concern for all 10 Alaska bowhead whale hunting communities.

If OCS development causes impacts to the bowhead and/or bowhead harvests, will the MMS be able to document this causality (or absence thereof)? One of the oft-cited limitations of several ESP sociocultural studies was the inability to ascribe causality where and when change occurred. Now that OCS development is occurring, if sociocultural changes in the coastal communities also occur, will the MMS be able to distinguish OCS-induced sociocultural change from non-OCS sociocultural change? How will the MMS address perceived changes to bowhead populations, migration paths, subsistence harvests, and community life?

Currently underway or recently completed are three MMS studies related to subsistence bowhead whaling (although they are not all conducted within the socio-economic component of the ESP). One is a multi-year study entitled *Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information* (Richardson and Thomson 2002, MMS 2002-012). This study is unique in its collaboration between biological investigators and area whale hunters. Residents of Kaktovik have assisted in the study design, field implementation, report review, and sharing of knowledge needed to determine the importance of the eastern Alaska Beaufort Sea to feeding bowheads (Galginaitis and Koski 2002). Other study components include aerial photography, behavioral observations, isotopic analysis of baleen and muscle tissue, stomach content analysis, and energetics modeling. In brief, although observations indicated that bowhead whales spend much of their time feeding while in the area and 83 percent of the whales harvested at Kaktovik had food in their stomachs, the study concluded that individual bowheads spent two to six days in the eastern Alaska Beaufort Sea and consumed less than five percent of their annual food requirement (Richardson and Thomson 2002, MMS 2002-012). The traditional knowledge portion of the study reinforced the cultural and dietary importance of the bowhead to the Inupiat as well as the importance of the local area for bowhead feeding and hunting.

In June of 1999, MMS initiated a multi-disciplinary, site-specific Beaufort Sea monitoring study, *Arctic Nearshore Impact Monitoring in the Development Area* (ANIMIDA), to examine impacts associated with the first federal oil development at the Northstar facility (Arthur D. Little, Inc. 2001). This ongoing study is designed to provide long-term continuity beyond what could be expected from industry-sponsored studies alone and therefore represents a different approach for the ESP. The study focuses primarily on the physical environment (e.g., trace metals, hydrocarbons, sediment flow, partitioning of contaminants between dissolved and particulate water phases, and effects on kelp) but includes one task which commenced in the 2001 whale hunting season dedicated to documenting Nuiqsut whaling crews' fall subsistence whale hunting activity from their Cross Island whaling camp (Galginaitis 2003; Galginaitis and Funk 2005, MMS 2005-025; 2004, MMS 2004-030). Cross Island is near the Northstar OCS production site and the objective of this study includes gathering information to be used to assess the relationships (if any) between changes in whaling activity and variables such as oil and gas activities and weather and ice conditions (Galginaitis 2003). Galginaitis has accompanied Nuiqsut whalers on their fall whaling trip facilitating systematic data collection of daily vessel hunting routes using GPS (Global Positioning System) units in the whalers' boats. As of 2004, data analysis is a minor component of this limited ethnographic and bowhead harvest pattern study that has collected four years of Nuiqsut vessel tracking information.

Finally, the current study, *Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Activities in the Beaufort Sea* (EDAW, Inc., forthcoming), is responsive to North Slope Iñupiat concerns that offshore oil and gas exploration and development activities are adversely affecting bowhead whale hunting and Iñupiat life. MMS commissioned this study to assess the potential effects of OCS activities on bowhead whale hunting activities in the Beaufort Sea. This study will document and analyze North Slope residents' perceptions of past, present, and potential future effects of oil industry acitivities on bowhead whales and whale hunting, on social practices associated with whaling, and on local society in general.

The bowhead is one of the most controversial aspects of current OCS development along the North Slope, where subsistence whalers are extremely concerned about the risks to the bowhead and, by extension, to Iñupiat cultural survival. Similar to the social indicators research following EVOS (see Chapter Eight), these three studies move the MMS from the position of anticipating impacts from OCS development on local communities to more applied research and monitoring. The feeding study (Richardson and Thomson 2002, MMS 2002-012) and the ANIMIDA study (Arthur D. Little, Inc. 2001) are also significant because they represent a relatively new research approach at the species level that incorporates the data from traditional knowledge sources (e.g., subsistence hunters) with western scientific data.

Traditional Knowledge Studies

Traditional knowledge has always been a component of ethnographic research, if not labeled as such. Collecting and using traditional knowledge outside of ethnography, however, is not a longstanding practice. The indigenous peoples who live on the land and harvest its resources have an intimate understanding of their environment grounded in a long-term relationship with the surrounding landscape, ocean, rivers, ice, and resources (Stevenson 1996). This understanding includes knowledge of the anatomy and biology of resources as well as ecosystem relationships. It is based on centuries of harvesting, processing and distribution of resources, and builds on observations of animal behavior, as well as seasonal and longer term variations in climate, hydrology, sea ice, and ocean currents. Traditional knowledge places people and their culture within the environment. Having this kind of shared knowledge has been an essential survival tool for indigenous peoples.

As development occurred, biologists conducted research to anticipate and/or monitor impacts on the flora and fauna of an area, and engineers designed structures and activities based on their understanding of the physical environment. Native residents observed that industry or government, despite a long timeline of observing baseline biological conditions, did not seek their traditional knowledge. Moreover, when Natives observed changes in their environment that they hypothesized were caused by industrial activity, their concerns were not considered scientifically valid and were often dismissed as “opinion” or “anecdotal” information.

Innovations in the field of “co-management” (e.g., the International Whaling Commission and the Alaska Eskimo Whaling Commission) in the late twentieth century were the main way in which traditional knowledge began to gain stature among western scientists and policymakers. Although fieldwork and interviewing local residents was always a part of the ESP sociocultural studies, the MMS has gone one step farther by funding the formation of a traditional knowledge database for the North Slope (*Ukpeagvik*

Iñupiat Corporation Science Division, forthcoming). The researchers have gathered existing sources (e.g., oral history tapes, testimony transcripts, etc.) of traditional knowledge and indexed them by abstracts, key words, geographic references, and annotated bibliography to make these data available to the scientific community. Researchers indexed each source by the following topics: subsistence areas; harvest methods; relationships between physical environmental and animal populations and behavior; bowhead whale behavior, movement and distribution; ice conditions and movement; wind patterns; current patterns; and place name information. This project, if completed, could be a significant validation of traditional knowledge and may have a major influence on research and development in the future by facilitating the incorporation of traditional knowledge into the design of development projects occurring in Native residents' traditional use areas. However, many technical challenges have arisen over the course of research.

A new ESP study in 2004 explicitly combines western science and Iñupiat traditional knowledge to help explain variation in the abundance of Arctic cisco in the Colville River (ABR, Inc., Stephen R. Braund & Assocates, Sigma Plus, MJM Research, KSOPI, forthcoming). The western scientists, working closely with a locally chosen panel of Iñupiat especially knowledgeable about Arctic cisco, will use existing data to test Iñupiat hypotheses of variation in abundance of Arctic cisco near Nuiqsut. The Iñupiat panel will prepare an independent assessment of the success and shortcomings of this method of combining western science and traditional knowledge.

Discussion

This section draws together three threads: the evolution of the ESP sociocultural studies, key methodological developments, and major research findings.

Evolution of ESP Sociocultural Studies

Faced with the need to assess potential impacts of OCS development on the sociocultural systems of Alaska coastal communities, the MMS sponsored a vast amount of sociocultural research in Alaska from the late 1970s to the present, much of it ethnographic in nature (Figure 5.1 and Table 5.1). The sociocultural component of the early core studies consisted of a baseline description followed by forecasts of likely impacts from one non-OCS (base case without OCS development) and three OCS development scenarios. Lacking flexibility to adapt quickly to changing forecasts, MMS replaced this approach with sociocultural systems analyses that mainly provided baseline descriptions. The sociocultural systems analyses principally focused on small rural communities while separate socioeconomic studies addressed the regional centers. The MMS expanded sociocultural scopes of work to integrate socioeconomic and sociocultural analyses of the communities. This move may have grown out of the early sociocultural findings in which subsistence as an economic and cultural endeavor was determined to be fundamental to the social, economic and cultural systems of the study communities.

As descriptive research continued, the ESP funded other clusters of sociocultural research to fill specific gaps in the OCS pre-lease impacts assessment process. One focus was on the interrelationship between subsistence and increasing cash economies in rural villages. Another set of studies attempted to design and implement a system for monitoring indicators of social well-being (social indicators). In the midst of much social and economic change in communities, the ESP studies needed to be able to distinguish OCS-caused change from non-OCS change. Toward this ongoing effort, the ESP launched a series of studies on institutional monitoring in an attempt to pinpoint more precisely the role of OCS development in sociocultural change. The ESP also funded detailed subsistence harvest studies, whaling studies and traditional knowledge studies, seemingly in response to the emergent finding from earlier ESP studies, mentioned above, concerning the socioeconomic and sociocultural primacy of subsistence in rural communities. Additionally, to anticipate potential social and economic changes brought about by environmental damage from OCS development, the ESP sponsored the harvest disruption effects analyses.

Thus, the ESP research program evolved over time. As the ethnographic data colored in a previously mostly blank canvas, MMS staff could more clearly see how these communities functioned, what was most important, and where there might be overlap between OCS development and sociocultural systems. Consequently, they directed subsequent research to hone in methodologically on their agency needs and generate more topically specific data that would address EIS (i.e., NEPA) questions about potential impacts caused by OCS development.

The harvest disruption studies were an acknowledgement of the importance of natural resource harvesting to communities near potential OCS development. Focusing specifically on that cultural, social and economic value, the studies examined the potential collision between OCS impacts on the resources and ramifications to the communities. Unfortunately, forecasting impacts again proved to be a troublesome task. The scenarios considered in the harvest disruption studies did not serve the MMS EIS analysts' needs ultimately, and these studies were less useful internally than had been hoped (Impact Assessment, Inc. 1987a, TR128). (See Chapter Eight for a further discussion of the effectiveness of MMS harvest disruption studies). Nevertheless, these documents contain thorough analyses of the study communities and remain of value ethnographically to the research community.

The social indicators studies were some of the larger, more visionary research endeavors that the MMS sponsored in the ESP, with great promise for monitoring sociocultural change and focusing on changes attributable to OCS development. However, these studies ultimately did not measure up to the original conceptual vision. Procedural and methodological problems plagued the project. MMS awarded the Phase I contract to researchers who conceived a design conforming to the requirement to not use survey instruments. MMS awarded the Phase II contract to a different group of researchers who disagreed methodologically with the Phase I product, and devised a different approach using a survey instrument, including Office of Management and Budget approval. The principal designer of Phase I won the Phase III contract and proceeded to revise the instrument further, finally applying it after EVOS occurred (requiring further revisions). The data apparently failed to isolate OCS-caused changes from other causes of change at a time when much change in rural Alaska was occurring (Impact Assessment, Inc. 1987a, TR128). Moreover, the cumbersome nature of the survey instrument hindered its successful implementation (Human Relations Area Files, Inc. 1993a, TR153). Finally, the analysis is difficult to interpret, making it unclear whether the studies accomplished their goals. As discussed earlier, the results should be of value to decision-makers in a general sense, if not achieving the specific MMS goal of identifying OCS-caused change.[46]

In terms of usefulness and shelf life (for the general research community, at least, and perhaps also for MMS), the subsistence studies and ethnographic descriptions (baseline studies, including the social indicators key informant summaries) are some of the more enduring and applicable products of the ESP sociocultural studies. The subsistence-based economy studies by the Alaska Department of Fish and Game as well as the subsistence harvest studies by Stephen R. Braund & Associates and ISER provided quantitative data that continue to be used by the research community. Given that subsistence is of fundamental cultural value to rural communities, and that it is potentially highly vulnerable to impacts from OCS development, this is the key issue where OCS development is most likely to collide with culture[47]. The subsistence-based economy studies articulated the ongoing importance of subsistence, and

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[46] For further discussion of the social indicators monitoring studies, see Jorgensen's discussion in Chapter 10.

[47] In fact, it already has to some extent. Consider, for example, the decades-old testimony from North Slope bowhead whale hunters who claim that noise from industry seismic ships has diverted bowheads further offshore from their traditional migratory route resulting in increased hunter travels, costs, exposure to danger and community stress as they pursue fall bowhead whales.

the wage economy's supporting role in subsistence, at a time when the general assumptions tended toward erosion of subsistence with the rise of a wage economy.

Key Methodological Developments

Although the approach used in most of the sociocultural studies derives from a well-established ethnographic research tradition, it is important to keep in mind that these studies collectively represent a new perspective on the task of impact assessment for the federal government. Marrying the tools and concepts of ethnography with impact assessment was no easy task. In reviewing each of the individual sociocultural core studies, we identified the analysis categories used in each study. While almost every study used a different set of analysis categories, many overlapped, and it appears that there is a cumulative evolution of analysis categories over time. While some researchers used only four analysis categories, others used up to 15. Given the length of time and variety of settings over which the scope of sociocultural analysis variables has evolved, one can probably safely conclude that any single study can use the cumulative set of variables as the basis for selecting the most important subset of variables for a given analysis. As noted previously, the systems analyses series of studies, following on the heels of the baseline and impact studies, had honed their analysis to three main categories common to each study: political systems, social systems, and economic systems. Most other sociocultural variables fit within these major groupings.

The first sociocultural core study conducted by Worl Associates set the precedent for including subsistence as the primary focus of analysis (Worl Associates 1978, TR22). This concept was honed in such studies as Payne's analysis of the complex of interacting environmental, social, economic, and cultural systems which he termed the "maritime adaptation" (Payne 1980, TR39). In 1981, Worl et al. set the further precedent of including subsistence in an integrated analysis of the economy (Worl, Worl, and Lonner 1981, TR64). To these conceptual advances should be added the significant methodological advances represented by the subsistence harvest studies (e.g., Stephen R. Braund & Associates and ISER 1993, TR147 and TR149) and the harvest disruption studies (e.g., Luton 1985, TR91; Little and Robbins 1984, TR89; Jorgensen 1984, TR90; and Stephen R. Braund & Associates and LZH Associates 1986, TR123). Additionally, the subsistence-based economies studies pioneered an approach that has also produced research of enduring value (Wolfe 1981, TR72; Wolfe et al. 1984, TR95). Contracts jointly funded by MMS and the Alaska Department of Fish and Game enabled the use of surveys for the first time in the ESP. The Alaska Department of Fish and Game went on to use the same methodology in the majority of their research, generating a huge body of valuable subsistence data that originated under the ESP (see Alaska Department of Fish and Game, Division of Subsistence, 2002a).

In addition to advancing the state of the art of subsistence analyses and conceptual approaches to sociocultural analyses, we can also observe a trend of increasing scope in the analysis categories used in ESP sociocultural research. Worl Associates started the ball rolling with cultural history, subsistence, political systems, and interethnic relationships as conceptual categories applied on the North Slope (Worl Associates 1978, TR9). They added cultural values, and social health and family relationships in the parallel impact assessment completed the same year (Worl Associates 1978, TR22). Three sociologists, Bennett, Heasley, and Huey, expanded the scope of sociocultural analyses by including demography, socialization, cohesiveness, community isolation, and environmental setting (1979, TR36). Cultural Dynamics, Ltd. researchers further expanded the cumulative scope, although they did not themselves apply all categories introduced already, by adding health and institutional religion, and key economic sectors (in this case fisheries, tourism, and outdoor recreation) (1979, TR41) and adding community services and facilities (1982, TR74). Finally, Payne and Braund expanded the scope of sociocultural studies in a new direction by including community characteristics affecting the exposure of the community to OCS impacts: proximity to development, and use of common transportation routes and modes (1983, TR67).

We get a glimpse of the limits of scope in the *Point Lay Case Study* (Impact Assessment, Inc. 1990, TR139). Limiting themselves to two communities rather than a region as in most sociocultural core studies, Impact Assessment, Inc. researchers included more of the cumulative set of analysis categories than any other sociocultural study: fourteen. As noted earlier, they concluded that it was not feasible for one researcher to complete the ethnographic component of the study as well as the intended scope of analysis variables.

The social indicators and institutional monitoring lines of research both attempted to develop methodologies for monitoring sociocultural systems for change, with the goal of distinguishing OCS-caused from non-OCS-caused change. The Chilkat Institute and Impact Assessment, Inc. developed and implemented institutional monitoring methodologies in the 1980s. The MMS has not pursued this line of research since then, implying that the methodology had not proven useful to the agency. The social indicators methodology, when applied after EVOS, was successful at gathering informative data about social and cultural well-being. However, whether it was successful at isolating OCS from non-OCS impacts was unclear, as is its future as a research methodology within the ESP.

As the MMS begins to oversee production on the OCS where previously they address only exploration and potential impacts, monitoring methodologies would seem to increase in importance. Rather than broad studies on well-being, however, the MMS has taken a very specific approach to monitoring by focusing on OCS development impacts on subsistence whaling. Similarly, the methodology for developing a traditional knowledge data base for the North Slope is an innovation within the ESP, the effectiveness of which remains to be seen once the project is completed. These more recent methodological developments within the ESP clearly reflect a trend toward addressing specific and key concerns among the indigenous peoples in the areas of OCS development.

Major Research Findings

Most of the sociocultural studies addressed the questions of what comprises the sociocultural systems of these communities, and what drives the systems. Starting with very little pre-existing research, the ESP generated substantial data on coastal communities in a short span of time. The early ESP social studies had one finding in common that appears to have helped to focus later research: the fundamental importance of natural resource harvesting to the sociocultural organization of the communities. Researchers identified natural resource harvesting, along with kinship-based organization, as the most determinant elements of the predominantly Native coastal villages' sociocultural systems. Traditionally, harvesting resources in these remote locations and harsh climates was crucial to survival. The extended family network was the tool to produce and distribute the resources most effectively, a system that reinforced cohesion and insured ongoing survival.

Another observation common to many of the reports was the rapid pace of change in recent decades, particularly the 1970s and 1980s - typically described as "westernization." After centuries of isolation, modern communications and transportation systems had increased exposure, whether desired or not, to new ideas (e.g., Native corporations for land claims settlements and other "western" institutions), new material objects (e.g., snowmachines), and new relationships (e.g., with state and federal governments). Several researchers noted that the pace of change was an important variable with regard to a community's response capacity. Rapid change caused more stresses to the sociocultural systems, manifesting as increased social health problems (alcoholism, domestic violence and crime) and overwhelmed political institutions. On the other hand, change occurring at a reasonable pace allowed the communities to develop institutions to process change with some degree of control and selectivity.

ESP sociocultural studies documented that, despite considerable change in these communities, traditional cultural values persisted and remained vital forces that organized the communities. In some cases, researchers observed communities adopting new institutions (a form of change) for the purpose of promoting traditional values (so they would not change).

Conclusion

Through 30 years (1975-2004) of sociocultural research on the communities near potential OCS development, the MMS continually responded to the findings of their contracted researchers who consistently noted the fundamental sociocultural importance of natural resource harvesting, cooperative behavior, processing, communal distribution, extended family sharing, and the importance of kinship in most communities. Given the potential for conflict between OCS resource extraction and local community resource harvests, the MMS steered ESP sociocultural research toward efforts to better understand causal links between OCS development and sociocultural impacts on communities. The harvest disruption, social indicators, institutional monitoring, traditional knowledge, and subsistence studies represent responsive efforts by the MMS to anticipate the interface between OCS development and local sociocultural impacts.

The MMS anticipated the likelihood that drilling would occur in bowhead habitat, with potential impacts for whaling communities. ESP sociocultural research focused on the North Slope region more heavily than any other region. Not coincidentally, the most recent large-scale sociocultural study contracted by the MMS, now underway, is a survey of whaling community residents in Barrow, Nuiqsut, and Kaktovik about the effects of OCS activity on bowhead whaling and Iñupiat culture. As oil production from OCS leases begins, ongoing studies move research toward a monitoring role. As oil prices increase, it is likely that OCS leasing will continue and could expand in areas anticipated at the beginning of the study program, reinforcing the value of the baseline studies and anticipating their future importance to understanding the effects of OCS exploration and development.

Chapter 6: An Overview of Subsistence in Alaska

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Introduction

This chapter provides an overview of contemporary subsistence patterns in Alaska, focusing in particular on contributions from the MMS ESP and other subsistence research efforts since the early 1980s. "Subsistence" refers to the *production and distribution of wild resources for local use and small-scale exchanges in Alaska*. During the late twentieth century, wild food production has been the focus of subsistence activities. Production of non-food items has become a secondary subsistence enterprise, principally furs and ivory for sale as simple commodities. Prior to the twentieth century, simple commodity production for sale occurred at larger volumes. Wolfe and Walker (1987) have estimated that the annual production of wild foods in the late 1980s was about 43.7 million pounds (usable weight) of wild foods in rural areas of the state (about 19.8 thousand metric tons). On a per person basis, this translated to about 375 pounds (170 kg) per person per year of wild foods. In urban areas, the annual harvest in the late 1980s was about 9.8 million pounds (about 4.4 thousand metric tons), primarily under sport fishing and hunting regulations, or about 22 pounds (9.9 kg) per person per year.

Arguably, following the pursuit of civil liberties and land claims, protection of subsistence has become the paramount political issue for Alaska Natives during the late twentieth century (Berger 1985; Wolfe 1993; Worl 1998). Other issues of importance to Alaska Native groups have included accessible health care, decent housing, safe water, quality local education, political representation, local jobs, profitable Native corporations, and parity in annual state-federal budgets, among others. But protection of subsistence has overshadowed these in the political arena. A comparable political issue has been *tribalism* – the exploration and exertion of governmental powers by Alaska tribes (the so-called "sovereignty movement," or "retribalization"). But to date tribalism has been as much an internal Alaska Native debate (involving tribal governments and ANCSA corporations) as a political engagement with federal and State governments. With subsistence, Alaska Natives have claimed a common economic stake and political interest. Because the land claims settlement did not protect subsistence uses, the political effort by Alaska Natives has been to push for laws and regulations recognizing and protecting the subsistence uses by Alaska Natives.

Currently, federal and Alaska State statutes define "subsistence" as the "customary and traditional uses" of fish and wildlife in Alaska (cf., Alaska National Interest Lands Conservation Act [ANILCA] Section 803, 16 U.S.C.A. 3113; Alaska Statutes 16.05.940(32)). This legal approach establishes *culture* as the basis of subsistence in the sense that it defines subsistence uses as *customary* and *traditional* uses learned and transmitted across generations. Most contemporary subsistence patterns in Alaska have descended from *Alaska Native cultural traditions*, broadly classified as Tlingit, Haida, Tsimshian, Alutiiq, Aleut, Yup'ik, Iñupiat, and Athabaskan. In addition, immigrant populations have introduced other customs and traditions regarding wild food harvests that may be broadly designated *Euro-American cultural traditions*. Many non-Natives also hunt and fish, although predominantly under cultural patterns distinct from Alaska Natives. As evolving cultural patterns, subsistence practices in Alaska communities display substantial regional differences, principally due to responses by Alaska Native and non-Native family groups to changing conditions in local areas.

At the turn of this century, about 622,000 people lived in Alaska (Alaska Department of Labor 2000). About 16 percent of Alaska's population was Alaska Native (97,889 people), distributed among 20 distinct cultural groups with 226 tribal governments. Most Alaskans (84 percent) were "non-Native," the majority arriving in Alaska from other areas of the United States. Most Alaskans (80 percent) lived in seven urban areas, including the greater Anchorage area with more than half (58 percent) of the state's population. The rural portion of Alaska's population lived in about 270 "villages" (11 percent) and 13 "towns" of between 2,000 and 13,000 people (nine percent). It is in these villages and towns that subsistence production comprises a significant part of the regional economy.

While rooted in culture, subsistence is *economic activity* at its base (Wolfe and Walker 1987; Langdon 1986). The core of subsistence is food production for local distribution and use. Some Alaska Native groups have emphasized that subsistence is a "way of life" in small, predominantly Alaska Native villages (e.g., Yupiktak Bista 1974; and 17 years later, Calista Corporation 1991). This perspective highlights the connections between subsistence production and distribution and other features of Alaska Native life such as settlement patterns, demography, land tenure systems, traditional knowledge, education of children, kinship groups, social roles, monetary employment, and values. Subsistence research has corroborated these linkages, as described below. MMS has called subsistence research in small, Alaska Native communities "sociocultural" research to highlight connections between wild food production and other sociocultural factors. The subsistence research sponsored by MMS also heavily draws on anthropological methodologies (participant observation, key respondent interviews, and systematic household surveys) for documenting subsistence patterns. Such a research approach is premised on the understanding that core economic pursuits (production, distribution, and consumption of wild foods) are part of larger sociocultural frameworks.

During the late twentieth century, the production and distribution of wild foods have occurred alongside other types of economic activities in Alaska communities. Wild food production and distribution is one of several economic sectors within a community and region (Wolfe, Gross, Langdon, Wright, Sherrod, Ellanna, Sumida, and Usher 1984, TR95). Other sectors include local public sector and private sector employment as well as the economic activities of local and non-local businesses. The *economic firms* involved in wild food production and distribution are households, extended kinship-based networks, and partnerships, primarily constituted and operated "informally" (that is, without business licenses or tax liabilities). Documenting relationships of wild food production and other types of economic activities in rural areas has been a goal of some MMS research, as described below. Overall, it appears that subsistence and other economic activities are loosely integrated in rural Alaska communities, primarily at the household level. How closely the subsistence sector integrates with other economic sectors, in particular communities and regions, is grist for the research mill.

Subsistence and Socioeconomic Effects

The major MMS interests driving the social component of the ESP are the potential socioeconomic effects of OCS activities. Central questions in regard to subsistence as an economic sector in rural communities are simple to frame:

- What are the potential or actual effects of OCS activities on the production and distribution of wild foods for local use?
- How can potential or actual negative effects be avoided, mitigated, or compensated?

For these two questions, subsistence measures are straightforward:

- What are effects on wild food production levels?
- What are effects on wild food distribution levels?
- What are effects on wild food use levels?

The factors of economic production – land, labor, and capital can help us understand the pathway of effects:

- What are effects on traditional subsistence use areas (land, water, and ice) and the activities conducted on them (including rules of access to use areas)?

- What are effects on particular wild resources (including salmon, other fish, land mammals, marine mammals, birds, marine invertebrates, and plants), and their individual harvest levels (including harvests from competing interests)?
- What are effects on groups providing labor in production and distribution?
- What are effects on technology and other capital equipment used in production?

Socioeconomic research funded by MMS has produced a fairly wide range of information pertaining to these core subsistence questions, as described below. The information is useful in several contexts, including the preparation of EISs. MMS can use the group of harvest disruption studies, for example, to help assess potential impacts of proposed OCS activities (e.g., Stephen R. Braund & Associates and LZH Associates 1986, TR123; John Muir Institute, Inc. 1984b, TR89; 1984c, TR90; 1984d, TR91). Most impact assessments have sections pertaining to potential effects on subsistence patterns. MMS can also use the information in planning, implementing, and conducting OCS activities. Research findings have informed the dialogue between interests at each stage so that interested parties can mitigate potential impacts. Although not intended, third parties have also used the information in litigating claims from EVOS. The analysis of wild food harvest information collected under the MMS research program was central to the Alaska Native claim (Duffield 1997; Fall and Field 1996). Finally, the State Boards of Fisheries and Game and the Federal Subsistence Board have used information from MMS research in regulating competition between commercial fishing, sport hunting, and subsistence harvest interests (Fall 1990). The mitigation of competition for wild resources, which OCS activities may indirectly affect, is the purview of these governmental entities.

General Coverage of MMS Subsistence Research

From its onset, the MMS research program recognized that the patterns of production and consumption of wild foods vary regionally in Alaska, and are strongly influenced by local customs, traditions, economic conditions, and historic processes. Regional variation was apparent in the wild species used as food, the seasonal round of subsistence activities, harvest levels, and the methods for harvesting, processing and preserving wild foods. To provide adequate documentation of regional differences, MMS designed its research program to represent multiple geographic areas.

Table 6.1 summarizes the regional geographic coverage of MMS subsistence (see Appendix A for full citations). It lists Technical Reports (TRs) and Special Reports (SRs) containing subsistence information by report number, geographic region, and Alaska Native cultural group. The report's number roughly reflects a chronological sequence, with higher numbers representing later research. Reports occasionally include subsistence patterns of non-Native residents of surveyed areas as well, particularly for communities with substantial non-Native populations such as Cordova, Kenai-Soldotna, and Valdez (Prince William Sound-Cook Inlet), Kodiak City (Kodiak Island area), Unalaska (Aleutian-Pribilof Islands), and King Salmon, Naknek, and Dillingham (Southwest Alaska) (cf., Fall and Utermohle, editors 1995, TR160; Fall, Vanek, Brown, Jennings, Wolfe, and Utermohle 2000).

Table 6.1: Subsistence Technical Reports by Region and Alaska Native Group

Region	Alutiiq	Aleut	Athabaskan	Yup'ik	Iñupiat
Prince William Sound - Cook Inlet	TR15, TR160, TR163		TR15		
Kodiak Island Area	TR15, TR121, TR160, TR163				
Alaska Peninsula	TR15, TR67, TR75, TR121, TR160, TR163	TR15, TR71, TR75, TR123		TR15, TR67, TR71	
Aleutian-Pribilof Islands		TR15, TR75, TR118, TR132			
Southwest Alaska			TR67	TR15, TR67, TR95, TR150	
Western Alaska				TR15, TR54, TR70, TR72, TR95, TR132	
Northwest Alaska				TR15, TR54, TR89, TR90	TR15, TR54, TR74, TR132, TR160
Arctic Slope, Alaska					SR8, SR9, TR15, TR91, TR101, TR129, TR133, TR135, TR136, TR139; TR140; TR147, TR149, TR160
Interior Alaska			TR7		

Figure 6.1 highlights the comprehensive geographic scope of the MMS-sponsored community subsistence studies as well as the large number of communities addressed in these studies. Table 6.2 shows the economic and demographic technical reports by community and region. As shown in Table 6.1 and Figure 6.1, MMS subsistence research generally has covered coastal areas rather than inland areas. This

Figure 6.1: Geographic Scope of ESP Community Subsistence Studies
Legend
Communities Addressed in Subsistence Studies
ANCSA Regional Corporation Boundaries
Source: Minerals Management Service
Arctic Ocean
Chukchi Sea
Beaufort Sea
Bering Sea
Gulf of Alaska
Pacific Ocean
RUSSIA
ALASKA
CANADA
Arctic Slope Regional Corp
N.A.N.A. Regional Corporation
Bering Straits Native Corporation
Doyon Ltd
Bristol Bay Native Corporation
Calista Corporation
Cook Inlet Region Inc
Ahtna Inc
Chugach Alaska Corporation
Koniag Inc
The Aleut Corporation
Sealaska Corporation
Barrow
Wainwright
Point Lay
Atqasuk
Nuiqsut
Kaktovik
Point Hope
Kivalina
Noatak
Kotzebue
Kiana
Ambler
Kobuk
Noorvik
Selawik
Shungnak
Shishmaref
Little Diomede
Wales
Deering
Buckland
Brevig Mission
Candle
White Mountain
Teller
King Island
Council
Koyuk
Nome
Golovin
Elim
Gambell
Savoonga
Shaktoolik
Unalakleet
Saint Michael
Stebbins
Nunivak Island
Copper Center
Valdez
Whittier
Tatitlek
Kenai
Cordova
Seward
Chenega Bay
Newhalen
Nondalton
Iliamna
New Stuyahok
Igiugig
Togiak
Dillingham
Goodnews Bay
Manokotak
Nushagak
Kokhanok
Seldovia
Clark's Point
King Salmon
Port Graham & Nanwalek (English Bay)
South Naknek
Naknek
Egegik
Ouzinkie
Port Lions
Kodiak
Pilot Point
Karluk
Larsen Bay
Port Heiden
Ugashik
Old Harbor
Ivanof Bay
Akhiok
Kaguyak
Chignik Lake
Chignik Bay
Nelson Lagoon
Chignik Lagoon
Sand Point
False Pass
Perryville
King Cove
Akutan
Saint Paul
Saint George
Yakutat
Kotlik
Emmonak
Alakanuk
Sheldon Point
Mountain Village
Saint Mary's
Scammon Bay
Pitka's Point
Pilot Station
Hooper Bay
Chevak
Nunapitchuk
Newtok
Kasigluk
Akiachak
Tununak
Atmautluak
Bethel
Akiak
Mekoryuk
Toksook Bay
Kwethluk
Nightmute
Napakiak
Napaskiak
Oscarville
Tuntutuliak
Chefornak
Eek
Kipnuk
Kongiganak
Kwigillingok
Quinhagak
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Table 6.2: Subsistence ESP Technical Reports by Community and ANCSA Regional Corporation Boundaries

	Community	Technical Report Number	No. Reports
Arctic Slope Regional Corporation			**14**
	Atqasuk	101, 129	2
	Barrow	15, 85, 101, 125, 129, 133, 135, 149	8
	Kaktovik	SR9, 15, 85, 129, 160	5
	Nuiqsut	SR8, 85, 129, 160	4
	Point Hope	15, 101	2
	Point Lay	101, 129	2
	Wainwright	91, 101, 129, 136, 147	5
N.A.N.A. Regional Corporation			**3**
	Ambler	74	1
	Buckland	74	1
	Candle	74	1
	Deering	74	1
	Kiana	74	1
	Kivalina	74, 160	2
	Kobuk	74	1
	Kotzebue	74, 160	2
	Noatak	74	1
	Noorvik	74	1
	NW Alaska	15	1
	Selawik	74	1
	Shungnak	74	1
Bering Straits Native Corporation			**6**
	Bering Strait Region	15	1
	Brevig Mission	54	1
	Council	54	1
	Elim	54	1
	Gambell	15, 54, 89, 132	4
	Golovin	54	1
	King Island	54	1
	Koyuk	54	1
	Little Diomede	54	1
	Nome	54	1
	Saint Michael	54	1
	Savoonga	54, 89	2
	Shaktoolik	54	1
	Shishmaref	54	1
	Stebbins	54, 72	2
	Teller	54	1
	Unalakleet	54, 90	2
	Wales	54	1

Table 6.2 (cont'd.)

	Community	Technical Report Number	No. Reports
Bering Straits Native Corporation (cont'd.)			**6**
	White Mountain	54	1
Cook Inlet Region Inc.			**2**
	Kenai	160	1
	Seldovia	160, 163	2
Ahtna			**1**
	Copper Center	7	1
Calista Corporation			**6**
	Akiachak	70	1
	Akiak	70	1
	Alakanuk	54, 70, 72, 132	4
	Atmautluak	70	1
	Bethel	70	1
	Chefornak	70	1
	Chevak	70	1
	Eek	70	1
	Emmonak	54, 70, 72	3
	Goodnews Bay	95	1
	Hooper Bay	70	1
	Kasigluk	70	1
	Kipnuk	70	1
	Kongiganak	70	1
	Kotlik	54, 70, 72	3
	Kwethluk	70	1
	Kwigillingok	70	1
	Mekoryuk	70	1
	Mountain Village	70, 72	2
	Napakiak	70	1
	Napaskiak	15, 70	2
	Newtok	70	1
	Nightmute	70	1
	Nunapitchuk	70	1
	Nunivak Island	15	1
	Oscarville	70	1
	Pilot Station	70	1
	Pitka's Point	70	1
	Quinhagak	70, 95	2
	Saint Mary's	70	1
	Scammon Bay	70	1
	Sheldon Point	54, 70, 72	3
	Toksook Bay	70	1
	Tuntutuliak	70	1
	Tununak	70	1
	Akhiok	121, 160, 163	3

Table 6.2 (cont'd.)

	Community	Technical Report Number	No. Reports
Koniag Inc.			**3**
	Kaguyak	163	1
	Karluk	121, 160, 163	3
	Kodiak	160, 163	2
	Larsen Bay	121, 160, 163	3
	Old Harbor	121, 160, 163	3
	Ouzinkie	121, 160, 163	3
	Port Lions	121, 160, 163	3
Chugach Alaska Corporation			**2**
	Chenega Bay	160, 163	2
	Cordova	160, 163	2
	Nanwalek	160, 163	2
	Port Graham	160, 163	2
	Seward	163	1
	Tatitlek	160, 163	2
	Valdez	160, 163	2
	Whittier	163	1
Sealaska Corporation			**1**
	Yakutat	15	1
The Aleut Corporation			**6**
	Akutan	118	1
	False Pass	71, 75	2
	King Cove	71, 75, 123	3
	Nelson Lagoon	71, 75	2
	Saint George	118	1
	Saint Paul	118, 132	2
	Sand Point	71, 75	2
	Two Aleut Villages	15	1
Bristol Bay Native Corporation			**9**
	Chignik Bay	67, 75, 121, 160, 163	4
	Chignik Lagoon	75, 121, 163	3
	Chignik Lake	75, 121, 150, 160, 163	5
	Clark's Point	67	1
	Dillingham	67, 150	2
	Egegik	67	1
	Igiugig	67	1
	Iliamna	67	1
	Ivanof Bay	75, 121	2
	King Salmon	67	1
	Kokhanok	67	1
	Manokotak	67	1
	Naknek	67, 150	2
	New Stuyahok	67, 95, 150	3
	Newhalen	67	1

Table 6.2 (cont'd.)

	Community	Technical Report Number	No. Reports
Bristol Bay Native Corporation (cont'd.)			**9**
	Nondalton	67, 150	2
	Nushagak	15	1
	Perryville	75, 121, 163	3
	Pilot Point	67, 71, 75	3
	Port Heiden	67, 71, 75, 150	4
	South Naknek	67	1
	Togiak	67, 95, 150	3
	Ugashik	71, 75	2

focus presumes OCS activities are most likely to affect subsistence patterns along the coast. MMS subsistence research also has paid more attention to coastal areas near potential lease sales. These priorities account for the absence of MMS subsistence research on Tlingit, Haida, and Tsimshian groups in Alaska's southeast archipelago, and the limited research (three reports) on Athabaskan groups in Alaska's Subarctic Interior. The largest number of reports (14 reports) has covered subsistence patterns of the Arctic Slope Iñupiat. The number of reports for other ethnic groups and regions varies between three and eight: Alaska Peninsula (eight), Western Alaska (six), Aleutian-Pribilof Islands and Alaska Peninsula Aleut (six), Northwest Alaska Iñupiat (five), Southwest Alaska Yup'ik (four), Northwest Alaska Yup'ik (four), Kodiak Island area (four), and Prince William Sound Alutiiq (three).

Regional Baseline Core Studies

Through the mid-1980s, MMS designed its subsistence research to provide baseline profiles of communities and areas, covering a wide range of topics that collectively described and explained subsistence patterns (Cultural Dynamics, Ltd. 1978, TR15; 1983, TR74; 1986, TR121; Ellanna 1980a and b, TR54; Wolfe 1981, TR72; Fienup-Riordan 1982, TR70; Earl R. Combs, Inc. and Langdon 1982, TR71; Payne and Braund 1983, TR67; Stephen R. Braund & Associates, ResourcEcon, Patrick Burden & Associates, Social Research Institute, and Kirkwood & Associates 1986, TR118). These early reports were compilations of information from the literature, augmented with materials from key respondent interviews and the expertise of investigators. The regional baselines typically provided a history of an area, including factors influencing subsistence patterns prior to the contemporary period, and a description of current subsistence patterns, insofar as researchers could construct a history from the literature. MMS intended the baselines to serve as starting points for documenting subsistence patterns during subsequent research efforts and ultimately for MMS to use to prepare EISs that address the prediction and monitoring of potential effects of OCS activities. The history component of the baseline helped to explain the content and trajectory of contemporary patterns observed in an area. Researchers could use the current description as a benchmark to measure continuity and change over time.

In the early work, *Historic Indicators of Alaska Native Culture Change*, Davis provided an historic literature review for the entire coastal area of Alaska, excluding the Southeast archipelago (Cultural Dynamics, Ltd. 1978, TR15). The report reviewed 11 anthropological studies on culture history and change covering the coastal areas within potential MMS lease sales. MMS intended the compilation as a baseline and background information to assist in assessments of OCS activities. The report identified several patterns in Alaska Native villages: (1) adoption of new technology (e.g., guns, outboard motors, generators, snowmobiles), (2) increased mobility in and out of villages, (3) continued fluctuation of cash employment and subsistence activities, (4) the centrality of family organization to social ties and economic activities both within and between villages, and (5) continued seasonality of yearly activities. Traditional economic patterns and organization within Alaska Native communities showed increased specialization, incorporation of new technology, use of cash, and dependence on externally-controlled funds, goods, and jobs. Wild resources were harvested with new tools, new forms of transportation, at greater distances, and under greater external regulation. Other multi-regional summaries of subsistence information for coastal Alaska areas can be found in *Alaska Natives and the Land* (U.S. Federal Field Committee for Development Planning in Alaska 1968), Wolfe and Ellanna (1983), and Schroeder, Anderson, Bosworth, Wright, and Wright (1987).

Ellanna provided a detailed treatment of subsistence patterns for Iñupiat and Yup'ik groups of the Bering Strait, Norton Sound, and Yukon Delta areas (Ellanna 1980a and b, TR54). The report presented information on a wide set of ethnographic topics, including traditional subsistence use areas, biological resources, settlement patterns, modes of production, values, and social organization. Subsistence patterns were placed in the context of several historic processes impacting the region - increased global trade networks, commercialization (whaling, fisheries, and reindeer herding), introduced formal educational systems (missions and public systems), minerals exploration (gold), and political change (increased external government control and land claims settlement). Ellanna reported that households integrated subsistence activities and cash employment. While most subsistence production was kinship based, there were emergent social institutions related to subsistence. These institutions included the Eskimo Walrus Commission, the Alaska Eskimo Whaling Commission, and Bering Sea Fisherman's Association. Such organizations worked towards sustaining both the resource and subsistence access to and harvest of resources (see also Freeman 1993). Interethnic conflicts had developed between Euro-American and

Alaska Native residents in regional centers like Nome. Ellanna concluded that the potential effects of OCS activity would occur in the context of these ongoing sociocultural trends.

In another sociocultural baseline study, Earl R. Combs, Inc. and Langdon (1982, TR71) provided a profile of six communities in the Alaska Peninsula (Sand Point, King Cove, False Pass, Nelson Lagoon, Pilot Point, and Ugashik), combining a literature review and key respondent interviews in each community. The culture of this area comprised an amalgam of Aleut, Yup'ik, Russian, Scandinavian, and other Euro-American traditions. Researchers identified commercial seafood production as an economic base. For local residents, commercial fishing was more important than seafood processing, with salmon fishing the central activity. Combs and Langdon observed that subsistence harvests might be greatest in communities with a narrower range of employment opportunities.

In three of the six communities studied, three family lineages comprised at least two-thirds of the population. Kinship was a major feature underlying social organization in communities. Combs and Langdon reported that in King Cove, for example, crew members of fishing vessels were drawn from, "the nuclear family (sons and daughters), from the sibling net, and from extended kin ties (cousins)." Locally-owned stores were also primarily family businesses (ibid.).

The report described the cyclic nature of commercial fisheries, including a boom from 1975 through 1980. There was a trend toward reduced local resident involvement in fish processing associated with increased earnings from harvesting, with females no longer supplementing household earnings through cannery employment. Greater local employment had resulted from an expansion of government services, particularly the establishment of local schools and community infrastructure with state oil revenues and federal revenues. New infrastructure developed during the study period (1975-80) included small boat harbors, bulk storage, fuel tanks, airport facilities, roads, clinics, schools, electrical generation systems, water systems, household telephones, satellite television, and zoning ordinances.

Payne and Braund (1983, TR67) provided a baseline description of subsistence patterns for the Bristol Bay and Alaska Peninsula areas. Materials were presented on eighteen communities - Igiugig, Iliamna, Kokhanok, Newhalen, and Nondalton (Iliamna Lake Region); Togiak and Manokotak (Togiak Bay); Chignik (Alaska Peninsula); Naknek, South Naknek, Egegik, Pilot Point, Point Heiden, and King Salmon (Kvichak Bay); Dillingham and Clark's Point (Nushagak Bay); and New Stuyahok (Nushagak River). The profile derived from a literature review and three months of fieldwork. The authors estimated that several years of research would be required to quantitatively evaluate subsistence usage for this number of communities. The report found relatively high participation in subsistence activities by area residents (75 to 100 percent). The use of wild resources varied by community, particularly for large game such as caribou or moose. Subsistence use areas of communities (that is, areas used by community residents) appeared to overlap. Residents of inland and coastal areas exchanged harvested products. The sustainability of wild food harvests (availability and dependability) was a central concern of Bristol Bay residents. In this part of Alaska, commercial salmon fishing was an important source of income. The authors speculated that the level of subsistence production might tend to increase during poor commercial fishing years.

Two early sociocultural baseline analyses documented subsistence patterns in the Yup'ik region of western Alaska, based on field research among select communities (Fienup-Riordan 1982, TR70; Wolfe 1981, TR72). Fienup-Riordan covered coastal communities between Quinhagak and Scammon Bay, including the lower Kuskokwim and Johnson rivers (Fienup-Riordan 1982, TR70). The area displayed a high degree of integrity and continuity in traditional sociocultural systems. The coastal Yup'ik communities retained a strong commitment to subsistence activities. While this finding may not seem surprising to a twenty-first century observer, a prevalent view prior to work in the 1970s and 1980s was that the commitment to the subsistence economy would weaken with the growth of the cash economy. On the contrary, however, residents of coastal communities viewed monetary employment as supportive and subordinate to traditional hunting and gathering activities. People used income gained from part-time employment in the commercial fishing industry or local capital improvement projects to capitalize subsistence production, such as seal hunting, herring fishing, and bird hunting. They typically shared subsistence products through noncommercial networks. Societies defined and distinguished families by the quantity and quality of the gifts given and received. Subsistence uses provided important social and economic values. Residents were committed to preserving traditional harvest patterns. In general, residents perceived OCS oil and gas activities as a potential conflict with traditional ways of living, particularly if the activities had negative effects on coastal resources.

Wolfe described subsistence activities in six lower Yukon communities - Alakanuk, Emmonak, Kotlik, Mountain Village, Sheldon Point, and Stebbins (Wolfe 1981, TR72). Like the coastal villages to the south described by Fienup-Riordan, the lower Yukon River area was heavily dependent upon wild food harvests, including fish and marine mammal species potentially affected by OCS development. Wolfe applied a number of methodologies new to the ESP to document subsistence uses. He used systematic household surveys to estimate subsistence harvests at the household level. This methodology emerged as the standard approach for quantifying annual subsistence harvest levels by the state's subsistence research program, frequently in collaboration with MMS (Fall 1990; Fall and Utermohle, editors 1995, TR160; Fall, Miraglia, Simeone, Utermohle and Wolfe 2001, TR163). Braund and his colleagues applied the household survey methodology in MMS research in Barrow and Wainwright (Stephen R. Braund & Associates and ISER 1988, TR133; 1989a, TR135; 1989b, TR136; 1993a, TR149; 1993b TR147). Wolfe used the case method to illustrate examples of subsistence production units (multi-household networks linked by kinship principles). Maps documented locations of summer salmon fish camps, net sites, and seal hunting areas for each community. He provided examples of sharing and distribution of wild foods, illustrating how most social group members were involved in the subsistence sector as consumers. Residents expressed considerable concern about potential negative effects of OCS activities on the region's economic and cultural patterns in the event of an oil spill.

Davis provided a baseline description of 11 Iñupiat communities in Northwest Alaska, based on a literature review and key respondent interviews (Cultural Dynamics, Ltd. 1983, TR74). The report covered history, social organization, community infrastructure, economy, and socioeconomic trends. Davis documented persistent cultural ties between villages in the Northwest arctic. Contemporary social organization was a complex blend of traditional and modern cultural institutions. Family and kinship continued as major organizing features of contemporary Iñupiat life. Davis found kinship organized newer activities such as fire fighting, search and rescue, and commercial fishing as well as traditional activities. Families still taught children to perform roles in hunting, fishing, and processing wild foods. Sea mammal hunting and fishing were mainstays in the area, including beluga (Buckland), bearded seal (Kotzebue), and ringed seal (Kivalina). Partnerships between individuals represented an organizational form underlying certain subsistence pursuits. People circulated surplus subsistence products through customary trade patterns. Households typically mixed cash with subsistence activities. The economic organization integrated wild food production with wage employment. Davis observed that leaders in the NANA region showed a willingness to participate in future industrial development. Little information about potential OCS activities was as yet available at the local village level.

Braund and several co-researchers provided an update on socioeconomic and sociocultural conditions at Akutan, St. Paul, and St. George in the Aleutian and Pribilof islands area, based on a literature review and key respondent interviews (Stephen R. Braund & Associates, et al. 1986, TR118). Commercial seafood production remained central to the economy of the Aleutian and Pribilof islands area. Local governments (traditional councils and municipal governments) and village corporations were attempting to become more involved in the commercial seafood industry, historically controlled by outside interests. In Akutan, restrictions on the commercial king crab fishery significantly reduced the municipal tax base and local employment. Whereas residents previously worked in seafood processing, jobs created by the city and village corporations were preferred over processing, as were crew positions on crab and salmon boats. Subsistence production provided stability to households facing variable yearly incomes and inflationary household expenses. A few residents with skiffs harvested the majority of subsistence foods. They shared products widely within the community. Braund estimated that subsistence foods provided over half the protein requirements of Akutan residents. Subsistence activities were essential to the domestic economic strategies of Akutan residents. They needed a monetary income to pay for subsistence equipment. The social organization of the community was kin-oriented and characterized by informal kin-based relationships more than by formal institutions.

St. Paul and St. George were communities in socioeconomic transition following the federal closure of the local commercial fur seal industry. Local entities (municipal governments, IRA councils, village corporations, and school districts) were replacing federal entities in local affairs. They used federal funds for developing a new infrastructure for commercial fishing, marine support services, tourism, and oil and gas industries. Resident employment levels were currently high. Harvests of fur seals continued as a subsistence activity, providing food and materials to local families. However, a lack of local control threatened the continued viability of the fur seal harvest, a traditional community activity.

In 1986, Davis provided an update of socioeconomic and sociocultural conditions in the Kodiak and Alaska Peninsula areas, based on 97 focused discussions with 147 residents of 11 communities - Chignik Lake, Chignik Lagoon, Chignik Bay, Ivanof Bay, and Perryville (Alaska Peninsula) and Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions (Kodiak Island) (Cultural Dynamics, Ltd. 1986, TR121). With the exception of older Alaska Native residents and some new non-Native residents, most residents perceived that subsistence activities were in decline. The Kodiak Island villages had more local employment than Alaska Peninsula villages. The role of commercial fishing in village life varied greatly among communities, with commercial fishing in decline in many communities. While concern for increasing levels of OCS activity was evident in the 1970s, concern about increased sport industries and tourism was more evident in the 1980s. Tension was developing over property rights, the influx of newcomers, problems associated with trespassing, and the sale of land. In general, village residents appeared supportive of oil and gas development, perhaps related to declines in local commercial crab fisheries, increased dependence on cash, increased commercial salmon fishing costs, and the decreased opportunity to engage in fishing as a livelihood.

Endter-Wada and associates describe and analyze wild resource harvest patterns for seven communities in the Bristol Bay region - Chignik Lake, Dillingham, Naknek, New Stuyahok, Nondalton, Port Heiden, and Togiak (Endter-Wada, Robbins, Levine, Boxberger, Nohalty, Jorgensen, and McNabb 1992a, TR150). The researchers conducted interviews with 212 households and 98 institutional officials during August and September, 1990. A statistical analysis was conducted using two indices - percentages of households harvesting wild resource types (involvement in subsistence activities) and mean pounds of resources harvested per household (nutritional dependence). The analysis provided support for three subregional patterns - southern Alaska Peninsula (Pacific), northern Alaska Peninsula (Bristol Bay), and inland/upriver. Endter-Wada and her colleagues measured the size of three types of networks: food production (harvesting), food processing, and sharing. They found sharing networks to be more extensive than food production networks, which in turn were more extensive than food processing networks. Kinship was the primary basis for organizing labor in subsistence production and sharing subsistence products. Meanings of subsistence included cultural continuity (need and preference for naturally-occurring foods, sharing, relationship with place, family traditions, and recollections), the social and “recreational” pleasures of subsistence activities, and the contribution that subsistence makes to economic security and psychological well-being. The household network analysis suggests that subsistence is an important foundation of regional social structure, provides intra- and inter-community integration and cohesion, and helps to maintain Native cultural traditions. There was a positive integration of commercial fishing and involvement in subsistence at both the individual and household levels. The final report provides brief histories of the region’s cultural groups, demographic patterns, and commercial fisheries. Community profiles of each community are provided (ethnohistory, economy, institutions, and subsistence activities), followed by the statistical analysis of the Alaska Department of Fish and Game harvest information.

Subsistence and Economic Development

A number of MMS subsistence studies have examined relationships of economic development and subsistence patterns. Reckord provided a regional analysis of historic changes in the Copper River Basin, particularly changes associated with the construction of the Trans-Alaska Pipeline during the 1970s (Reckord 1979, TR7). This is one of the few MMS studies of an inland population, with a focus on the Ahtna around Copper Center. The report concluded that the pipeline period brought demographic changes, with substantial increases in the numbers of Euro-American migrants into the area from outside Alaska. Increased wage employment allowed young Ahtna living in Anchorage to return home. Households reported adjusting to a new mix of monetary employment and subsistence activities. Athabaskan potlatches continued in the area during the period. Residents thought that the standard of living had improved in the region, but many Ahtna also reported that they personally did not benefit from the improvements. Reckord noted increased personal stress associated with the rearrangement of status positions and traditional roles in the community related to uneven distribution of money (see also Reckord 1983). She found, for example, that prior to pipeline construction the elderly had the highest incomes due to their pensions while during pipeline construction young women with work experience could work on the pipeline or in the Native corporations. This change affected the status of elderly so that young workers earning large salaries "took over and changed the political and social roles once held by the elders" (Reckord 1979:206, TR7).

Luton identified potential disruptions to subsistence patterns from a hypothetical oil spill at Wainwright, an Iñupiat community in Northwest Alaska (John Muir Institute 1984d, TR91). The report assessed potential social and cultural ramifications of renewable resource disruptions of various magnitudes. While purely speculative, the analysis is of interest when compared with impacts experienced by Pacific Gulf Alutiiq communities following EVOS. The report anticipated several problems experienced in fact, including decreased wild food harvests due to perceived health risks from potentially tainted foods, increased purchases of commercial foods, adjustments of wild food distribution systems to provide preferential care for the elderly and infirmed, and protracted litigation over lost subsistence products.

In a study of *Subsistence-Based Economies of Coastal Communities in Southwest Alaska*, Wolfe and colleagues (Wolfe, et al. 1984, TR95) looked at a general theoretical question: what were the effects of increased money ("monetization") on village economies? The project focus was on money-subsistence relationships. The question was of interest to MMS because OCS activities might bring more money into villages. The research examined a view (current among some) that bringing jobs and money to villages would transform the local economy away from "traditional" subsistence activities and toward "modern" economic activities. That is, with more money, some theorized that subsistence would disappear over time. As an example of this view, a forecast by Harris, Palinkas, and Petterson (Impact Assessment, Inc. 1982, TR75) for the Alaska Peninsula and Aleutian areas projected an increase in monetary income from commercial fisheries and an eventual transformation of wild food harvests from a "means of subsistence" to "recreation." The *Subsistence-Based Economies* study compared Yup'ik communities in the Southwest region (Togiak, New Stuyahok) and Western region (Quinhagak, Goodnews Bay) with different levels of involvement in the "cash sector." The research looked for indicators that the level of money was associated with an apparent transformation of the village economy away from subsistence. The study concluded that money, in and of itself, did not transform village economies away from subsistence activities - there was little evidence of that happening in the four communities. Using a number of household cases as examples, researchers showed that people commonly invested money in ways to support traditional subsistence activities. While study results did not support the research hypothesis that growth of the cash sector of the economy might reduce the subsistence sector of the economy, the report concluded that other factors might transform village economies away from subsistence: restrictions on subsistence activities imposed by outside governmental regulations, increased competition for resources from outsiders, and (perhaps) stratification of the essentially egalitarian village social systems.

Alaska Consultants, Inc., Courtnage, and Stephen R. Braund & Associates (1984, TR101) provided regional and community socioeconomic descriptions of the Chukchi Sea communities of the North Slope Borough. The researchers organized this descriptive analysis to facilitate the future development of a methodology to assess potential localized impacts associated with OCS oil and gas economic and employment activities in the Barrow Arch lease sale area. They documented subsistence land use patterns of five villages: Point Hope, Point Lay, Wainwright, Atqasuk, and Barrow. Since the Prudhoe Bay petroleum development started in the 1970s, a new, distinct population group emerged on the North Slope: transient workers housed in industrial enclaves (Prudhoe Bay, Deadhorse, Kuparuk, and the Trans-Alaska Pipeline corridor area). There was little interaction between this group and the residents of North Slope traditional villages. Few village residents worked at Prudhoe Bay and few industrial workers visited the villages. In the villages, borough expenditures derived from property taxes at Prudhoe Bay supported nearly all wage employment. Authors of the report observed that wage employment appeared to affect the timing of subsistence activities, but that the use of motorized equipment usually offset this time contraint through reduced travel time to subsistence harvest areas.

Like Technical Report No. 95, a team of researchers (Petterson, McNabb, Nebesky, Young, Waring, Robbins, and Fienup-Riordan) provided in-depth descriptions and comparisons of subsistence patterns in three communities - St. Paul (Aleut), Alakanuk (Yup'ik), and Gambell (Siberian Yup'ik) (Impact Assessment, Inc. 1988, TR132). This study of village economies examined relationships between the subsistence and commercial use of resources. The findings indicated an integration of subsistence harvests and wage employment at the household level. Wage work did not appear to conflict with subsistence activities in the three communities and there were no clear relationships between income and subsistence activities at the household level. Compared with Alakanuk and Gambell, St. Paul households produced less subsistence foods and were more involved in wage employment (see also Stephen R. Braund & Associates et al. 1986, TR118). The report provided detailed descriptions of income sources in the case communities, primarily federal and state dollars funneled through capital projects, local government employment, and subsidized education, energy, and housing. The report discussed household developmental cycles at Gambell. The researchers found that the roles of households in subsistence production may change over time in association with cyclic changes in the age and composition of household members. They provided detailed information on capitalization in subsistence equipment.

Impact Assessment, Inc. researchers (1990c, SR8) discussed the interaction of oil development and subsistence patterns on the Arctic Slope, including perceived impacts on bowhead harvests leading to the 1986 Oil/Whalers Agreement and the reported near total displacement of caribou hunters from the Kuparuk/Prudhoe Bay field (see also Kruse, Baring-Gould, Schneider, Gross, Knapp, and Sherrod 1983, TR85). The displacement reported by Impact Assessment, Inc. researchers apparently occurred because of reported harassment of hunters by oil personnel, difficulties created by physical obstructions, hunters' beliefs that the area was closed to hunting, and local concerns that caribou in the area might be tainted. Another discussion of events leading to the Oil/Whaler Agreement and hunter displacement from caribou hunting areas is found in Pedersen, Wolfe, Scott, and Caulfield (2000).

Social Organization of Subsistence Production and Distribution

Family groups produce subsistence foods in rural Alaska using a type of social organization of production called a "domestic mode." Extended families serve as the principal "economic firms" in the subsistence sector, often involving multiple generations and lineal and collateral kin. Secondarily, subsistence production is the work of partnerships among members of different family groups, such as in whaling crews and caribou hunting parties. Hunting partners split shares among themselves for secondary distribution within extended family networks.

Recognition of the kinship-based organization of subsistence activities appeared in the earliest MMS reports. In an early synthesis of materials on sociocultural systems in the Bering Strait-Norton Sound area, Ellanna (1980a:36, TR54) stated that:

> In the small, rural, primarily Native communities, kinship has remained the basis of social organization and is a key organizing factor in subsistence activities. This type of social organization will continue in the foreseeable future and will be important in enabling individuals to adapt to social, economic, and political change. This same form of social organization has remained primary among Nome Natives that have originated from village areas and therefore must be considered as an important functional system in Nome today.

Ellanna provided examples of kinship-based organizations of the early historic period in the Norton Sound-Bering Strait area, including the marine mammal "hunting crew" led by an *umealiq* (whaling captain), and "local families" (extended family groups) organized through real and fictive kinship relations. A division of labor by age and sex was common in subsistence activities, with adult men primarily responsible for harvesting and adult women primarily responsible for processing, preserving, and preparing wild foods.

Numerous researchers have provided examples of social groups involved in subsistence production (see Ellanna 1983; Ellanna and Sherrod 1984; Magdanz, Utermohle, and Wolfe 2001; Schichnes and Chythlook 1988; Stanek 1985; and Worl and Smythe 1986, TR125). Wolfe et al. (1984, TR95) included multiple examples illustrating the composition of subsistence production groups for salmon, caribou, and seals for Yup'ik communities in southwest and western Alaska. Researchers were surprised to find that production groups differed substantially by species. There appeared to be substantial fluidity in the organization of economic firms for subsistence production across species within a single community using kinship and partnerships.

During this past century, the domestic mode used in subsistence production has existed alongside other institutional forms of production in rural communities. For example, the *economic cooperative* was a common institutional form for organizing village retail stores, commercial fish buyer-processors, and village electrification systems. *Corporations* commonly were used by residents for managing Alaska Native village and regional assets (for-profit corporations), as well as for providing health, housing, and other social services to Native communities (non-profit corporations). *Associations* were common institutional forms for quasi-political functions, such as resource co-management entities like the Alaska Eskimo Whaling Commission and the Alaska Native Harbor Seal Commission. *Tribal governments* (organized under the Indian Reorganization Act) and *municipal governments* (organized under state law) commonly were involved in economic activities. In addition to these local entities were corporate and governmental organizations administered from outside the local area, including petroleum, timber, and mining companies and state and federal government agencies. People rarely used these "modern" institutional forms, introduced to rural Alaska primarily during the twentieth century, at the local level for subsistence production and distribution. With few exceptions (e.g., Pribilof Islands subsistence fur seal hunt), the cooperative, corporation, and association have neither replaced nor penetrated the domestic mode of subsistence food production.

The systematic documentation of the social organization of subsistence production and distribution has proved difficult in practice for several reasons. First, no single methodology emerged as a standard for documenting subsistence work groups and distribution networks (as did the retrospective household survey for documenting subsistence harvest levels, described below). Second, researchers observed the social organization of subsistence to be complex and fluid (more so than other economic institutions), and systematic measurement was difficult and expensive. Third, documenting social groups and networks was more personally intrusive than documenting other aspects of subsistence (such as geographic areas or harvest levels), because of the need to gather names of people, identify links of kinship and affiliation, and learn personal histories of alliance and conflict. While people place great value on subsistence, they often fail to see the utility of gathering detailed, personal information under the auspices of subsistence research.

Customary Use Areas and Common Property Systems

Subsistence harvests typically occur within customary use areas surrounding rural villages. Numerous researchers mapped customary use areas during the 1980s (Caulfield and Pedersen 1981; Caulfield 1983; Kari 1983; Pedersen, Coffing, and Thompson 1985; Pedersen 1990; Wright, Morris, and Schroeder 1985). The Subsistence Division of the Alaska Department of Fish and Game (2002b) converted many subsistence use area maps to electronic formats for computerized analysis. Two MMS projects collected inventories of sites used for subsistence by Nuiqsut residents (Impact Assessment, Inc. 1990c, SR8) and by Kaktovik residents (Impact Assessment, Inc. 1990d, SR9). They linked harvest patterns by species to sites on maps. The reports discussed historic relationships of subsistence land use in the "hinterland" areas surrounding "anchor" communities that offered special employment opportunities, such as whaling stations, fur trading posts, DEW line employment sites, and schools. As described below, Braund and his colleagues collected detailed land use information for Barrow and Wainwright (Stephen R. Braund & Associates and ISER 1988, TR33; 1989a, TR135; 1989b, TR136; 1993a, TR149; 1993b, TR147), an effort continued by the North Slope Borough, which now maintains a geographic information database for the region.

In rural areas, customary law regulates access within customary use areas such as subsistence fish camps, trap lines, set net sites, and hunting areas (see Wolfe 1981, TR72). Customary law manages access but not ownership of wild fish and game. In Alaska Native cultural traditions, wild animals cannot be "owned," as they have their own spiritual owners and controllers. Animals allow themselves to be taken by humans when treated properly following local traditional rules. The state and federal governments do not usually formally recognize local systems of customary law regulating access to use areas. Rather, state and federal governments recognize land ownership as the basis for regulating access to lands and waters. With the exception of posted private property and lands placed off limits to the public for security reasons, all lands are considered by the state and federal government to be open to public access (albeit commonly with restrictions on the method of access and requirements for permits). The state and federal government manage access to fish and game primarily through harvest restrictions. In Alaska, the state and federal governments legally define wild stocks and populations as “public resources,” managed by the government for public values. They treat wild fish and game as “common property” for the “common use.” Wild resource harvests are subject to regulation by state and federal government. Alaska’s constitution mandates wild fish and game be “developed” for “sustainable” and “common” use. Within such a mandate, property rights to fish and game take the form of rights of harvest granted by either the state or federal government (depending on authority over species), typically through hunting and fishing permits.

Wild Food Production, Distribution, and Use

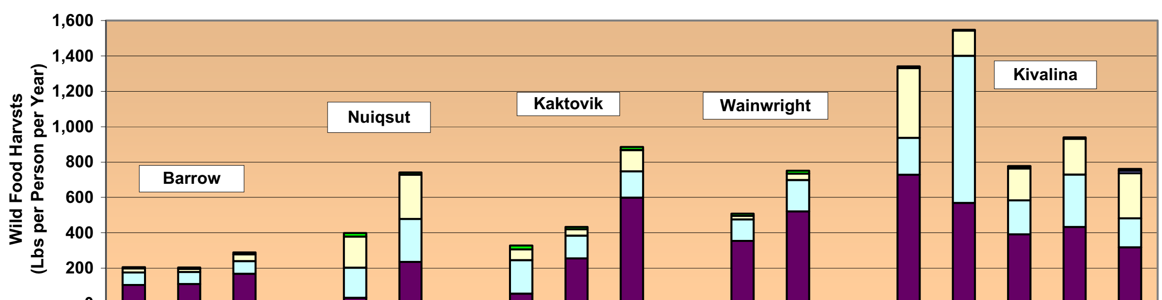
Key measures of subsistence patterns in a community or region include levels of wild food production, distribution, and use. A number of MMS subsistence projects measured wild food production, distribution, and use (Stephen R. Braund & Associates and ISER 1988, TR133; 1989a, TR135; 1989b, TR136; 1993a, TR149; 1993b, TR147; Fall and Utermohle, editors 1995, TR160; Wolfe 1981, TR72). These projects applied systematic household survey methods similar to those used by the Alaska Department of Fish and Game Subsistence Division to document subsistence patterns during a single study year. The principal difference in approaches involved the frequency of reporting, with the studies conducted by Stephen R. Braund & Associates and ISER involving multiple contacts over the course of the year while the other studies relied on respondent recall of an annual harvest in a single interview. Researchers commonly implemented the harvest assessments in collaboration with local Alaska Native organizations. Because harvest, distribution, and use information was gathered using standardized formats (e.g., household surveys, harvest calendars, or interview protocols), the data could be combined in analysis with information from other research projects, especially subsistence information contained in the State’s computerized Community Profile Database (Alaska Department of Fish and Game, Division of Subsistence 2002a).

Prior to the mid-1980s, federal-state harvest permit and license systems did not adequately document wild food production, distribution, and use in rural Alaska areas (Fall 1990). The literature provided little systematic information on wild food harvest levels. Such record systems were adequate for documenting harvests by urban residents, but were not reliable information sources for small, remote villages. Peter Craig demonstrated the situation in a literature review on subsistence fisheries in coastal Arctic communities (Atqasuk, Barrow, Kaktovik, Nuiqsut, Point Lay, and Wainwright) (Craig 1987, TR129). He identified from the literature some basic characteristics of subsistence fisheries, including general species (whitefish, char, grayling, and some salmon), harvest timing, and some harvest locations. However, information on harvest levels was extremely poor. While the report estimated a total annual harvest of about 210,000 pounds of fish, the information was derived from spotty observations - some over 15 years old served as the basis of the estimate.

Researchers conducted an exceptional series of harvest assessments in Barrow (1987, 1988, and 1989) and Wainwright (1988 and 1989) to provide quantitative information on subsistence harvests across all species (Stephen R. Braund & Associates and ISER 1988, TR133; 1989a, TR135; 1989b, TR136; 1993a, TR149; 1993b, TR147). The goal was to produce for the first time an accurate contemporary picture of total wild food harvests for the two Arctic Slope communities. Braund and his colleagues collected the information through systematic interviews with households (stratified by level of productivity) at regular intervals in collaboration with the North Slope Borough. Chapter Seven discusses this group of studies in more detail. The studies produced a wealth of detailed information of harvests by species, month, and quantity (numbers and pounds). In addition, the researchers compiled detailed maps of subsistence use areas, showing harvest sites by species (marine mammals, other terrestrial mammals, caribou, fish, birds) during each year of the study, placed within the context of the community's long-term use area.

Figure 6.2 shows an example of findings, displaying harvests at Barrow and Wainwright by year and species category, alongside harvests at Nuiqsut, Kaktovik, and Kivalina documented with comparable methodologies (Alaska Department of Fish and Game, Division of Subsistence 2002a; Burch 1985). The quantitative information depicts subsistence patterns at a level of precision not achievable through key respondent interviews or literature reviews.

Figure 6.2: Wild Food Harvests for Five Arctic Communities, Pounds per Person per Year



	1987	1988	1989	1985	1993	1985	1986	1992	1988	1989	1964	1965	1982	1983	1992
Birds and Eggs	7.41	7.42	9.76	20.04	11.98	21.25	12.26	16.83	12.18	15.41	2.85	0.14	3.41	5.22	10.79
Vegetation	0.07	0.06	0.44	0.42	1.1	0.07	0.3	1.18	0	0	6.78	3.89	10.24	4.05	14.03
Fish	22.7	16.93	39.28	176.13	250.62	60.65	35.79	118.91	19.97	37.15	393.93	141.87	181.31	200.85	253.29
Land Mammals	70.9	68.64	71.18	169.28	242.03	188.76	128.45	149.55	120.17	178.18	209.86	832.65	190.85	296.99	165.25
Marine Mammals	104.85	110.77	168.5	33.31	236.01	57.24	256.02	599.13	355.59	520.5	727.82	569.13	392.25	433.04	318.02

For instance, wild food harvests at Barrow (206 pounds, 204 pounds, and 289 pounds) were at levels that exceeded the Recommended Daily Allowance for protein for the community's population (133 percent, 132 percent, 187 percent, respectively). These figures applied to all households in Barrow, of which 61 percent were Iñupiat in 1988. This means that the per capita figures for Native households alone were much higher. By weight (pounds per capita), major wild food categories at Barrow in 1987 were bowhead whale (61.2 pounds), caribou (57.9 pounds), walrus (26.5 pounds), whitefish (16.7 pounds), bearded seal (13.7 pounds), and other seals (5.7 pounds). Subsistence productivity was lowest from November through April and highest from May through October. Harvests of some species were extremely specialized, with about six families producing most of the subsistence fish in Barrow. One-third of the 36 Barrow whaling crews re-covered their whaling boats in 1987, and with an average of five walrus skins per boat, over 70 skins were used.

In addition to this increased precision in describing subsistence production, new research questions were raised by the quantitative assessment, such as why harvests at Barrow were the lowest among surveyed arctic communities (see Figure 6.2). Researchers could explore such questions through comparisons of subsistence information of wider sets of communities, as more harvest assessments became available. For example, as shown in Figure 6.3, Wolfe and Walker (1987) reported wild food harvest levels in rural populations (375 pounds per person per year as a statewide average) were substantially larger than those of urbanized populations (22 pounds per person). Compared with Pacific Gulf populations, Barrow's harvests were not low. In Figure 6.3, wild food harvests by Arctic region populations are ranked high among rural areas, while harvests by Pacific Gulf communities ranked lower.

One of the first statistical analyses of community-level wild food harvests concluded that subsistence productivity increased with the percentage of Alaska Natives in a population and decreased with per capita household income (Wolfe and Walker 1987). Researchers confirmed these relationships with subsequent analyses of harvest information collected in Gulf of Alaska communities following the *Exxon Valdez* oil a population (Figure 6.4). The lowest harvests occurred in predominantly non-Native cities like Valdez and spill (Fall and Utermohle, editors 1995, TR160; Fall et al. 2001, TR163), shown in Figures 6.4 and 6.5. In Pacific Gulf communities, wild food harvest levels were strongly associated with the cultural composition of Kenai, the highest harvests in predominantly Alaska Native villages, with harvests in "towns" (Cordova and Kodiak) intermediate, though toward the lower end of the continuum. Wild food harvests were highest in Pacific Gulf communities with lower per capita incomes, and wild food harvests were lowest in cities and towns with higher per capita incomes (Figure 6.5).

Figure 6.3: Wild Food Harvests by Alaska Area, 1990s

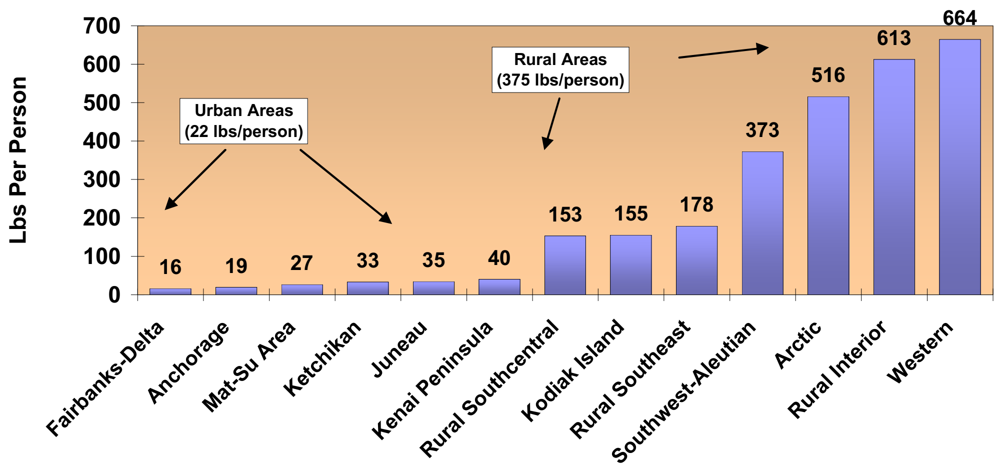


Figure 6.4: Wild Food Harvest Levels by Cultural Composition of Communities, Gulf of Alaska Area, Circa 1991-93

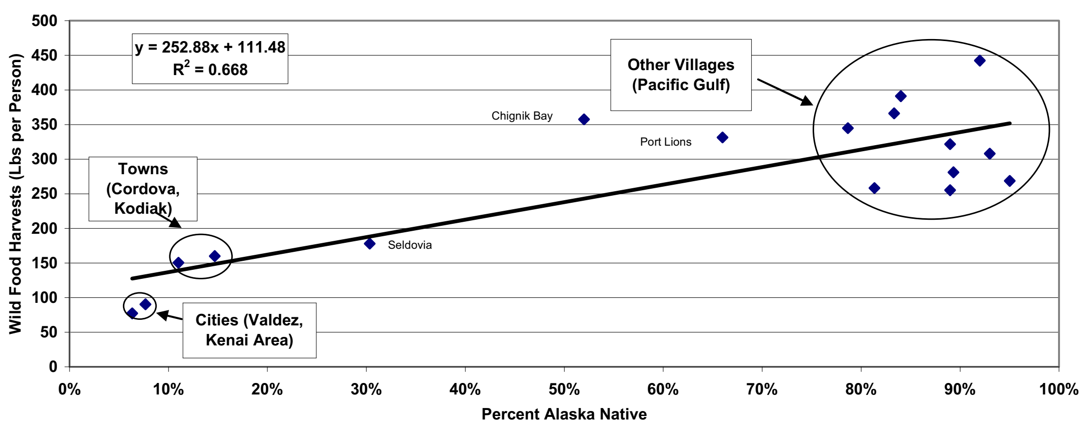
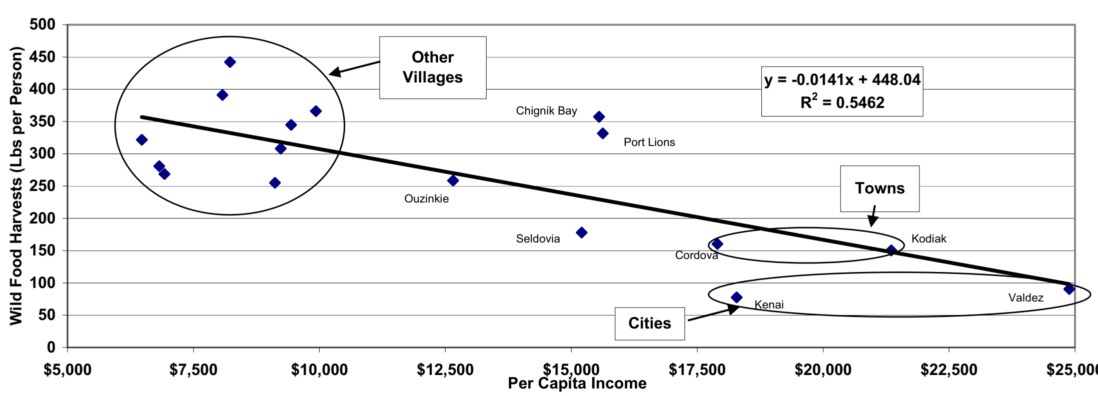


Figure 6.5: Wild Food Harvests of Community by Per Capita Income in Community, Gulf of Alaska Area, Circa 1991-93



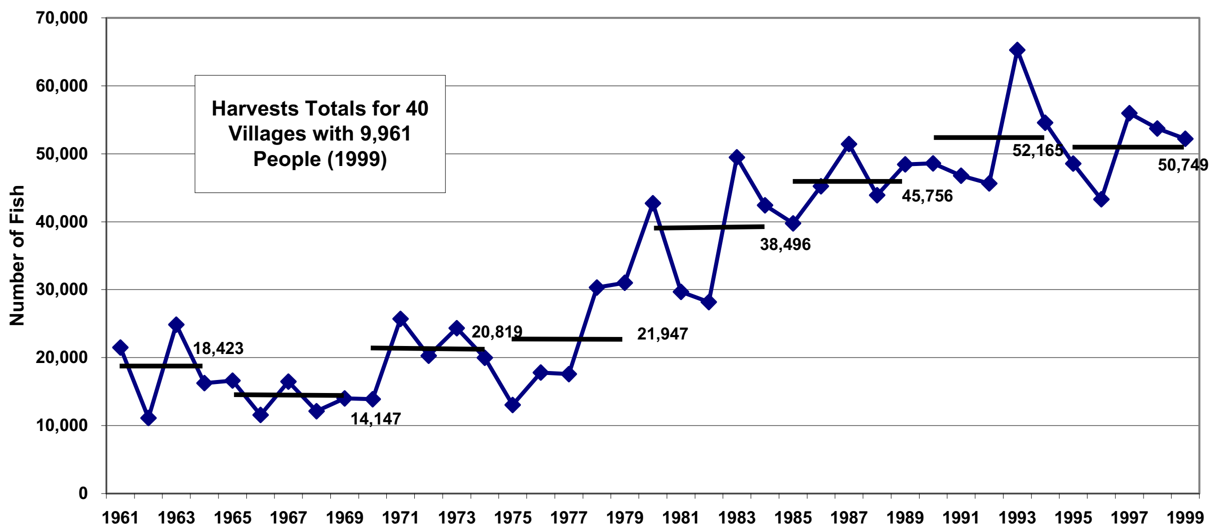
Such quantitative findings raise questions regarding relationships between the subsistence sector of the economy and the cash sectors of the economy. As discussed above and in the next chapter, key respondent, survey research, and participant observation methodologies have documented household cases illustrating positive relationships between monetary income and subsistence harvests within a community. Households commonly used monetary earnings to capitalize harvest activities, leading to increased subsistence productivity. Yet at the community level, higher mean per capita incomes were associated with decreased harvests of wild foods. Wolfe and Walker (1987) and Fall et al. (2001, TR163) interpreted these community-level relationships in terms of a wider set of historic, demographic, cultural, and political factors. Increased in-migration by non-Natives into an area appeared to lead to a number of changes: a shift in the dominant cultural orientation of the population (including a shift away from wild foods); increased competition for wild resources between sport, commercial, and subsistence interests; increased regulatory restrictions on subsistence uses; and, depletions of local wild fish stocks and populations. economic development frequently triggered increased in-migration by non-Natives. During the late twentieth century, spending of state oil revenues and federal public grants stimulated in-migration (Williams 2000).

Such an analysis points to indirect effects on subsistence productivity in Alaska by economic booms, such as those associated with oil development during the 1970s and 1980s. As an area's demographic profile shifts toward predominantly non-Native populations, subsistence productivity appears to decrease. Researchers documented these effects in urban-rural fringe areas (such as the inland Copper Basin) distant from OCS and onshore petroleum activities (Fall 1985). The apparently contradictory findings of a positive and a negative relationship between the cash and subsistence economies in fact are the result of two different levels of analysis, the household and the community. The explanations given above for each level of analysis operate simultaneously. The answer to the question of whether there is a positive or negative relationship between the cash and subsistence economies therefore may depend on whether you are looking at the household or community level.

Other research questions raised by the quantitative information in Figure 6.2 pertain to variability and trends in subsistence production. Burch (1985) attributed the substantial decrease in subsistence production in Kivalina between the 1960s and the 1980s to reduced dog food harvests, as snowmachines replaced sled dogs. Pedersen, Wolfe, Scott, and Caulfield (2000) associated the substantial between-year differences in wild food harvests for Nuiqsut and Kaktovik to variable bowhead whale harvests. Hunters attributed missed bowhead harvests on certain years to disturbance from offshore oil exploration (ibid.). An analysis comparing subsistence harvest variability across several Alaska regions presented information that subsistence harvests in Arctic communities displayed more between-year variability than Pacific Gulf communities (Wolfe, Scott, Pedersen, and Caulfield 2000).

There are few time series of subsistence harvests for communities or areas. The lack of time series information makes it more difficult to assess single-year observations. Figure 6.6 provides an example of a time series, depicting subsistence chinook salmon harvests from 1961 to 1999 in the Yukon River drainage, based on annual harvest assessments by the Alaska Department of Fish and Game (Alaska Department of Fish and Game, Division of Subsistence 2002c). Researchers attribute the substantial between-year variation in part to yearly chinook run sizes and harvest conditions. In addition, five-year averages suggest an overall increase in subsistence chinook harvests from 1965 through 1995. A number of factors may account for these trends, including increasing human populations in the Yukon River drainage and shifts in targeted salmon species. Trends in subsistence production for other species and areas are as yet undocumented (but see Wolfe 2001 for harvest trends for harbor seals and sea lions from 1992 through 2000).

Figure 6.6: Subsistence Chinook Harvests, Yukon River Drainage, 1961-1999 and Five-Year Average



MMS subsistence research following EVOS (1991, 1992, and 1993) collected time series information on the *distribution* and *use* of wild foods, in addition to *harvest* (Fall and Utermohle, editors 1995, TR160; Fall et al. 2001, TR163; see also Langdon and Worl 1981). Information was collected through systematic household surveys in Prince William Sound (Chenega Bay, Cordova, Tatitlek, and Valdez), Lower Cook Inlet (Kenai, Nanwalek, Port Graham, and Seldovia), Kodiak Island (Akhiok, Karluk, Kodiak City, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions), Alaska Peninsula (Chignik Bay and Chignik Lake), and the Arctic (Kaktovik, Kivalina, Kotzebue, and Nuiqsut). In Chapter Eight, Fall discusses the results of this research pertaining to the question of the effects of the spill on subsistence. Also of interest are the results pertaining to the general questions of how people produce and distribute wild resources. Researchers measured the extent to which households gave or received wild resources during the survey period. The researchers designed these questions to provide quantitative measures of the distribution of wild foods, recognizing that the local non-commercial distribution system was an important feature of the subsistence sector. Past harvest surveys had documented that wild foods commonly were produced by specialists (a subset of all households), and subsistence products were distributed to other households in a community. Survey questions also asked if a household *used* a wild resource during the survey period, a rough measure of consumption. A comparison of household *harvest* and *use* served as an additional measure of distribution among producers and consumers. The post-spill information could be analyzed with information collected during pre-survey years by the Division of Subsistence of the Alaska Department of Fish and Game.

Figures 6.7 and 6.8 illustrate relationships between *production* and *distribution* of wild foods (Fall et al. 2001, TR163). As shown in Figure 6.7, subsistence productivity was not equivalent among all types of households in four Alutiiq villages near the spill (Chenega Bay, Nanwalek, Port Graham, and Tatitlek). Subsistence productivity increased with the developmental stage of a household, measured by the ages of household heads – developing households (20-30 years), mature households (40-50 years), and households with active elders (over 60 years old). Subsistence productivity was lowest in households of single mothers, retired elders, and inactive single persons. Researchers attribute these relationships to a household developmental cycle involving the household's labor force composition, level of skills, degree of social responsibilities, and incomes. Wild food harvests fell for most household types during the first two post-spill years and rebounded the third year.

Figure 6.8, depicts the distribution of wild foods for communities and households, measured as the percentage of available species reported *received* by a household during the survey year. As shown in Figure 6.8, most household types received from 20 to 25 percent of available species during the pre-spill year. During the first post-spill year, distribution of wild foods fell across all household types, showing that harvest disruptions were widely felt in a community. However, during the first two post-spill years, the least productive households in the community - households of single mothers, retired elders, and active singles - received a disproportionately greater amount of wild foods. It appears that during the disaster, community residents adjusted the distribution network in the subsistence sector to provide support for the most dependent segment of a community. Household measures of distribution and use were able to document these relationships and effects. Chapter Eight provides more details on the documentation of subsistence impacts.

Figure 6.7: Wild Food Harvests by Household Type, Four Alutiiq Villages Nearest the Oil Spill, Pre-Spill Year to 1993

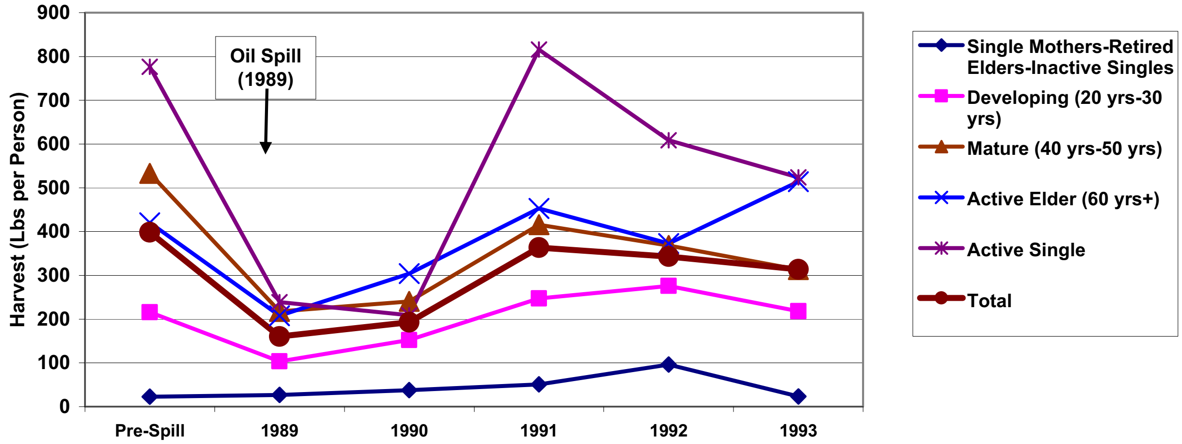
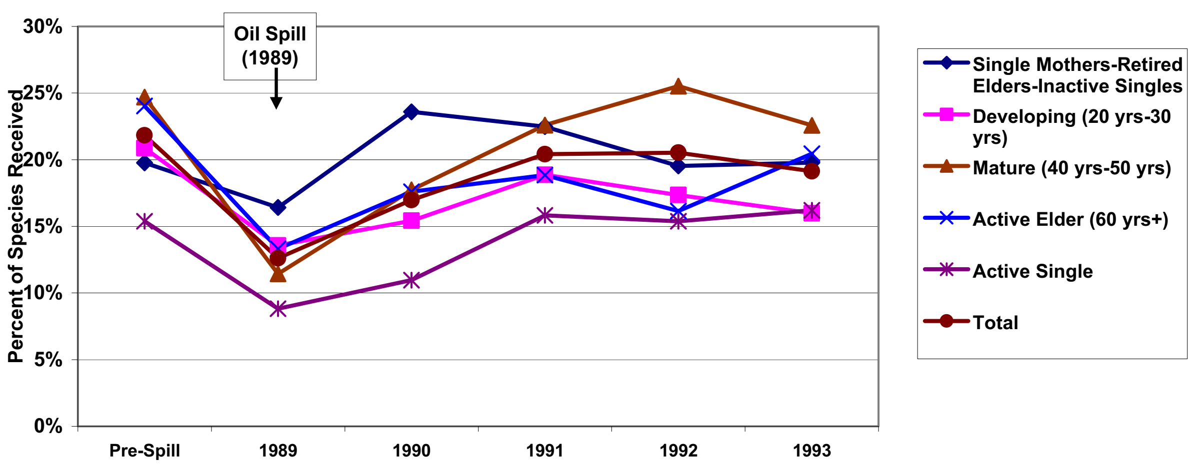


Figure 6.8: Wild Foods Received by Household Type, Four Alutiiq Villages Nearest the Oil Spill, Pre-Spill Year to 1993



Key Findings

Viewed from the vantage point of early in the twenty-first century, it may at first seem trivial to say that a key finding of ESP is the persistence of subsistence as an important component of the economy, society, and culture of Alaska's coastal communities. After all, as demonstrated in Chapter One, those designing the ESP recognized the importance of both the "traditional" and the "modern" systems in Alaska (Peat, Marwick, Mitchell, URSA, CCC/HOK and Dames & Moore 1978:2, TR1). Yet ESP research contributed to a crucial change in perspectives from that articulated in the late 1970s. For many at that time, the words “traditional” and “modern” reflected a presumption that Native people in Alaska were undergoing a transition from one state, “traditional”, to another, “modern.” Subsistence research has changed our perspective to one of dynamic adaptation, in which the values and kinship relations underlying an active use of subsistence resources remain strong while the methods of production have changed in response to growth of the cash economy and the role of formal institutions.

Subsistence research has also underscored the vulnerability of subsistence to both large scale disruptions (i.e., oil spills) and cumulative small scale disruptions (e.g., displacement from hunting areas). Chapters Seven and Eight discuss these findings in more detail.

A key “finding” of a quite different sort concerns the evolution of research methods. Over the course of more than a decade of studies, researchers sponsored by the ESP and by the Division of Subsistence in the Alaska Department of Fish and Game have developed an approach which combines ethnographic and survey research methods. The approach has allowed researchers both to understand the relationships underlying observed changes in subsistence patterns and to generalize and compare quantitative estimates of subsistence activities, harvest levels, and uses.

Chapter 7: Subsistence Harvest Patterns and Oil Development on Alaska's North Slope

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Introduction

This chapter examines relationships between petroleum development and subsistence using the North Slope of Alaska as a case study. The first section describes the traditional patterns of subsistence on the North Slope. Next is a description of the regional history of petroleum activity followed by a brief description of contemporary North Slope settlement patterns, regional economy, and land status. After identifying the ESP technical reports relevant to North Slope subsistence uses and introducing a set of research questions, the following sections of the chapter examine the research questions in light of the relevant research. The final section of the chapter looks more closely at planning and mitigation activities.

Traditional Subsistence Activities

Alaska's North Slope stretches from the crest of the Brooks Range north to the Arctic Ocean, east to the U.S. and Canada border, and west along the Chukchi Sea – an area of about 81,000 square miles (see Figure 7.1). This area is rich in wildlife resources such as caribou, Dall sheep, muskox, seals, bowhead and beluga whales, migratory waterfowl, whitefish, and arctic char. The area and its natural resources have sustained human occupation for thousands of years. Archaeological records show that predecessors of the present-day Iñupiat population have been on the arctic coastal plain for nearly 6,000 years (Lobdell 1986) and inland for up to 12,000 years (Kunz and Rainer 1995).

Prior to the end of the nineteenth century, the Iñupiat were semi-nomadic, and only seasonally occupied semi-permanent settlements at or near key resource harvesting sites across the North Slope. Historic settlement and subsistence patterns on the North Slope have been described extensively by Simpson (1855); Murdoch (1892); Ray (1885); Leffingwell (1919); Jenness (1957); Sonnenfeld (1956); Gubser (1965); Oswalt (1967); Spencer (1959); and Schneider, Pedersen and Libbey (1980). Worl Associates (1978a, TR9) synthesized these and other sources in the early ESP technical report, *Beaufort Sea Region Sociocultural Systems* and is a primary source for much of the following discussion.

Figure 7.1: Alaska's North Slope
Legend
Communities
Military Sites
Select Oil Facilities
Alaska Maritime Refuge
Arctic National Wildlife Refuge
Borough/REAA (Regional Educational Attendance Area) Boundaries
Gates of the Arctic National Park and Preserve
National Petroleum Reserve - Alaska
Sources: Bureau of Land Management, Department of Natural Resources, Environmental Protection Agency, and Fish and Wildlife Service
0 50 100 200 Miles
Map Area
Arctic Ocean
Beaufort Sea
Chukchi Sea
Barrow
Elson Lagoon
Dease Inlet
Point Franklin
Peard Bay
Wainwright
Icy Cape
Atqasuk
Northwest NPR-A
Teshekpuk Lake
Northeast NPR-A
National Petroleum Reserve - Alaska
Fish Creek
Colville River
Umiat
Alpine Facility
Northstar Facility
Nuiqsut
Kuparuk River
Prudhoe Bay
Deadhorse
Sagavanirktok River
Camden Bay
Canning River
Staines River
Kaktovik
1002 AREA
Demarcation Point
Arctic National Wildlife Refuge
ALASKA
CANADA
YUKON FLATS REAA
Arctic Village
Venetie
Wiseman
Anaktuvuk Pass
BROOKS RANGE
NORTH SLOPE BOROUGH
YUKON-KOYUKUK REAA
NORTHWEST ARCTIC BOROUGH
Gates of the Arctic National Park and Preserve
Point Lay
Alaska Maritime Refuge
Kukpowruk River
Cape Lisburne
Point Hope
Cape Thompson
Kivalina
Noatak
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North Slope Iñupiat consisted of two interrelated groups. The *Taġiugmiut* primarily harvested sea mammals, including the bowhead whale, and the *Nunamiut* primarily harvested caribou. The Taġiugmiut occupied several major settlements and many smaller satellite settlements and campsites on the Chukchi Sea coast between present day Point Hope and Barrow. They - and their inland Nunamiut relatives - occupied numerous campsites and at least three trading centers along the Beaufort Sea coast as far east in Alaska as present day Kaktovik (Worl Associates, 1978a:9, TR9). The Taġiugmiut's choice of location at any time of the year had much to do with sea ice. In the spring, they established whaling camps near open water leads that formed off the coast of permanent coastal settlements. Whaling camps could be several miles out on the ice (ibid., 14). Following the whaling season, some Taġiugmiut would move inland to camps along rivers while others would base hunts for walrus and bearded seal from the village. Still other hunting groups might range along the coast hunting ducks or gathering eggs, or travel inland hunting caribou. When the ice formed again in the fall, the Taġiugmiut returned to their permanent coastal settlements. Worl Associates based the following Taġiugmiut seasonal round (Table 7.1) on the work of Larsen and Rainey (1948):

Table 7.1: Traditional Taġiugmiut Seasonal Round

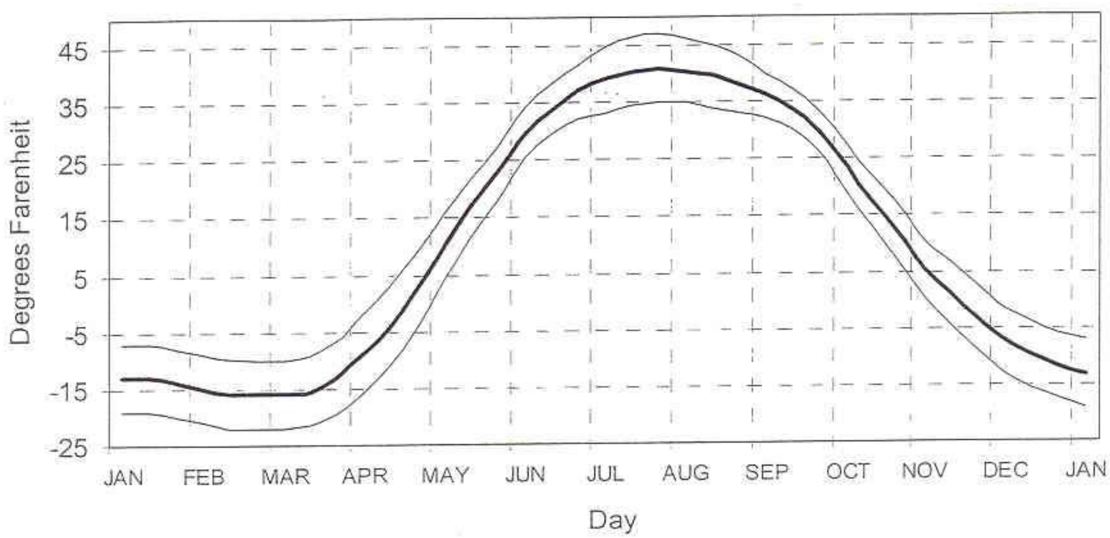
Time of Year	Ice Condition	Activity
Fall	New ice forms	Return from summer dispersion; await formation of "slush ice" to begin series of fall and winter religious ceremonies; little hunting.
November-April	Pack ice solid	Small hunting groups obtain seal through breathing holes and seal nets; polar bears also present on pack ice.
January	Pack ice solid	Jigging for tomcods and smelt through ice.
February - March	Pack ice solid	Crab obtained through ice (Point Hope only).
March- May	Offshore lead opens in ice	Crews on pack ice, one to three miles from shore awaiting bowhead whales; some seals, belugas, and migratory waterfowl hunted.
May – June	Ponds appear on ice	Ponds appear usually at seal breathing holes where seals now crawl out on the ice; after whaling feast, men stalk seals on ice.
June - July	Ponds appear on ice	Larger ponds open; hunters hide behind walls of ice blocks they have constructed; bearded seals harpooned as they rise or swim close to shield; some walrus killed by same method.
July	Appearance of ice floes	Herds of walrus rest on beach and are killed there or as they crawl up out of the water.
(Summer)	Ice disappears	Villagers disperse to summer camps along the shore where fish and belugas are taken from nets; others visit rookeries for birds and to gather eggs; some hunt caribou; other villagers travel to trading centers.

The more inland-oriented Nunamiut did not have permanent communities. Each group occupied a defined territory. The Nunamiut organized their subsistence activities around caribou movements, ranging from the interior tundra to the mountains (Worl Associates, 1978a:33, TR9). In the spring and the fall, Nunamiut took advantage of concentrations of caribou migrating through mountain passes to hunt in cooperative groups using drive lines, locating main encampments and caches nearby. In the later fall and winter, the larger groups dispersed to scattered camps. In the summer, Nunamiut groups aggregated in camps at trading centers near the coast, such as Kaktovik and old Nuiqsut (ibid., 34; Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9).

A particularly important feature of traditional seasonal harvest cycles was that, at any one point in time, a hunter/fisher had a range of options to fall back on should a particular resource not be available or abundant. Options were limited by environmental conditions, however. In addition to sea ice, low temperatures, fierce winter storms, and limited or no sunlight constrained travel. Generally, early December through January (and sometimes well into February) was typically a relatively quiet time for subsistence harvesting activity. Hunters faced temperatures as low as -40^{o}F and scant daylight (Figures 7.2 and 7.3). At that time of the year, hunters typically focused on equipment maintenance and repair in preparation for wide ranging harvest activities such as furbearer and caribou hunting and the upcoming spring whaling season. Beginning in late spring, when the snowmelt was almost over and dog sled travel was difficult (usually late May through early June), area residents gradually began to travel the coast by boat. They first travelled by small boat inside the barrier island lagoon systems. Then, once rivers were ice-free, they travelled by boat inland up the rivers to established camps. In late June or early July as the seasonal icepack in the Arctic Ocean receded from the coast, they travelled along the coast, outside the barrier islands. Iñupiat hunters adjusted to the whims of wandering caribou and took advantage of seasonal opportunities to hunt upriver or along the coasts. Traditional subsistence land use areas were huge, covering virtually all of the North Slope. Pedersen (1979) interviewed Iñupiat hunters in the late 1970s and asked each hunter to map his cumulative harvest use area over the course of his lifetime (Figure 7.4).

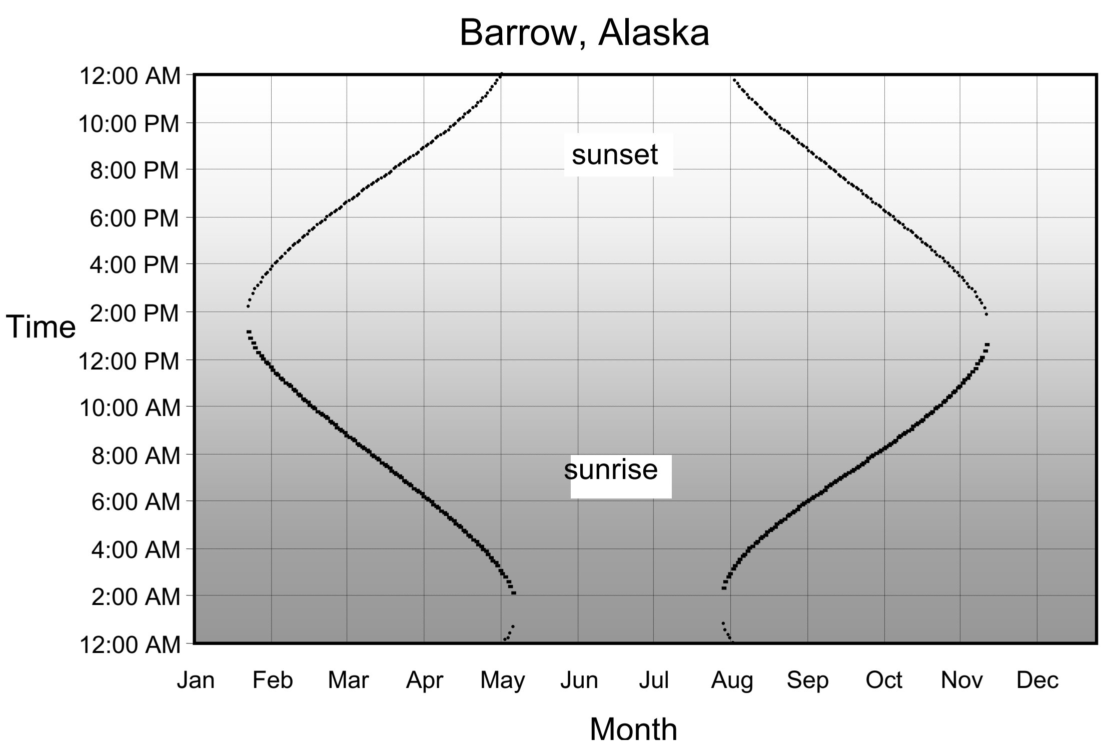
Early explorers, and later anthropologists, visiting North Slope communities remarked on the regular seasonal subsistence harvest pattern, the dietary breadth of the Iñupiat and the uniform use of many resources across the vast region. Seals, whales, waterfowl, caribou, and fish were reported as central resources to coastal residents in the nineteenth and first half of the twentieth centuries (Simpson 1855; Murdoch 1892; Ray 1885; Leffingwell 1919; Jenness 1957; Sonnenfeld 1956; Oswalt 1967; Spencer 1959; Brower 1942).

Figure 7.2: Daily Mean, Maximum and Minimum Temperatures for Barrow, Alaska



Source: National Climatic Data Center/NESDIS/NOAA. Barrow, Alaska.

Figure 7.3: Annual Round of Sunrise and Sunset at Barrow



Source: Astronomical Applications Department, U.S. Naval Observatory, Washington, D.C.

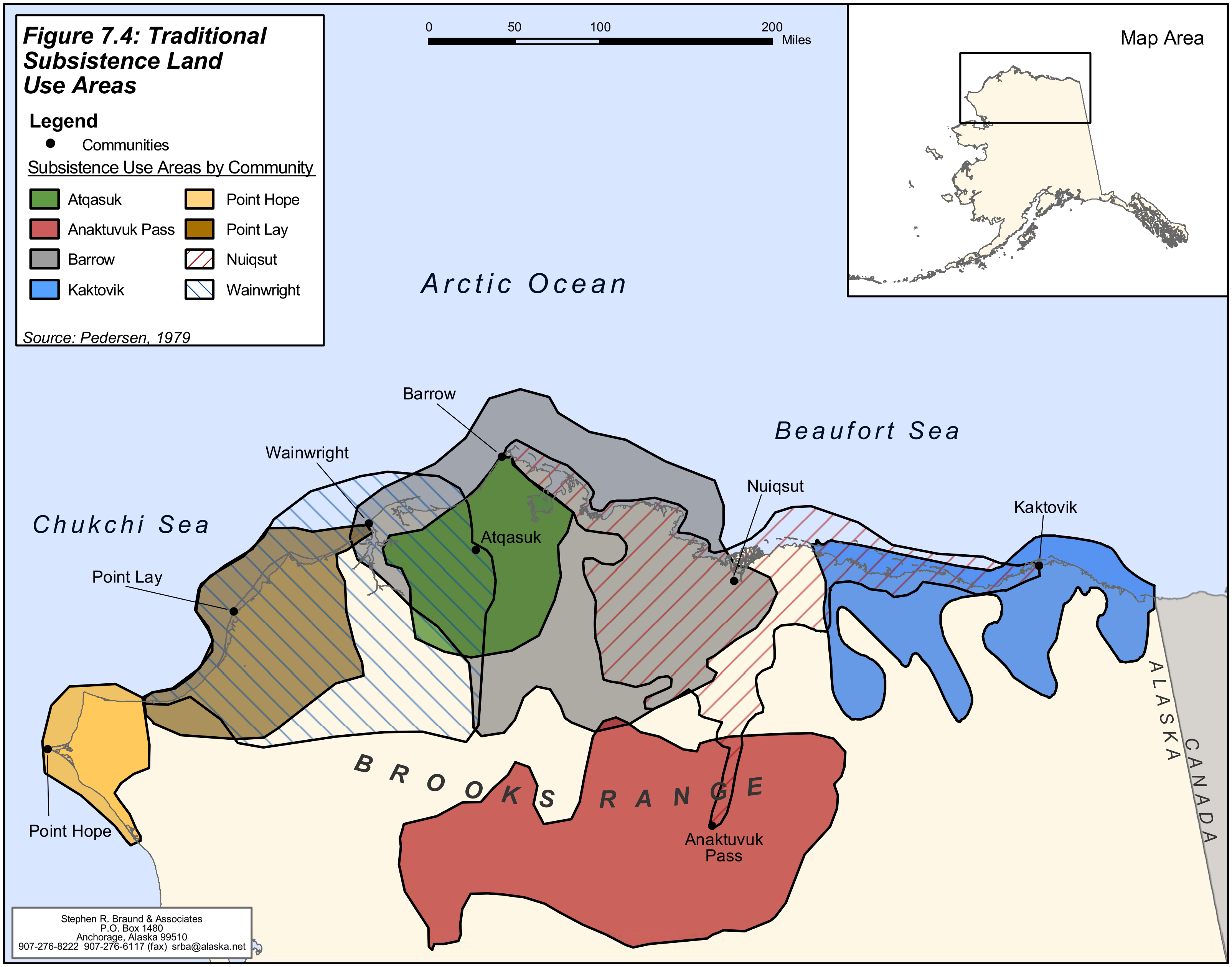


Figure 7.4: Traditional Subsistence Land Use Areas
Legend
Communities
Subsistence Use Areas by Community
Atqasuk
Anaktuvuk Pass
Barrow
Kaktovik
Point Hope
Point Lay
Nuiqsut
Wainwright
Source: Pedersen, 1979
0
50
100
200
Miles
Map Area
Arctic Ocean
Beaufort Sea
Chukchi Sea
Barrow
Wainwright
Atqasuk
Nuiqsut
Kaktovik
Point Lay
Point Hope
Anaktuvuk Pass
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The North Slope Iñupiat are today settled in eight small, widely scattered, non-road-connected communities, connected by air year round, by sea in summer and by land (snowmachine) in winter. Communities on the North Slope range from Point Hope in the west to Kaktovik, close to the U.S. - Canada border in the east (Figure 7.1). The largest community now and in the past is Barrow, with a current population near 5,000 (the US 2000 decennial census count, disputed by the borough, was 4,586). At Point Barrow are the remains of *Utqiagvik*, a community site occupied some 500 years ago by a whale-hunting people referred to as "Thule" by archaeologists. Today's North Slope Iñupiat residents, like their Thule ancestors, continue to rely on whales as a reliable subsistence resource (Hall and Fullerton 1988; Stephen R. Braund & Associates and ISER 1993a, TR149).

The current pattern of permanent year-round Iñupiat communities began to emerge in the late 1800s. This change occurred in response to a number of events on the North Slope, including development of shore-based commercial whaling at Point Hope and Barrow, exploitation of walrus and caribou populations to support the commercial whalers, decimation of the Iñupiat population due to disease outbreaks, hiring of Iñupiat for wage work, the influence of missionaries, establishment of fur trading posts, and government intervention (Worl Associates 1978a, TR9; see also Spencer [1959]; Chance [1966]; Nelson [1969]; Anderson, Bane, Nelson, Anderson, and Sheldon [1977]; Schneider et al. [1980]; Nelson [1981]; Alaska Consultants, Inc., Courtnage, and Stephen R. Braund & Associates [1984, TR101]; Chance [1990]; and Stephen R. Braund & Associates and ISER [1993a, TR149 and 1993b, TR147]). The re-establishment of Kaktovik during the Cold War and the settlement of still-mobile inland Nunamiut from several areas at the trading post in Anaktuvuk Pass in the Central Brooks Range further solidified the permanent settlement pattern in the early 1950s (Gubser 1965; Spearman 1979; Hall, Gerlach and Blackman 1985; Impact Assessment, Inc. 1990d, SR9). More recently (e.g., beginning in the early 1970s) Iñupiat re-established communities at preferred subsistence locations such as Atqasuk and Nuiqsut (Impact Assessment, Inc. 1990c, SR8).

Researchers updated several community histories, ethnographies and subsistence harvest patterns for North Slope communities in the 1970s and early 1980s. These include all North Slope Borough communities (North Slope Borough Contract Staff 1979 and Pedersen 1979), Anaktuvuk Pass (Spearman 1979; Hall, Gerlach, and Blackman 1985), Kaktovik (Jacobson and Wentworth 1982), and Nuiqsut (Hoffman, Libby, and Spearman 1978; Libbey, Spearman, and Hoffman 1979; Brown 1979). Braund and Burnham (1984) documented North Slope subsistence harvest areas in the early 1980s.

In the 1990s, not including MMS ESP Technical Reports that are addressed later in this chapter, both the Alaska Department of Fish and Game, Division of Subsistence and the North Slope Borough Department of Wildlife Management conducted several subsistence studies on Alaska' North Slope. The Alaska Department of Fish and Game, Division of Subsistence reports primarily addressed Kaktovik (Pedersen and Coffing 1984; Coffing and Pedersen 1985; Pedersen, Coffing, and Thompson 1985; Pedersen 1990; Pedersen, Haynes and Wolfe 1991). Fuller and George (1999) evaluated subsistence harvest data for the eight North Slope Borough communities based on the Borough's 1992 census. The North Slope Borough Department of Wildlife Management's ongoing subsistence harvest study has provided several subsistence reports including Atqasuk (Hepa, Brower, and Bates 1997), Anaktuvuk Pass (Brower and Opie 1996), Kaktovik (Brower, Olemaun, and Hepa 2000), and Nuiqsut (Brower and Hepa 1998).

North Slope Petroleum Development

Petroleum exploration on the North Slope began onshore in the 1940s, long before the federal government began to contemplate offshore oil development in the 1970s. Existence of North Slope oil resources were formally noted by government officials beginning in 1904 when oil seeps along the coast east of Barrow were reported and then investigated (Jamison, Brockett, and McIntosh 1980; Arctic Environmental Information and Data Center 1975; Brower 1942). These oil seeps had long been known to and used by Iñupiat in the area (Brower 1942; Ebbley and Joesting 1943). The coastal seeps and some additional inland oil prospects provided sufficient evidence for Congress in 1923 to designate a vast area east, south, and west of Barrow as the Naval Petroleum Reserve Number 4 (NPR-4) (Figure 7.1). Exploration crews investigated the area extensively from 1923 through 1953. The USGS conducted reconnaissance mapping through 1926, and in the period 1944 through 1953, the U.S. Navy conducted an exploratory drilling program in the reserve. The exploratory drilling program identified three oil accumulations and six gas accumulations (USGS 1979).

The Navy contracted with a firm called Arctic Contractors (ARCON) to conduct the exploration of NPR-4. ARCON initially intended to import its labor. The Iñupiat petitioned Alaska’s delegate to Congress, demanding that ARCON use local labor. As a result, ARCON began hiring Iñupiat as laborers in 1946 (Worl Associates, 1978a, TR9). Sonnenfeld (1957) described in detail how these events firmly established the year-round wage economy on the North Slope.

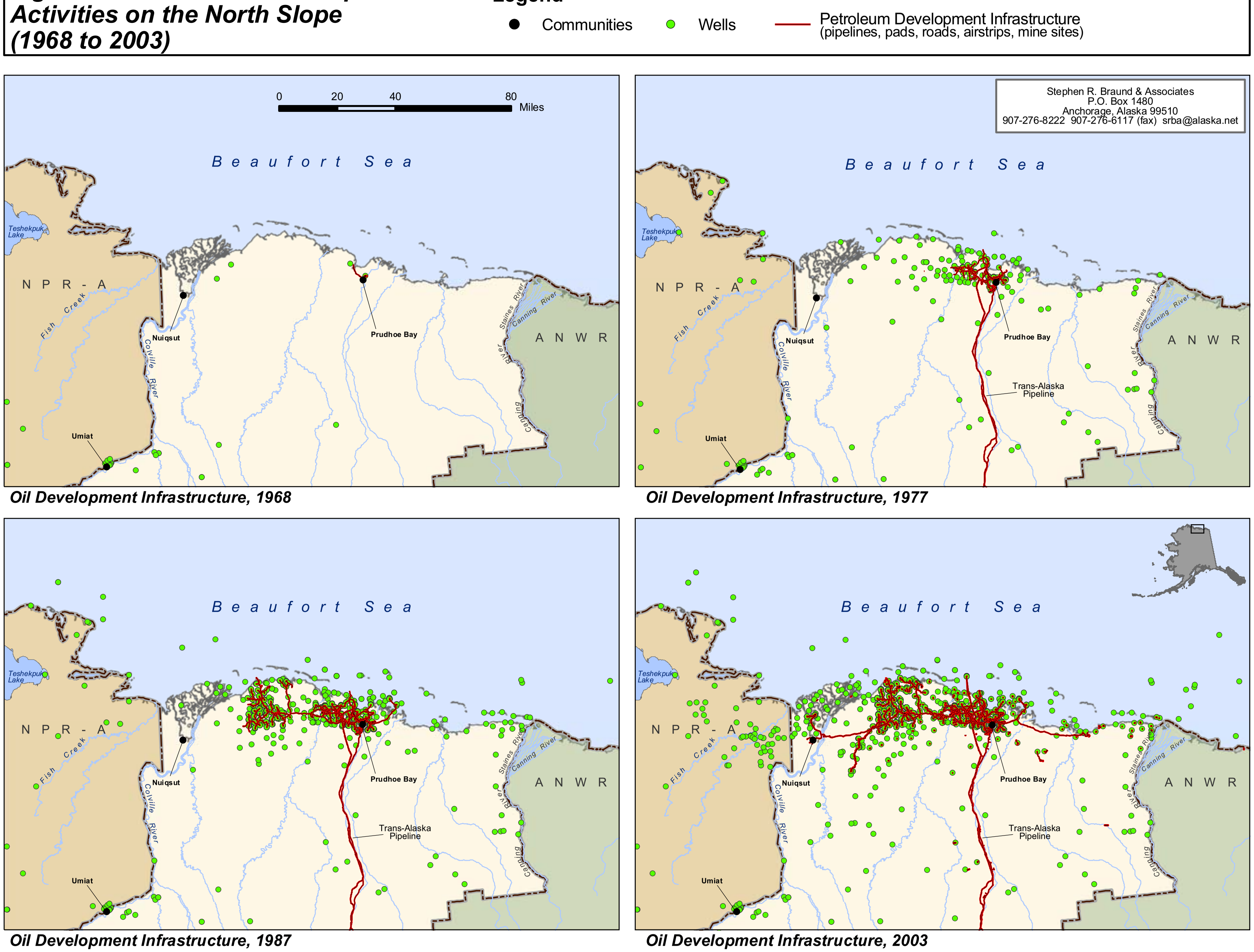
The federal government evaluated small producible gas wells in the Barrow area during 1949 and 1950. These wells became the first production wells on the North Slope, and small diameter pipelines were installed from the wells to supply fuel to a developing U.S. Navy installation just north of Barrow (later known as the Naval Arctic Research Laboratory [NARL]) (USGS 1979; Kruse, Baring-Gould, Schneider, Gross, Knapp, and Sherrod 1983a:48, TR85). The South Barrow Gas Field, as it is now designated, was expanded in 1963 (Hopson 1976 Federal Energy hearings) to serve the entire Barrow community, and still produces natural gas for local consumption (Kornbrath 1995).

The Iñupiat's next major exposure to petroleum development activities occurred in the 1960s. Beginning in 1963, industry began to drill the first of 11 unsuccessful exploration wells on the North Slope (National Research Council 2003:33). In January 1968, ARCO announced a major oil find on State of Alaska leased lands in the Prudhoe Bay area (Central Arctic) (Figure 7.5). ARCO designated this find "Prudhoe Bay State No. 1." It was eventually to become the largest onshore find in North America. By 1977, a consortium of producers completed the Trans-Alaska Pipeline to transport arctic oil from the Prudhoe Bay area fields south to the port of Valdez in southcentral Alaska. The discovery set off a period of intense exploration and rapid development of a number of onshore oil accumulations from Prudhoe Bay west to the Kuparuk River area of the Central Arctic and to the Colville River Delta by 1999.

Meanwhile, in 1976 under the Naval Petroleum Reserves Production Act, Congress redesignated Naval Petroleum Reserve Number 4 as the National Petroleum Reserve in Alaska (NPR-A) and transferred management responsibility from the Navy to the Department of the Interior. Under BLM oversight, competitive oil and gas lease sales were held in 1982, 1983, and 1984 (Kornbrath 1995), and then resumed in a portion of the NPR-A in 1999 and 2002 (U.S. Department of the Interior, BLM and MMS 2003:1.A.2). Industry drilled the first non-government sponsored exploratory well in the NPR-A in 1985. The lease sales resulted in intensive seismic studies and exploration drilling in the northeast portion of NPR-A west of the Colville River in areas previously known to contain oil and gas reservoirs. Phillips Alaska, Inc. (now ConocoPhillips Alaska, Inc. [CPAI]) has had an extensive drilling program in the Fish Creek area, just west of the North Slope community of Nuiqsut (Figure 7.1). CPAI lease holders have located reserves of oil in NPR-A, and efforts are underway to develop these pools because they are located near existing oil processing and transportation infrastructure at the Alpine oil facility in the western Colville River delta 20 miles to the east (U.S. Department of the Interior, BLM 2004).

In the Central Arctic area of the North Slope, the Alaska Department Natural Resources, Division of Oil and Gas, has administered an ongoing leasing program on lands and near-shore areas. Over the last 30

Figure 7.5: Petroleum Development Activities on the North Slope (1968 to 2003)



years, this program has resulted in the successful identification and development of additional oil reserves in the Central Arctic. The State of Alaska typically prepared social, economic and environmental analyses for proposed lease sales. The State of Alaska is not required to complete an EIS as its lease sale action does not require the action of a federal agency, and therefore does not fall under the NEPA mandate in this circumstance. For example, the Alaska Division of Policy Development and Planning (1982) prepared *A Social, Economic, and Environmental Analysis of the Proposed Beaufort Sea Oil and Gas Lease Sale No. 36* pursuant to State Adminsitrative Order 52 to advise then Governor Jay Hammond of the issues surrounding proposed major State activities. The purpose of this analysis was to: 1) analyze the social, economic, and environmental implications of the proposed project, 2) recommend measures that the State could take to improve planning for the lease sale and to minimize potential adverse impacts that are identified in the analysis, and 3) to provide the Department of Natural Resources with information for making decisions about the proposed lease sale, including whether or not to hold the sale (Ibid.).

Since 1979, the federal government has conducted eight offshore lease sales in the Beaufort Sea resulting in 31 exploration wells, and two lease sales in the Chukchi Sea resulting in five exploratory wells (see Chapter Two). Since the mid-1990s the MMS has held a series of offshore MMS lease sales in the Beaufort Planning Area (Sales 144, 170, and 186) and is in the process of holding others: Oil and Gas Lease Sales 195 and 202, scheduled for 2005 and 2007. In addition to these lease sales, the U.S. Army Corps of Engineers prepared an EIS for development of British Petroleum's (BP's) federal offshore prospect Northstar, northwest of Prudhoe Bay (U.S. Army District Engineer, Alaska 1999) (see Figure 7.6), which was approved in 1999. None of the leases in the Beaufort or Chukchi seas was put into offshore production until the fall of 2001, when federal OCS leases associated with BP/Murphy Oil's Northstar oil find in the mid-Beaufort Sea west of Prudhoe Bay completed development and went into production. Product is transported through a sub-sea buried pipeline connecting the man-made production island with onshore infrastructure. This is the first permanent federal offshore lease to produce on the North Slope and, as such, is a major milestone in national efforts to find, develop and produce federal offshore oil and gas resources in Alaska.

The MMS in 2001 prepared an EIS for an offshore development at Liberty, a short distance east of Prudhoe Bay (Figure 7.6). MMS completed the final EIS for that project in 2002 (U.S. Department of the Interior, MMS 2002), but the project, managed by BP, remains on hold in 2004 by corporate decision. The MMS in 2001 approved seasonal exploratory drilling at an offshore prospect named McCovey. The McCovey prospect is located in close proximity to Cross Island, in the principal fall whaling area used by

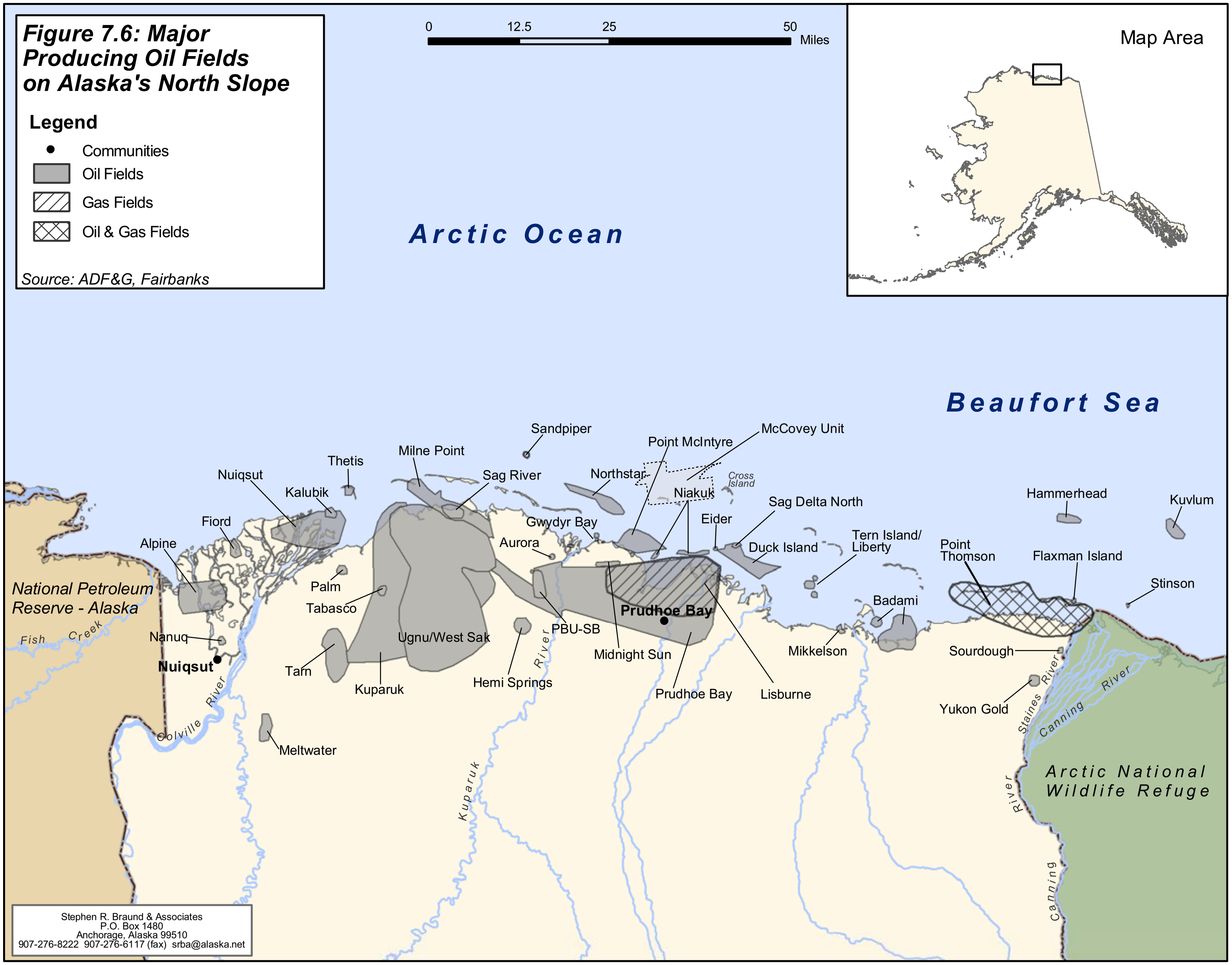


Figure 7.6: Major Producing Oil Fields on Alaska's North Slope
Legend
Communities
Oil Fields
Gas Fields
Oil & Gas Fields
Source: ADF&G, Fairbanks
0
12.5
25
50
Miles
Map Area
Arctic Ocean
Beaufort Sea
National Petroleum Reserve - Alaska
Arctic National Wildlife Refuge
Sandpiper
McCovey Unit
Point McIntyre
Milne Point
Thetis
Nuiqsut
Kalubik
Sag River
Northstar
Cross Island
Niakuk
Sag Delta North
Hammerhead
Kuvlum
Fiord
Alpine
Gwydyr Bay
Eider
Aurora
Duck Island
Tern Island/ Liberty
Point Thomson
Flaxman Island
Stinson
Palm
Tabasco
Badami
Prudhoe Bay
Nanuq
Nuiqsut
Ugnu/West Sak
PBU-SB
Midnight Sun
Mikkelson
Sourdough
Tarn
Kuparuk
Hemi Springs
Prudhoe Bay
Lisburne
Yukon Gold
Meltwater
Fish Creek
Colville River
Kuparuk River
Staines River
Canning River
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Nuiqsut whalers. Commercial quantities of oil were not discovered. However, the noise and activity associated with industry exploratory drilling was a source of conflict to Beaufort Sea subsistence harvesters who claimed the activity interfered with their hunting of bowhead whales.

New fields on the periphery of the Prudhoe Bay/Kuparuk development area are adding substantially to the processing and production facilities, roads, and pipeline infrastructure in the Central Arctic. Ongoing interest in the Alpine North and South, Tarn II, Palm, Liberty, and Sourdough prospects are indicative of the growth potential in these fields (Figure 7.6). There are also continuing efforts to open to competitive leasing the so-called “1002 area” located in the Arctic National Wildlife Refuge, on the coastal plain inland of the Iñupiat community of Kaktovik, some 150 miles east of Prudhoe Bay (Figure 7.1). Limited seismic studies conducted in the area in 1983-85 indicated promising conditions for finding economically recoverable hydrocarbon accumulations (U.S. Department of Interior, FWS 1986). Congress is still debating legislative action to open the area to oil and gas leasing.

In 2003, oil production continues from a gradually expanding number of privately held interests and leases on State of Alaska leased lands onshore and in near-shore waters in the Central Arctic. Most recent are field installations on state lands at Badami to the east, and Alpine and Tarn to the west of the Prudhoe Bay/Kuparuk area (Figure 7.6). By 2003, oil development, production, and transportation extended 40 miles east of Prudhoe Bay to BP’s facility at Badami, 50 miles west to CPAI’s Alpine facility in the Colville River delta, about 20 miles north to BP’s Northstar offshore facility, and approximately 35 miles inland to CPAI’s expanding Meltwater facilities southwest of Prudhoe Bay (Figure 7.6). The Iñupiat have thus been exposed to substantial onshore petroleum development over the past 40 years. Figure 7.5 shows the expansion of North Slope oil and gas infrastructure from the 1968 to 2003. Figure 7.7 represents overlaying a map of oil development, including production facilities, pipelines, pads, roads, airstrips, gravel mine sites, and wells (Figure 7.5) on a map of Iñupiat traditional subsistence land use areas (Figure 7.4). It is clear in Figure 7.7 that onshore oil development has thus far been focused in Nuiqsut's subsistence use areas.

The lack of substantial offshore production on the Beaufort and Chukchi OCS does not mean that offshore petroleum development has not affected the subsistence way of life of the North Slope Iñupiat. As the next section will show, ESP-sponsored research found that activities such as seismic testing have affected subsistence activities. Seismic work occurs both in the pre-lease assessment of geological potential and in post-lease exploration.

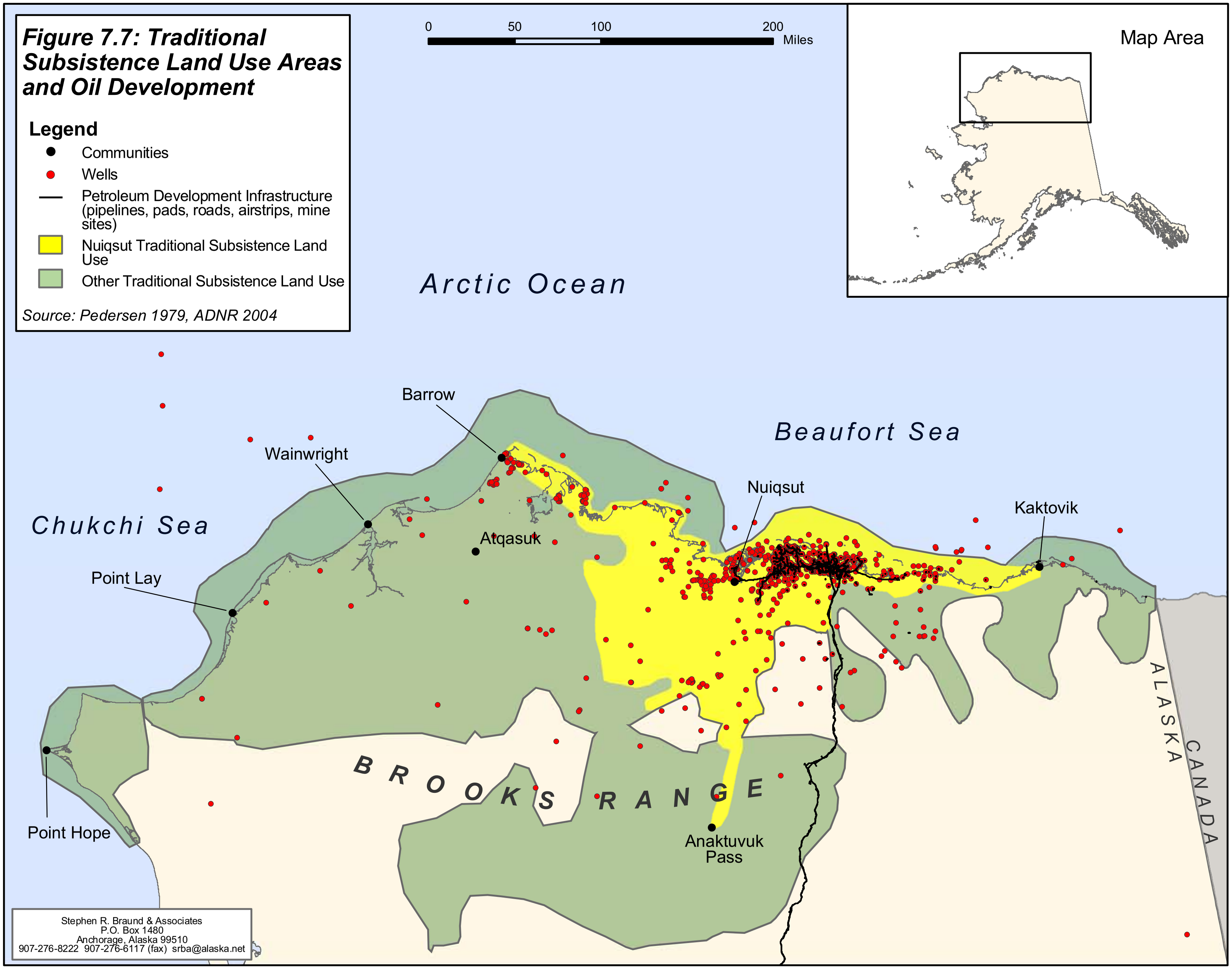

Figure 7.7: Traditional Subsistence Land Use Areas and Oil Development
Legend
Communities
Wells
Petroleum Development Infrastructure (pipelines, pads, roads, airstrips, mine sites)
Nuiqsut Traditional Subsistence Land Use
Other Traditional Subsistence Land Use
Source: Pedersen 1979, ADNR 2004
0
50
100
200
Miles
Map Area
Arctic Ocean
Beaufort Sea
Chukchi Sea
Barrow
Wainwright
Atqasuk
Point Lay
Point Hope
Nuiqsut
Kaktovik
Anaktuvuk Pass
BROOKS RANGE
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ESP Reports Relevant to North Slope Subsistence

This section describes the role of the ESP in understanding effects of petroleum development on North Slope subsistence and reviews research on subsistence conducted during the period of oil development on the North Slope. Since the social component of the ESP began in 1976, MMS has published 22 technical reports (with more forthcoming) relevant to North Slope subsistence as part of the federal government's efforts to inform decision-making on offshore development.

The North Slope region was an early focus for social research sponsored by the ESP. The government directed this round of research toward the government's decision on whether to hold the 1979 Beaufort Sea Lease Sale[48]. In the original design of the ESP, subsistence-related baseline descriptions were part of the scope of the sociocultural series of technical reports. The *Beaufort Sea Region Sociocultural Systems* technical report was the first report in the ESP sociocultural series (Worl Associates 1978a, TR9). Worl and her colleagues focused on Iñupiat ecological relationships through time, political development, and interethnic relationships. The ESP commissioned an update of this work, published as the *Beaufort Sea Sociocultural Systems Update Analysis* in 1981 (Worl, Worl, and Lonner, TR64). This second report focused on the further development of both regional and local institutions, and on the significant increase of the non-Iñupiat population, particularly in Barrow.

The ESP's initial design also called for a companion technical report on impacts. MMS published Worl Associates' *Sociocultural Systems Impacts of the Beaufort Sea Petroleum Development Scenarios* in 1978 (TR22). The authors based their analysis on the four OCS scenarios developed in *Beaufort Sea Petroleum Development Scenarios* (Dames & Moore 1978a, TR6). It is important to understand that this set of Beaufort Sea petroleum development scenarios did not include a potential oil spill and consequently Worl's analysis was similarly limited. Two other studies provided input projections of natural environmental impacts (Dames & Moore 1978c, TR21) and local population impacts (ISER 1978b,

[48] Lease Sale 39in the Gulf of Alaska (1976) and Lease Sale CI in Cook Inlet (1977) preceeded the Beaufort Sea Lease Sale (BF) held in 1979. Given the timing of the lease sales and the timing of initiation of the social component of the ESP, however, early research focused on the Beaufort Sea and the Gulf of Alaska in preparation for Lease Sale BF (1979) and Gulf of Alaska Lease Sales 55 (1980) and RS-1 (1981). Sixteen of the first 23 ESP technical reports published in 1977-1978 related to the Beaufort Sea Region (see Appendix 1). Fourteen of the next 18 ESP technical reports published in 1979-1980 focused on the Gulf of Alaska.

TR18). A major theme of Worl Associates' analysis was to trace the potential connections of these potential environmental and population impacts on subsistence, and thereby on other dimensions of Iñupiat society: culture, politics, interethnic relationships, social health, and family relationships.

The scope of the 1983 regional report, *A Description of the Socioeconomics of the North Slope Borough* (Kruse et al. 1983a, TR85) highlighted the importance of potential subsistence-related impacts. The report included chapters on "Resource Use and Value Conflicts," and on "Perceived Threats of Development." Kruse and his colleagues also concluded that a sense of local control could mediate the intensity of fears about potential development impacts. They devoted a chapter to the ability of local institutions to address Iñupiat concerns.

MMS commissioned several North Slope community ethnographic studies under the ESP. In the *Nuiqsut Case Study*, Galginaitis and his co-contributors (RFSUNY, 1984, TR96) measured the economic importance of subsistence based on observations of consumption of subsistence foods. Galginaitis also compared these local data with regional survey data for the smaller North Slope villages as a whole. Alaska Consultants, Inc., Courtnage, and Stephen R. Braund & Associates (1984, TR101) collaborated to prepare the *Barrow Arch Socioeconomic and Sociocultural Description*. This technical report included qualitative descriptions of subsistence land use patterns for the villages of Point Hope, Point Lay, Wainwright, Atqasuk, and Barrow, including the delineation of intensive and maximum use areas by major species category. In a study focused on Wainwright, *Effects of Renewable Resource Harvest Disruptions on Socioeconomic and Sociocultural Systems: Wainwright, Alaska,* Luton (1985, TR91) wrote an extensive ethnography that included descriptions of subsistence task groups, variability in subsistence resources, technologies used in subsistence, as well as species-specific descriptions of subsistence harvesting, sharing, processing, and consumption. Worl and Smythe's *Barrow: A Decade of Modernization* (1986, TR125) focused on contemporary patterns of household and family organization, relating these patterns to the cash and subsistence economies. In the *Point Lay Case Study*, Impact Assessment Inc. (1989a, TR139 and 1989b, TR140) researchers described contemporary subsistence patterns and reported the results of a 1987-88 survey of subsistence harvest levels conducted by the Alaska Department of Fish and Game.

The Alaska Department of Fish and Game harvest data for Point Lay were the first such data reported in an ESP technical report. However, in the late 1980s the ESP sponsored two multi-year subsistence harvest data collection efforts: *North Slope Subsistence Studies: Barrow 1987-89 and Wainwright 1988-89* (Stephen R. Braund & Associates and ISER, 1988, TR133; 1989a, TR135; 1989b, TR136; 1993a, TR149;

and 1993b, TR147). The intent of these studies was to quantify subsistence harvests and document subsistence harvest locations over multiple years. Two reports pertaining mainly to a review of the North Slope Borough's Traditional Land Use Inventory (TLUI) with brief descriptive reviews of subsistence harvest patterns and use areas in Nuiqsut and Kaktovik were sponsored by MMS in 1990 (Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9). One other ESP report provides quantitative subsistence harvest descriptions; the villages of Nuiqsut and Kaktovik on the North Slope were selected as control communities (sited away from the spill area) in *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska* (Pedersen 1995a and 1995b, in Fall and Utermohle, editors. 1995, TR160).

Beginning in 2001, MMS has sponsored a limited ethnographic and harvest pattern study of bowhead whaling at Cross Island as part of a broader effort to monitor effects of BP's Northstar offshore oil development facility on selected environmental variables (Galginaitis 2003; Galginaitis and Funk 2005, MMS 2005-025; 2004, MMS 2004-030). Galginaitis has accompanied Nuiqsut whalers on their fall whaling trip and overseen systematic collection of daily vessel tracking information from GPS units in whaler's boats. By the end of 2004, this study has collected four years of vessel tracking information. MMS is also sponsoring a study designed to assess the potential impacts of OCS activities on bowhead whale hunting activities in the Beaufort Sea (EDAW, Inc., forthcoming); a North Slope traditional knowledge study (*Ukpeagvik* Iñupiat Corporation Science Division, forthcoming), a North Slope subsistence study to conduct subsistence mapping at Nuiqsut, Kaktovik, and Barrow (Stephen R. Braund & Associates, North Slope Borough Department of Wildlife Management, ESRI-Northwest, Encompass Data & Mapping, Kruse, and Johnson, forthcoming); and an analysis of the North Slope Economy from 1965 to the present (Northern Economics, Inc., forthcoming). The MMS website provides current information about ongoing and planned studies on the North Slope (beyond FY 2004), at www.mms.gov/alaska/ess/essp/sp.htm.

Since its inception, the ESP series of technical and special social science reports has and continues to document the subsistence and cultural changes Iñupiat have undergone during the initial florescence and continued expansion of oil exploration and production in onshore and nearshore environments. This documentation was undertaken concurrently or in cooperation with state and local governments and continues to the present day. In several cases the ESP reports provide the only quantitative harvest information for the communities addressed.

Iñupiat Subsistence During North Slope Petroleum Development

This section begins with a brief description of contemporary settlement patterns, the regional economy, institutions, and land status. The discussion continues by posing a set of research questions regarding North Slope subsistence and its relationship to petroleum development, and then addressing the questions based on the literature.

As of 2004, the North Slope Borough includes eight Iñupiat communities: Point Hope, Point Lay, Wainwright, Barrow, Atqasuk, Nuiqsut, Anaktuvuk Pass, and Kaktovik. The Borough is the world's largest municipality comprising 88,281 square miles (Figure 7.1). These eight communities have a combined population of about 7,400 persons, of which approximately 5,400 are Native (U.S. Census 2000) (Table 7.2). Barrow, located in the same vicinity as the historic *Utqiagvik* site, is the regional center and has the greatest population (4,581 in 2000). Barrow serves as the seat of borough government. Iñupiat continue to constitute the voting majority in every village as well as the borough as a whole.

Table 7.2: North Slope Borough Community Populations, 2000

		Population	
North Slope Borough Community	**Total**	**Native[1]**	**Non-Native**
Point Hope	757	686	71
Point Lay	247	218	29
Wainwright	546	508	38
Barrow	4,581	2,933	1,648
Atqasuk	228	215	13
Nuiqsut	433	386	47
Anaktuvuk Pass	282	249	33
Kaktovik	293	246	47
Total	7,367	5,441	1,926
Percent of Total		74%	26%

Source: U.S. Bureau of Census 2000.

[1] Native population data for each community are from the 2000 U.S. Census category "American Indian or Alaskan Native alone or in combination with one or more races."

Legal land ownership on the North Slope is complex. The two largest land owners are the federal government and the State of Alaska, with private land ownership (mainly Native) being relatively small. Federally owned land primarily consists of the Arctic National Wildlife Refuge and Alaska Maritime Refuge, the Gates of the Arctic National Park and Preserve, and NPR-A (Figure 7.1). The federal government also owns a host of small land withdrawals along the arctic coast for military radar and communications purposes. State lands, managed by Alaska Department of Natural Resources, are mainly confined to the central arctic area (popularly known as the "Prudhoe Bay Area" or "Central Arctic") and west in the NPR-A. Small holdings of private land, mainly Native Allotments and Native corporate lands (Village and Regional Native Corporation lands) are scattered throughout the sub-region, with concentrations around communities and in the area to the west of NPR-A. The State of Alaska owns near-shore waters (within three miles of the coastline), and the United States claims territorial waters outside this zone. Land use on the North Slope, and thus "ownership" in a community sense, is very straightforward in the minds of its residents: the entire sub-region, including near-shore waters of the Chukchi and Beaufort seas, have been and continue to be used by the Iñupiat to sustain their culture and way of life[49]. More detailed discussion of North Slope land ownership and land disposition can be found in Alaska Consultants, Inc. et al. (1984, TR101), and evolving indigenous conceptions of land use rights are detailed in Galginaitis' 1990 reports (Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9).

With the exception of the Trans-Alaska Pipeline, most existing petroleum facilities are located on state or private land within the Iñupiat-controlled North Slope Borough. By winning the fight to create the North Slope Borough, the Iñupiat gained the right to tax petroleum industry property on state and private land. In so doing, the Borough has been able to fund an extensive capital improvements program, building water and sewer systems, upgrading schools, housing, transportation, and medical facilities (Kruse et al. 1983, TR85). In the 1980s, the Borough became the largest employer of Iñupiat on the North Slope, as it continues to be. The Borough also established a Department of Wildlife Management and a regional Fish and Game Management Committee, both with the mandate to help protect subsistence on the North Slope.

Research Themes

Industrial growth in the Central Arctic in the 1970s began on the periphery of lands traditionally used by residents now settled in two Iñupiat communities, Nuiqsut to the west and Kaktovik to the east (Pedersen 1979; Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9). Subsistence use and industrial development overlap in the Central Arctic. It is within this context that the status of subsistence on the North Slope and research on the effects of petroleum development on subsistence must be examined. The research themes addressed in this chapter are:

- The extent to which subsistence continues to a viable part of the Iñupiat way of life
- Positive and negative impacts of petroleum development on subsistence activities

[49] Section 8 of the Alaska National Interest Lands Conservation Act (ANILCA) establishes subsistence as a priority use of public lands.

- Iñupiat perceptions of threats to subsistence posed by petroleum development
- Responses of local, state, and federal institutions to subsistence concerns

The Extent to Which Subsistence Continues to be a Viable Part of the Iñupiat Way of Life

As Worl Associates noted in *Beaufort Sea Region Sociocultural Systems*, "an initial survey of the Arctic Slope may leave the impression that it is a transitional society on its way to complete modernization" (1978a:1, TR9). Usher (1981:3), writing more generally about northern Canada and Alaska, noted that most researchers in the 1960s expected a transition from a subsistence economy to a market economy to occur. Early in its history, the North Slope Borough started to receive large amounts of property tax revenues. In 1983, for example, the borough received $134 million in property tax revenues. The resident Iñupiat population at the time numbered under 4,000 (Kruse et al. 1983, TR85). As Kruse et al. noted in their *Description of the Socioeconomics of the North Slope Borough*, "The primary source of social and economic change on the North Slope between 1973 and 1983 has been the North Slope Borough. We expect this situation to continue as long as the borough continues to receive substantial property taxes from the petroleum industry and significant environmental effects can be avoided" (ibid., v). In the early 1980s the cash economy was expanding, and the subsistence economy was in crisis. The state had, for the first time, restricted the Iñupiat caribou harvest of the Western Arctic Herd, fearing the population had fallen from over 200,000 down to 50,000 animals. And in June 1977, the International Whaling Commission voted to prohibit Iñupiat from harvesting any bowhead whales (Worl Associates, 1978a, TR9). Thus, at the same time that the cash economy was being fueled by petroleum tax dollars, harvests of the two most important subsistence species were being severely restricted or curtailed entirely. One might expect, then, that a rapid transition to a wage economy would have occurred on the North Slope, not as a direct result of onshore petroleum development, but rather as the combined result of an expected transition throughout the north, accelerated by Iñupiat capital expenditures to modernize living conditions on the North Slope and increased regulatory restrictions on the harvest of key subsistence resources. Instead, as Worl, Usher and others have pointed out, research on the North Slope and elsewhere over the past 30 years has dramatically revised our understanding of change in the north. ESP reports have contributed to this new understanding. A synthesis of this research follows.

In *Beaufort Sea Region Sociocultural Systems*, Worl Associates described a mixed economy in which many Iñupiat found it possible to alternate between wage employment and subsistence (Worl Associates, 1978a, TR9). Cash helped to support subsistence activities, through the purchase of snowmachines, gas, ammunition, and equipment. Relatives or hunting partners used cash to help support active hunters. Hunters shared harvests, sometimes in exchange for such commodities as gas or ammunition (ibid., 106).

Worl Associates characterized the cash and subsistence economies as complementary more than competitive. They also linked the subsistence economy to the social network and Iñupiat cultural values (ibid., 109). They concluded, “There has been a growing recognition among social scientists of the systemic viability of transitional systems, those being neither modern nor traditional. The Beaufort Sea Region illustrates how a traditional society reorganized itself with its older social and cultural forms in a modern setting" (Worl Associates, 1978a:1, TR9).

Complementing the qualitative research of Worl Associates’ 1978 contribution to the ESP and related work for the North Slope Borough was the quantitative study of North Slope Subsistence funded by the National Science Foundation, published in 1982 as *Energy Development on Alaska’s North Slope: Effects on the Iñupiat Population* (Kruse, Kleinfeld, and Travis 1982; also see 1981). This study was a collaboration of ISER at the University of Alaska and the North Slope Borough. Researchers conducted structured personal interviews with a random sample of 290 Iñupiat adults from six North Slope communities between October 1977 and February 1978.

Subsistence was a major topic in the 1977 North Slope Survey, but the survey did not measure actual harvest levels. Given the sensitivity of harvest information at that time, researchers decided to focus on participation in, and time spent on, subsistence activities. They found, for example, that 70 percent of Iñupiat adults participated in one or more subsistence activities in the twelve months prior to the survey (Kruse et al. 1982:102). Participation was as high among Barrow Iñupiat (72 percent ±7) as among residents of the smaller villages (66 percent ±7) (Kruse 1982:27). Participation by North Slope Iñupiat as a whole (69 percent ±4) also compared favorably with participation by Iñupiat in the NANA region (73 percent ±4), despite the relatively greater wage employment opportunities on the North Slope (ibid., 24-26).

Harvest data provide a more direct indication of the size of the subsistence economy during the period of oil development. One of the first ESP technical reports to contain harvest data was the *Point Lay Case Study* (Impact Assessment, Inc. 1989, TR139). Impact Assessment researchers included the results of harvest reports from a stratified random sample of 25 households in Point Lay made by Sverre Pedersen of the Alaska Department of Fish and Game Subsistence Division (Table 7.3). Pedersen estimated that in 1987 Point Lay residents harvested 819 pounds per capita, with beluga whales accounting for 64 percent of the total harvest and caribou accounting for 16 percent.

Of particular interest are the three communities located nearest to petroleum development activities on the North Slope: Barrow, Nuiqsut, and Kaktovik. Stoker (1983) summarized the first quantitative estimates from Barrow and Kaktovik, estimating an annual average community subsistence harvest during the 20 year period 1962-82 of 928,205 pounds, or 540 pounds per capita for Barrow (which at the time was predominantly Iñupiat) and 32,408 pounds, or 219 pounds per capita for Kaktovik (Table 7.3). The species-specific harvest amounts upon which these estimates were based were themselves estimates based on a review of existing agency information and relevant reports available at that time,[50] rather than the result of household interviews.

Table 7.3: Subsistence Harvest Data for Five North Slope Communities: Percent of Total Harvest by Species, Total Harvest, and Per Capita Harvest

	Point Lay[1]	Barrow[2]		Wainwright[3]	Nuiqsut[4]	Kaktovik[4]	
Resource	**1987**	**1962-82[1]**	**1987-89**	**1988-89**	**1993**	**1962-82**	**1992-93**
Bowhead Whale	—	21%	38%	35%	29%	28%	63%
Caribou	16	58	27	23	31	16	11
Walrus	4	5	9	27	—	3	—
Bearded Seal	2	3	4	5	—	7	2
Hair Seals	4	4	2	1	3	4	1
Beluga Whales	64	1	—	1	—	6	—
Polar Bears	<1%	—	2	2	—	3	1
Moose	2	—	3	<1%	2	4	1
Dall Sheep	—	—	<1%	<1%	—	4	3
Muskox	—	—	<1%	<1%	—	—	2
Grizzly Bear	<1%	—	—	—	<1%	—	—
Small Land Mammals	<1%	—	<1%	<1%	<1%	—	—
Birds	5	1	4	2	2	—	2
Fishes	3	7	11	5	34	22	13
Vegetation	<1%	—	<1%	<1%	<1%	—	—
Total	100%	100%	100%	100%	100%	100%	100%
Total Harvest (lb)	100,681	928,205	702,660	304,047	267,818	32,408	170,939
Per Capita Harvest (lb)	819	540	233	638	742	219	886

Sources:

1 Point Lay: Impact Assessment, Inc. 1989b. (Galginaitis, Downs, VanStone) Point Lay Case Study. MMS Technical Report No. 139;

2 Barrow: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Barrow, 1987, 1988, 1989. MMS Technical Report No. 149;

3 Wainwright: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Wainwright, 1988, 1989. Technical Report No. 147;

4 Nuiqsut and Kaktovik: Fall James, Charles Utermohle (eds.) 1995. An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska: V. Alaska Peninsula and Arctic. MMS Technical Report No. 160.

[50] Sources for Stoker's analysis include Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Department of the Interior, North Slope Borough, Joint Federal-State Land Use Planning Commission for Alaska data as well as village and regional accounts and summaries.

The first subsistence harvest data collections funded by the ESP itself were two major, multi-year harvest data collection efforts in Barrow and Wainwright (Stephen R. Braund & Associates and ISER, 1993a and 1993b, TR149 and TR147; see also interim annual reports TR133, TR135, TR136). The intent of these studies was to measure reliably edible pounds of subsistence harvest by species and to map subsistence ranges by identifying successful harvest locations. To accomplish this, Stephen R. Braund & Associates and ISER researchers worked with the North Slope Borough to use Borough census results to stratify Barrow households by level of overall subsistence consumption (i.e., the proportion of all meat and fish consumed that was harvested by the household as opposed to given to the household or purchased). They selected probability samples of households from each stratum (i.e., all, most, some, half or none or the meat and fish consumed was harvested by the household), using a higher probability of selection for the active hunter households. The researchers subsequently weighted the data in the analysis so that the results are representative of all Barrow households. In Barrow, the researchers selected 149 of 937 households. Of these selected households, 101 provided harvest data for all three years of the Barrow study. Of the 48 households who did not provide harvest data in all three years, 31 moved from Barrow and 17 declined to participate at some point during the study. Based on the households maintained in Barrow for the three-year study period, the response rate was 86 percent. In Wainwright, the researchers asked all 124 households to participate; 100 households participated in both years of the Wainwright study. Four of the 124 selected households declined to participate and 20 households moved during the study period, yielding a response rate of 96 percent for households maintained in Wainwright for the two year study period. To minimize recall problems, researchers contacted each household an average of five times a year. They adjusted the frequency of contacts with sample households so that they contacted active households more frequently, at least once per month. We provide this level of detail on the methods used because these Barrow and Wainwright Subsistence Studies are a unique contribution to the ESP program. The data are statistically generalizable to the populations of these two communities and, for the first time, provide an empirical benchmark for assessing impacts on subsistence harvest levels and locations.

Based on three years of harvest data, the Barrow Subsistence Study yielded an estimate of 233 usable pounds per capita harvested annually by Barrow residents (Stephen R. Braund & Associates and ISER 1993a:206, TR149). These figures can be compared with the average estimate for the period 1962-82 reported above by Stoker of 540 pounds per capita in Barrow (Stoker 1983). Given the different ways of measuring harvest (i.e., a best estimate based on a review of existing information at the time versus a statistical sample of households), one cannot infer more than that there was probably a decrease in overall harvest between the two periods. Based on the percentage contributions of each species, it appears that the major difference is accounted for by a change in the caribou harvest. In both periods, however, it is clear that bowhead whales and caribou constituted over half of the subsistence harvest of Barrow residents. It is also clear that at over 200 pounds of subsistence resources harvested annually per man, woman, and child in Barrow, subsistence remained a viable part of the local economy in the 1980s.

Another important contribution of the Barrow and Wainwright Subsistence Studies was the documentation of harvest locations. Figure 7.8 shows a composite view of harvest sites for all species over three years (Stephen R. Braund & Associates and ISER 1993a, TR149).

Comparable data for Wainwright indicated 968 pounds per capita for the 20 year period 1962 to 1982 (Stoker 1983:Table A-1). The 1988-89 figure of 638 pounds per capita demonstrates that subsistence continued to be a viable component of the Wainwright Iñupiat way of life in the late 1980s (Stephen R. Braund & Associates and ISER, 1993b:43, TR147). In the case of Wainwright, bowhead, caribou, and walrus together accounted for 85 percent of the total subsistence harvest (see Table 7.3). Turning to Nuiqsut, which was treated as a control community in *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska* (Pedersen 1995b In: TR160), the per capita harvest in 1993 was measured at 742 pounds, with bowhead whale, caribou, and fish (particularly whitefish) each accounting for about a third of the total harvest (ibid., XXII-28). Kaktovik was also a control community, with a reported per capita harvest over twelve months in 1992-93 of 886 pounds (Pedersen 1995a In: TR160). Bowhead whale accounted for 64 percent of the total subsistence harvest, with fish species and caribou accounting for another 24 percent.

Between April and September 1993, the North Slope Borough collected subsistence harvest data representing the 1992 calendar year for the communities of Anaktuvuk Pass, Atqasuk, Barrow, Kaktovik, Nuiqsut, Point Hope, Point Lay and Wainwright (Fuller and George 1999). The Borough collected the harvest data as part of the 1993 North Slope Borough Census of Population and Economy. The objectives of the census and the subsistence-harvest data analysis were to:

- document the variety of mammals, fish, plants and birds harvested by residents of the North Slope Borough villages,
- estimate the annual harvest (in numbers and pounds) by village for the 76 species included in the census survey,
- quantify the involvement of North Slope Borough residents in various subsistence activity categories, and
- describe the harvest periods for each of the 76 species included in the study for each village (Fuller and George 1999).

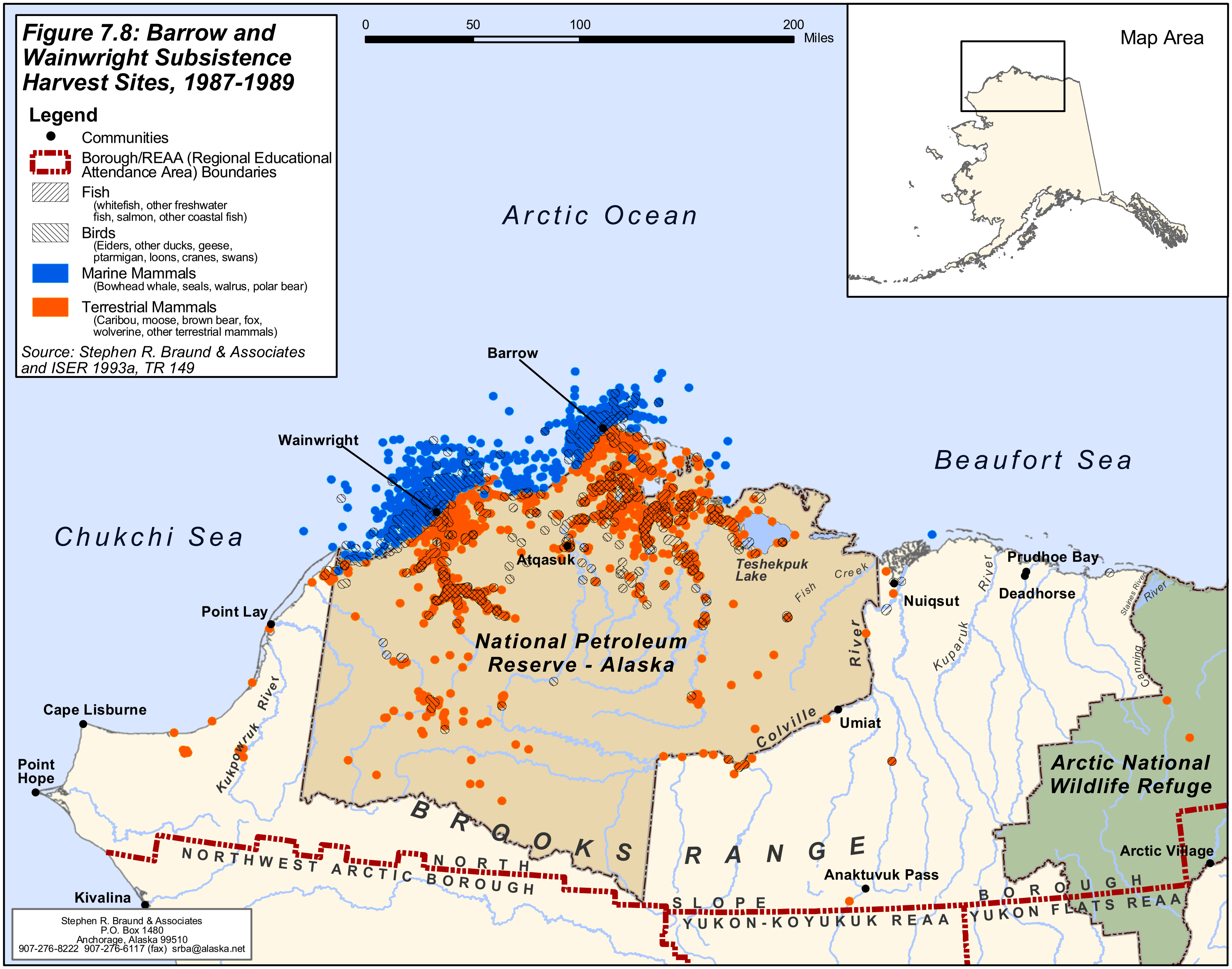
Figure 7.8: Barrow and Wainwright Subsistence Harvest Sites, 1987-1989
Legend
Communities
Borough/REAA (Regional Educational Attendance Area) Boundaries
Fish
(whitefish, other freshwater fish, salmon, other coastal fish)
Birds
(Eiders, other ducks, geese, ptarmigan, loons, cranes, swans)
Marine Mammals
(Bowhead whale, seals, walrus, polar bear)
Terrestrial Mammals
(Caribou, moose, brown bear, fox, wolverine, other terrestrial mammals)
Source: Stephen R. Braund & Associates and ISER 1993a, TR 149
0
50
100
200
Miles
Map Area
Arctic Ocean
Beaufort Sea
Chukchi Sea
Barrow
Wainwright
Atqasuk
Teshekpuk Lake
Fish Creek
Nuiqsut
Prudhoe Bay
Deadhorse
Point Lay
Cape Lisburne
Point Hope
Kivalina
National Petroleum Reserve - Alaska
Colville River
Umiat
Kuparuk River
Staines River
Canning River
Kukpowruk River
Arctic National Wildlife Refuge
Arctic Village
Anaktuvuk Pass
BROOKS RANGE
NORTHWEST ARCTIC BOROUGH
NORTH SLOPE BOROUGH
YUKON-KOYUKUK REAA
YUKON FLATS REAA
Stephen R. Braund & Associates
P.O. Box 1480
Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net

For the 1993 study year, Fuller and George (1999) reported the following subsistence harvest in per capita pounds: Kaktovik 787 pounds, Wainwright 436 pounds, Nuiqsut 359 pounds, and Barrow 49 pounds. Fuller and George (ibid.) noted that there may be significant variations in subsistence harvests due to changes in resource availability, harvest success, and survey participation and completion. This variability is most evident in coastal villages that harvest large marine mammals, where a successful harvest of small numbers of animals can provide large amounts of food. As an example, the range of per capita pounds harvested in Nuiqsut varied from 399 to 741 pounds per capita in 1985 and 1993, respectively (Alaska Department of Fish and Game 2001).

More recently the North Slope Borough Department of Wildlife Management has collected data and produced reports for their Subsistence Harvest Documentation Project, covering the period from July 1, 1994 to June 30, 1995 in Anaktuvuk Pass (Brower and Opie 1996), Nuiqsut (Brower and Opie 1997; Brower and Hepa 1998), Atqasuk (Hepa, Brower and Bates 1997) and Kaktovik (Brower, Olemaun and Hepa 2000). The objectives of the Borough's Subsistence Harvest Documentation Project included:

- documenting the level of subsistence-harvested animals required by each North Slope community to meet its nutritional and cultural needs, and
- obtaining harvest and land use data that will allow greater local participation in the management of wildlife resources within the North Slope Borough and will assist the Borough in better representing Borough residents when dealing with state and federal regulatory agencies that may wish to establish unreasonable harvest quotas or other restrictive harvest guidelines.

The Borough Department of Wildlife Management subsistence studies did not publish subsistence harvest data in per capita pounds. For their reports, the Department published harvest numbers by species and the contribution of major species to the unstated per capita pounds figure for the sample year 1994-1995. For Nuiqsut, 58 percent of harvested edible pounds were caribou, 30 percent fish, moose and birds five percent each, and marine mammals and plants two and zero percent respectively. Researchers noted that the sample year was extraordinary in that Nuiqsut hunters harvested no bowhead whales, which accounts for the small percentage of marine mammals and the large percentage of caribou taken that year[51]. Kaktovik took 61 percent of its harvested edible pounds from marine mammals, 26 percent from terrestrial mammals, 11 percent fish, and two percent as birds. Anaktuvuk Pass' harvest was 83 percent

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[51] Nuiqsut whalers did not harvest any bowhead whales in 1994 due to difficult weather conditions, and the whalers decided to end their season after an accident directly related to those condition. Nuiqsut whalers harvested four bowhead whales in 1995, their full quota. However, the Borough study year was from 7/1/94 to 6/30/05 and therefore did not include the fall 1995 Nuiqsut bowhead harvests.

caribou, 13 percent moose and sheep, four percent fish and less than one percent birds and plants. Atqasuk's harvest was 57 percent caribou, 37 percent fish, three percent birds, two percent marine mammals, and one percent plants.

North Slope Region per capita subsistence harvest estimates, when placed in a statewide perspective, are some of the highest even in rural Alaska (Alaska Department of Fish and Game, Division of Subsistence 2000). When compared to urban Alaska, such as the Fairbanks-Delta and Anchorage areas where annual wild food harvests are estimated to be 16 and 19 pounds per capita, respectively, the high degree of regional reliance on local resources in the five North Slope communities for which we have subsistence harvest data becomes even more clear (Wolfe 2000).

As shown above, subsistence resources such as bowhead whale, caribou, beluga, fish, waterfowl, and walrus constitute substantial parts of the Iñupiat diet. The variety of subsistence resources harvested is also an important characteristic of Iñupiat culture (see Table 7.4). Worl Associates wrote, "To review the harvest of only one subsistence resource independently would not reveal the exchange-and-reciprocity system which is an integral aspect of the total economy" (1978a:107, TR9). Table 7.4 lists 40 different resources used by the North Slope Iñupiat.

Table 7.4: Subsistence Resources Harvested by North Slope Community

Species	Inupiaq Name	Scientific Name	P[1]	B[2]	W[3]	N[2]	K[4]
Marine Mammals							
Bearded Seal	*Ugruk*	Erignathus barbalus	√	√	√	√	√
Ringed seal	*Natchiq*	Phoca hispida	√	√	√	√	√
Spotted seal	*Qasigiaq*	Phoca largha	√	√	√	√	√
Ribbon seal	*Qaigulik*	Phoca fasciata		√	√		
Beluga whale	*Quilalugaq*	Delphinapterus leucas	√	√	√		√
Bowhead whale	*Agviq*	Balaena mysticetus		√	√	√	√
Polar bear	*Nanuq*	Ursus maritimus	√	√	√	√	√
Walrus	*Aiviq*	Odobenus rosmarus	√	√	√		√
Terrestrial Mammals							
Caribou	*Tuttu*	Rangifer tarandus	√	√	√	√	√
Moose	*Tuttuvak*	Alces alces	√	√	√	√	√
Brown bear	*Aklaq*	Ursus arctos	√	√	√	√	√

Species	Inupiaq Name	Scientific Name	P[1]	B[2]	W[3]	N[2]	K[4]
Fish (continued)							
Other marine fish							√
Capelin	*Pagmaksraq*	Mallotus villosus		√	√		√
Rainbow smelt	*Ilhuagniq*	Osmerus mordax	√	√	√	√	√
Arctic cod	*Iqalugaq*	Boreogadus saida	√	√	√	√	√
Tomcod	*Uugaq*	Eleginus gracilis		√	√		√
Flounder (ns)	*Nataagnaq*	Liopsetta glacialis	√		√	√	√
Birds							
Snowy owl	*Ukpik*	Nyctea scandiaca				√	√
Red-throated loon	*Qaqsraupiagnuk*	Gavia stellata		√			√
Tundra Swan	*Qugruk*	Cygnus columbianus				√	√
Eider							
Common eider	*Amauligruaq*	Somateria mollissima	√	√	√	√	√

Species	Inupiaq Name	Scientific Name	P[1]	B[2]	W[3]	N[2]	K[4]
Dall sheep	*Imnaiq*	Ovis dalli		√	√	√	√
Musk ox	*Uminmaq*	Ovibus moschatus				√	√
Arctic fox (Blue)	*Tigiganniaq*	Alopex lagopus		√	√	√	√
Red fox[4]	*Kayuqtuq*	Vulpes fulva		√	√	√	√
Porcupine	*Qinagluk*	Erethizon dorsatum		√	√		
Ground squirrel	*Siksrik*	Spermophilus parryii	√	√	√	√	√
Wolverine	*Qavvik*	Gulo gulo	√	√	√	√	√
Weasel	*Itigiaq*	Mustela erminea				√	√
Wolf	*Amaguk*	Canis lupus	√	√		√	√
Marmot	*Siksrikpak*	Marmota broweri	√			√	√
Fish							
Salmon (ns)							
Chum	*Iqalugruaq*	Oncorhynchus keta	√	√	√	√	
Pink (humpback)	*Amaqtuuq*	Oncorhynchus gorbuscha	√	√	√	√	√
Silver (coho)	*Iqalugruaq*	Oncorhynchus kisutch			√		√
King (chinook)		Oncorhynchus tshawytscha			√		
Sockeye (red)		Oncorhynchus nerka					
Whitefish (ns)	*Aanaakliq*	Coregonus sp.	√	√	√		√
Fish (cont'd.)							
Silver (coho)	*Iqalugruaq*	Oncorhynchus kisutch			√		√
Round w.f.	*Aanaakliq*	Prosopium cylindraceum		√	√		
Broad w.f.	*Aanaakliq*	Coregonus nasus	√	√	√	√	√
Humpback w.f.	*Pikuktuuq*	Coregonus clupeaformis		√	√	√	
Least cisco	*Iqalusaaq*	Coregonus sardinella		√	√	√	√
Bering Arctic cisco	*Qaaktaq*	Coregonus autumnalis	√	√	√	√	√
Other freshwater fish							
Arctic grayling		Thymallus arcticus	√	√	√	√	√
Arctic char		Salvelinus alpinus	√	√	√	√	√
Burbot (Ling cod)		Lota lota		√	√	√	√
Lake trout		Salvelinus narnaycush		√	√	√	√
Northern pike		Esox lucius		√	√		

Species	Inupiaq Name	Scientific Name	P[1]	B[2]	W[3]	N[2]	K[4]
King eider	*Qinalik*	Somateria spectabilis	√	√	√	√	√
Spectacled eider	*Tuutalluk*	Somateria fischeri		√			√
Steller's eider	*Igniqauqtuq*	Polysticta stelleri		√			√
Other ducks (ns)	*Qaugak*		√	√	√		√
Pintail	*Kurugaq*	Anas acuta	√				√
Long-tailed ducks	*Aaqhaaliq*	Clangula hyemalis		√		√	√
Surf scoter	*Aviluktuq*	Melanitta perspicillata		√			√
Goose							
Brant	*Niglingaq*	Branta bemicla n.	√	√	√	√	√
White-fronted goose	*Niglivialuk*	Answer albifrons		√	√	√	√
Snow goose	*Kanuq*	Chen caerulescens		√	√	√	√
Canada goose	*Iqsragutilik*	Branta canadensis		√	√	√	√
Ptarmigan (ns)	*Aqargiq*	Lagopus sp.	√	√	√	√	√
Willow ptarmigan	*Nasaliik*	Lagopus lagopus	√	√	√		√
Other resources							
Berries (ns)			√	√	√	√	√
Blueberry	*Asiaq*	Vaccinium uliginosum		√			√
Cranberry	*Kimminnaq*	Vaccinium vitis-idaea		√			√
Other resources (cont'd.)							
Salmonberry	*Aqpik*	Rubus spectabilis		√			√
Bird eggs (ns)	*Mannik*		√	√	√		√
Gull eggs							√
Geese eggs							√
Eider eggs				√			√
Greens/ roots (ns)			√	√	√	√	√
Wild rhubarb	*Qunulliq*	Oxyric digyna		√			√
Wild chives	*Quagnaq*	Allium schoenoprasum		√			√
Clams	*Imaaniq*			√			√
Wood						√	√
Fresh water	*Imiq*			√			√
Freshwater ice	*Sikutaq*			√			√
Sea ice	*Siku*		√	√	√	√	√

Sources:

P[1]/Point Lay: Impact Assessment, Inc. 1989b. (Galginaitis, Downs, VanStone) Point Lay Case Study. MMS Technical Report No. 139
B[2]/Barrow: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Barrow, 1987, 1988,1989. MMS Technical Report No. 149
W[3]/Wainwright: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Wainwright, 1988,1989. Technical Report No. 147;
N[4] and K[5]/Nuiqsut & Kaktovik: Fall, James, Charles Utermohle (eds.) 1995. An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska: V. Alaska Peninsula and Arctic. MMS Technical Report No. 160.

Also revealing is the fact that Iñupiat often choose to engage in a wider variety of subsistence activities when they have the time and money to do so. Kruse et al. (1982:102) found that Iñupiat men in households receiving incomes of $25,000 or higher engaged in subsistence activities in more months than Iñupiat men in households receiving incomes of under $25,000, noting that increased incomes were used to purchase equipment and to widen the variety of subsistence products pursued. The authors concluded, "Subsistence activities continue to play an economic role on the North Slope. The data also suggest that food and activity preferences are likely to continue to involve subsistence activities even as incomes increase" (ibid. 103). In *Beaufort Sea Petroleum Development Sociocultural Impacts*, Worl Associates wrote that the relationship between employment and subsistence largely depends on the flexibility of the work schedule (1978b:71-72, TR22). They noted that, "the North Slope Borough and Native Corporations have informally adopted liberal employment policies conducive to maintaining subsistence pursuits."

Measures of household participation in successful harvests of subsistence resources from Point Lay, Barrow, Wainwright, Nuiqsut, and Kaktovik (Table 7.5) also illustrate the social and cultural importance placed on subsistence activities. Overall participation rates in the five communities ranged from 68 to 90 percent. At least ten percent of residents in all five communities (even Barrow, taking into account its 40 percent non-Iñupiat population) harvested nine different subsistence species.

Table 7.5: Participation Rates in Subsistence Harvest Activities by North Slope Community

	Point Lay[1]	Barrow[2]	Wainwright[3]	Nuiqsut[4]	Kaktovik[4]
Total	NA	68%	88%	90%	89%
Marine mammals	NA	48	82	37	40
Terrestrial mammals	NA	54	62	76	68
Fish	NA	41	66	81	81
Birds	NA	53	56	76	64
Marine Mammals					
Bowhead whale	*	38%	75%	5%	6%
Walrus	19	9	28	0	2
Bearded seals	29	4	35	7	28
Ringed seals	30	2	25	31	26
Spotted seals	31	<1	6	2	4
Polar bear	3	6	7	2	4
Terrestrial mammals					
Caribou	76%	54%	23%	74%	55%

	Point Lay[1]	Barrow[2]	Wainwright[3]	Nuiqsut[4]	Kaktovik[4]
Moose	15	7	<1	10	6
Brown bear	11	<1	<1	8	0
Dall sheep		3	<1	0	28
Wolverine	7	1	NA	16	13
Arctic fox	*	5	NA	13	15
Red fox	*	<1	NA	23	11
Fish					
Whitefish (all species)	5%	34%	23%	74%	70%
Grayling	40	21	25	65	15
Arctic char	25	5	*	31	79
Salmon (all species)	21	12	5	36	9
Burbot		10	<1	57	0
Birds					
Geese	58%	29%	45%	73%	47%
Eiders	70	43	40	36	38
Ptarmigan	54	20	14	45	57

Sources:

[1] Point Lay: Impact Assessment, Inc. 1989b (Galginaitis, Downs, VanStone) 1989a. Point Lay Case Study. MMS Technical Report No. 139 (note: participation rates by resource category are not reported).

[2] Barrow: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Barrow, 1987, 1988,1989. MMS Technical Report No. 149.

[3] Wainwright: Stephen R. Braund & Associates and ISER 1993. North Slope Subsistence Study: Wainwright, 1988,1989. Technical Report No. 147.

[4] Nuiqsut & Kaktovik: Fall, James and Charles Utermohle (eds.) 1995. An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska: V. Alaska Peninsula and Arctic. MMS Technical Report No. 160.

The unique Iñupiat cultural adaptation to a harsh climate and sparse resources - sharing through an extended-kinship network – continues to be a strong cultural force in the three communities near oil and gas development areas. A source of sharing data in the early 1980s is Alaska Consultants, Inc. and Stephen R. Braund & Associates (1984) *Subsistence Study of Alaska Eskimo Whaling Villages*. Based on a 1982 survey of 370 households in nine Alaska whaling communities, 97 percent of the respondents shared bowhead whale. Over 90 percent of the respondents shared bowhead whale meat and *maktak* in their village and with residents in other villages in their region. Sharing included sending bowhead whale meat and *maktak* to relatives and friends in Anchorage, Fairbanks, and Juneau (Alaska Consultants, Inc. and Stephen R. Braund & Associates 1984:Table133). Two sources of sharing data in the late 1980s and early 1990s are the 1988 North Slope Borough Census of all eight North Slope Villages and the Pedersen subsistence harvest studies for Nuiqsut and Kaktovik (1995a and 1995b, TR160). Table 7.6 shows the percentage of households receiving subsistence foods from other households and the percentage of households giving away subsistence foods based on data from these two sources. The important point of this table is the high percentage of reported sharing. The differences in reported sharing in Nuiqsut and Kaktovik are likely the result of the different forms used in asking sharing questions (note that we are comparing results from two different studies). Clearly, sharing (giving and receiving) in North Slope communities is extensive and continues to play a dominant economic, cultural, and social role in the lives of North Slope Iñupiat even today (Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9; Pedersen 1995a and b, TR160).

Table 7.6: Percentage of Households Sharing of Subsistence Foods by North Slope Community

	Point Lay[1] 1988	Barrow[2] 1988	Wainwright[3] 1988	Nuiqsut[4] 1988	Nuiqsut[4] 1993	Kaktovik[5] 1988	Kaktovik[5] 1993	Point Hope 1988	Anaktuvuk Pass 1988	Atqasuk 1988
Received subsistence foods from other households	76%	74%	65%	72%	98%	82%	92%	78%	80%	53%
Gave subsistence foods to other households	91%	61%	72%	84%	92%	71%	83%	86%	71%	63%

Sources: North Slope Borough 1988; Pedersen 1995a and b, TR160.

Finally, as acknowledged in *Alaska Iñupiat Subsistence and Wage Employment Patterns: Understanding Individual Choice* (Kruse 1991), the ESP supported research comparing North Slope Iñupiat subsistence and wage employment patterns over a decade: 1977 to 1988. In this paper, Kruse compared the results of two North Slope surveys: the 1977 North Slope Survey supported by the National Science Foundation and conducted as a collaboration of the University of Alaska and the North Slope Borough, and the 1988 North Slope Borough Census, deliberately designed to repeat many questions asked in the 1977 survey. Kruse concluded:

> Results separated by a decade of intense wage employment activity on Alaska's North Slope contradict the theory that Iñupiat choose between subsistence and wage employment tracks. They suggest, first, that it is not necessary to choose; men and women who decide to work 12 months a year still report high levels of subsistence activity. They suggest, second, that the formal education that presumably reinforces aspirations that are best met through wage employment does not extinguish individual desires to continue subsistence activities. (Kruse 1991:323).

In answer to the question posed in this section, subsistence does continue to be a viable part of the Iñupiat way of life.

Postive and Negative Impacts of Petroleum Development on Subsistence Activities

While most of the research conducted under the ESP has been disciplinary rather than inter- or multi-disciplinary, natural and social scientists met together in a Subsistence Session at the 1983 Beaufort Sea OCS Synthesis Meeting (Burns 1983; Burns and Bennett 1987). They attempted to identify and characterize the most important potential impact relationships between offshore oil development and subsistence on the North Slope. Participants identified five categories of potentially negative impacts of offshore oil development on subsistence: direct mortality of fish and wildlife; habitat destruction; dislocation of fish and wildlife; physical disruption of access to fish and wildlife; and, regulatory restriction of access to fish and wildlife (Kruse et al. 1983:171, TR85). The authors of *Description of the*

Socioeconomics of the North Slope Borough subsequently added a sixth category: increased competition for fish and wildlife (ibid., 171). The following discussion of negative impacts of petroleum development on North subsistence focuses on these six effects: 1) direct mortality, 2) vulnerable habitats, 3) dislocation, 4) physical disruption, 5) regulatory disruption, and 6) competition. Thereafter, the discussion turns to positive impacts on subsistence.

Direct Mortality of Fish and Wildlife

Recognizing that an oil spill could conceivably reach virtually any part of the Beaufort Sea coastline, participants at the 1983 OCS Beaufort Sea Subsistence Synthesis Session identified subsistence resources vulnerable to population effects from oil spills as eiders (during spring migration), long-tailed ducks (in lagoons in summer), fish (egg and larval stages nearshore), and species vulnerable to individual mortality as ringed seals (nursing pups), polar bears, and possibly bowhead whales (Burns 1983; Kruse et al. 1983:172, TR85). The authors of Technical Report No. 85 concluded that lease sales in the vicinity of Barrow and Kaktovik, "including the high use areas such as Peard Bay, Elson Lagoon, Camden Bay, and the coast east of Kaktovik to Humphrey Point are relatively more likely to result in resource use conflicts" (ibid., 172). The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope recently concluded in a National Research Council report that, "Harm to marine mammals from contact with spilled oil (as in the *Exxon Valdez* experience and other instances) and specific morphological characteristics of the bowhead whale (eroded areas of skin, extent of conjunctival sac, narrowness of stomach-connecting channel) indicate that spilled oil would pose a great potential threat to those organs in bowhead whales" (National Research Council 2003:102).

The only significant offshore oil spill on the North Slope to date may have been the one described by Thomas Brower, probably referring to the late 1940s and early 1950s (Kruse et al. 1983:191, TR85). According to Brower, when a Liberty ship in a Navy convoy ran aground, personnel pumped bunker fuel over the side to lighten the ship. Brower testified that this particular spill killed waterfowl and seals, and that whales changed their migration to avoid the spill area (ibid., 191). This experience underlies a widespread Iñupiat belief that offshore development poses a risk to subsistence species. While there have been no major oil spills (National Research Council 2003), Iñupiat expect they will occur. Iñupiat perceptions are addressed later in this chapter.

Vulnerable Habitats

Participants in the 1983 OCS Beaufort Sea Subsistence Synthesis Session (Burns 1983) hypothesized that subsistence resource habitats particularly vulnerable to oil spills included salt marshes (disrupting feeding activity of geese). They also noted the Teshekpuk Lake area to be an important subsistence use area that would be vulnerable to the effects of gravel mining and transportation corridors related to offshore development. Removal of water for ice roads and water flooding could impact the overwintering habitat of whitefish. Kruse et al. (1983:173, TR85) concluded that the potential impacts of offshore development related to habitat destruction, "primarily involve onshore support facilities and activities such as roads, pipelines, and gravel removal." To these conclusions, Worl Associates added that mining of gravel in the nearshore zone of the Canning River delta could affect a biologically productive area for prey species of subsistence resources (Worl 1978b, 77). More recently, the Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope concluded that, "Careful mitigation can help to reduce the effects of North Slope oil and gas development and their accumulation, especially if there is no major oil spill. However, the effects of full-scale industrial development of the waters off the North Slope would accumulate through displacement of polar bears and ringed seals from their habitats, increased mortality, and decreased reproductive success" (National Research Council 2003:105-106). The National Research Council also concluded, "During the early years of development, gravel mining for roads and pads often interrupted both ice sheet flow and stream flows, and hence fish movement. The permitting process and the regulatory environment for protecting fish have improved over time and are generally effective" (National Research Council 2003:129).

Dislocation of Fish and Wildlife

Participants in the 1983 OCS Beaufort Sea Subsistence Synthesis Session hypothesized that causeways could dislocate fish and that noise could dislocate beluga and bowhead whales (Kruse et al. 1983:173-174, TR85). Concerning fish, the North Slope Borough extended a monitoring program of causeway-induced effects and found that causeways did interfere with movement of juvenile least cisco and humpback whitefish moving from the Colville River to Prudhoe Bay in the early summer (National Research Council 2003:128). As a result of these studies, producers installed a breach retrofit in 1996. The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope subsequently found that the retrofit did reduce blockage of fish, but concluded, "The effectiveness of breach design for existing or new causeways has not been resolved" (National Research Council 2003:130).

Concerning bowhead and beluga, Kruse et al. (1983:174, TR85) concluded,

> The most significant potential dislocation of wildlife from the perspective of Iñupiat resource use would be the avoidance of noise in nearshore hunting areas by bowhead and beluga whales. In the spring, these sensitive areas would include the area to the west of Point Barrow, the area between Icy Cape and Point Franklin, and the area from Cape Thompson to Cape Lisburne. In the fall, the sensitive areas would include the area from

Demarcation Point to the west of Arey Island and the area from Dease Inlet to west of Point Barrow.

The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope concluded in 2003 that "Noise from exploratory drilling and marine seismic exploration causes fall-migrating bowhead whales to divert around noise sources, including drillship operations and operating seismic vessels, at distances of 15-20 km" (National Research Council 2003:102).[52]

In both Nuiqsut and Kaktovik, whalers have stated that they have already experienced conditions in some years in which they either caught no whales or had to extend their search area far offshore to obtain whales (Kaleak 1996; Long 1996; Pedersen 1995a). Traveling far offshore in small (16 to 25 foot) open boats is not without danger as seas are unpredictable and help, if something happens, is far away. In addition to the element of danger is the difficulty of towing the whale back to shore for processing before it spoils. Long distance tows have taken up to 10 to 12 hours when whalers have traveled far offshore. Travelling far offshore also increased wear and tear on equipment and consumption of fuel and other resources used to support whaling.

In the last 15 years the MMS has worked with whalers to minimize seismic and other oil exploration effects on whales and whale hunting in the Beaufort Sea communities. MMS has mandated individual community-industry agreements to limit industry activity during the whaling period and to provide various forms of assistance to whalers under certain circumstances as part of its permitting of industry exploration activities (e.g., conflict avoidance agreements). To date, the main focus of industry has been in the Central Beaufort Sea, where Nuiqsut conducts most of its marine subsistence harvest activities, but whalers in both Barrow and Kaktovik have also had some limited experiences with offshore exploration in their marine subsistence use areas as well (discussed below). Though whalers report that exploration activities have at times affected them, those effects have not been chronic, and the level of effect has decreased with annual community-industry agreements.

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[52] For a discussion of 20 km bowhead displacement by seismic activity, see Miller, Elliott, Koski, Moulton, and Richardson (1999) and Richardson, Miller and Greene Jr. (1999). Information describing and reviewing bowhead drillship avoidance zones of an approximately 15-20 km radius can be found in Schick and Urban (2000); Davies (1997); Richardson, Greene Jr., Malme, and Thomson (1995); Hall, Gallagher, Brewer, Regos and Isert (1994); and Koski and Johnson (1987).

The 1983 OCS Subsistence Synthesis Session participants also thought that onshore facilities ancillary to offshore development could affect the movement patterns and distribution of caribou. The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope later concluded,

> The intensively developed part of the PBOC [Prudhoe Bay Oilfield Complex] has altered the distribution of female caribou during the summer insect season. Elsewhere, a network of roads, pipelines, and facilities has interfered with their movements between coastal insect-relief and inland feeding areas…. Possible consequences of these disturbances include reduced nutrient acquisition and retention throughout the calving and midsummer periods, poorer condition in autumn, and a lowered probability of producing a calf in the following spring (National Research Council 2003:116).

Worl Associates projected that OCS workers can affect subsistence without being competitors hunting for subsistence resources; workers can disperse game simply by increasing the level of human non-hunting activity in hunting areas (1978b:70, TR22). As Kruse and his colleagues pointed out in TR85, some petroleum development areas (e.g., Kuparuk) have been open to Iñupiat hunting.

Physical Disruption of Access

In 1983, participants in the OCS Subsistence Synthesis Session subsistence session did not foresee that OCS development would affect access by subsistence harvesters, unless related onshore developments disturbed sites or made access more difficult. They noted, however, that both Barrow and Nuiqsut residents had reported such problems from existing onshore developments.

In addition to direct effects on subsistence access, Nuiqsut residents have reported that camps, seasonal homes, and other sites of cultural significance to them in the development area have been destroyed (buried under gravel pads for oil wells or facilities), looted, or made inaccessible or otherwise unappealing (Kuukpik Corporation 2002). As a consequence, hunters and trappers now rarely visit a large and gradually increasing area to the east and north of Nuiqsut (Haynes and Pedersen 1989; Pedersen 1995b; Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9). The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope stated:

> On-land subsistence activities have been affected by the reduction in the harvest area in and around the oil fields. The reductions are greatest in the Prudhoe Bay field, which has been closed to hunting, and in the Kuparuk field, where the high density of roads, drill pads, and pipelines inhibits travel by snow machine. The reduction in area used for subsistence is most significant for Nuiqsut, the village closest to the oil-field complex. Even where access is possible, hunters are often reluctant to enter oil fields for personal, aesthetic, or safety reasons. There is thus a net reduction in the available area, and this reduction continues as the oil fields spread (National Research Council 2003:156).

Hunting in the Alpine development area is also growing more difficult due to infrastructure and industry activity in the vicinity of the industrial complex (Kuukpik Corporation 2002).

Regulatory Disruption of Access

Participants in the 1983 OCS Subsistence Synthesis Session thought that OCS development would be unlikely to result in regulatory restrictions, again, with the exception of onshore facilities like pipelines and processing facilities (Kruse et al. 1983:175-175, TR85). The authors of Technical Report No. 85 concluded that cumulative onshore developments could result in regulatory closures that "would produce conflicts with Iñupiat resource use." (ibid., 177). The Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope noted that "traditional hunting areas within active oil fields are now closed to hunting (National Research Council 2003:136). State regulatory closures affecting hunting, trapping and fishing have been instituted to protect resources and minimize land use conflicts in the Prudhoe Bay area, along the Dalton Highway leading south out of Prudhoe Bay along the Trans-Alaska Pipeline, in the coastal area from Oliktok east to Bullen Point, and covering portions of State Game Management Unit 26B (east of the Colville River to the Canning River) (Kruse et al. 1983:175-177; 223). Industry security and surveillance in the gradually increasing development area has led subsistence users to incorrectly assume that development areas are off limits to hunting and trapping (Impact Assessment, Inc. 1990d:1-44, SR9). Presence of security personnel, vehicle traffic on oilfield roads, public roads, pipelines, facilities as well as abundant helicopter and aircraft over-flights of the development area further decreased aesthetic values, cultural privacy, and overland travel for subsistence users venturing into the area (ibid., 1-45).

CPAI is exploring development options for five satellite[53] production pads that correlate with former CPAI exploratory well locations - CD-3 (CD-North), C-4 (CD-South), CD-5 (Alpine West), CD-6 (Lookout) and CD-7 (Spark). Pipelines, gravel roads and a bridge across the Nechelik Channel would connect these satellite production pads to the existing Alpine Field road and Alpine Central Processing Facility (APF), with the exception of CD-3, which would be accessible by a gravel airstrip instead of a

[53] In oil and gas terminology, a "satellite" is a smaller hydrocarbon accumulation that cannot be reached from existing facilities through directional drilling and that itself cannot economically support separate processing facilities. Development of a satellite is typically achieved by means of a production pad that flows recovered hydrocarbons by pipeline to another facility for processing. Processing includes the removal of water and gas from the produced oil before transport to the sales oil line.

road connection (U.S. Department of the Interior, BLM 2004). This development could further affect important caribou and waterfowl hunting, trapping and fishing areas, such as Fish and Judy creeks used by Nuiqsut subsistence harvesters (Kuukpik Corporation 2002, U.S. Department of the Interior, BLM 2004). Oil and gas development west of Nuiqsut on NPR-A lands results in Nuiqsut being nearly surrounded by industrial development.

To the east of Prudhoe Bay, development has also proceeded along the coast, and proposed developments now under consideration would occupy leases adjacent to the Canning River, the western boundary of the "1002" portion of the Arctic National Wildlife Refuge (Figure 7.1). Some residents of Kaktovik noted that exploration and testing in that general area during the 1980s made the area undesirable to them for subsistence hunting and fishing activities, and they referred to the Canning River as their "Berlin Wall" (Impact Assessment, Inc. 1990d:1-12, SR9). Other potential reservoirs in the area are receiving renewed interest as infrastructure grows eastward to serve fields such as Badami, making other potential prospects such as the Point Thomson, Kuvlum, Yukon Gold, and Hammerhead, potentially more feasible (Figure 7.6).

The adjustment of Nuiqsut hunters to development is similar to observations made in British Columbia and Nunavut in Canada: "The flexibility of indigenous economies has enabled them to avoid or accommodate frontier activity and intrusion by withdrawing to more and more marginal lands" (Brody 1982). As Peters (1999) writes, however, "there are limits beyond which hunting economies and frontier development become irreconcilable." Since the 1970s, the evolving North Slope Iñupiat mechanism for avoiding or accommodating industrial activity in traditional subsistence areas is the reliance on motorized transportation (e.g., snowmachines, four wheelers, and large outboard motors) to access lands on the margin of traditional areas. High fuel costs (e.g., $4.50 per gallon for gasoline in villages) and increasing capital and maintenance costs for equipment is making this adapative response to development increasingly unaffordable.

Competition for Fish and Wildlife

The final subsistence impact category, increased competition for fish and wildlife, can result in several ways: non-Iñupiat who come to North Slope villages to work; non-Iñupiat who use new modes of access (e.g., the North Slope Haul Road) to reach wildlife population harvested by Iñupiat; and Iñupiat who move from Barrow to smaller villages, in part to get away from the accelerated pace of change there (Kruse et al. 1983:177, TR85). In addition, during times of subsistence resource shortages, Iñupiat are sensitive to non-local hunters from other villages who may travel far from their community to harvest resources. Kruse et al. did not think that petroleum development enclave workers would compete for local resources as company regulations prohibit such workers from hunting or fishing. However, Worl Associates, *Beaufort Sea Petroleum Development Scenarios Sociocultural Impacts* (1978b:32, TR22) noted that enclave workers - now familiar with the area - could return independently to hunt. Luton (1985:576-578, TR91) noted that the non-Native population of Wainwright increased during the 1980s, with an attendant increase in non-Iñupiat harvesting. While the resident non-Iñupiat harvesting at the time did not appear to be a source of friction, sports hunters flying into upriver areas had caused some friction (ibid., 577). More recently, competition, albeit friendly, between Iñupiat communities for furbearers has increased as a result of the increased range and speed of newer snowmobiles in combination with reported dispersion of furbearers due to oil and gas seismic activities. Interviews conducted in association with the Alpine Satellite Development Plan Draft EIS revealed that it is not uncommon in the winter for furbearer hunters from Atqasuk, Barrow, Nuiqsut, and Anaktuvuk Pass traveling on snowmachines to encounter one another in NPR-A (United States Department of the Interior, BLM 2003b:Sections 3.4.3 and 4A.4.3).

Worl Associates also wrote that the Camden-Canning OCS Scenario being considered in the late 1970s could involve a significant in-migration of Iñupiat to Kaktovik, increasing pressures on subsistence resources (1978b:68, TR22). At the same time, they projected that communities experiencing an out-migration of Iñupiat could leave elderly citizens without enough active hunters to meet their subsistence needs (ibid., 68).

Increased Funding, Employment, Training, and Logistic Support

The positive effects of petroleum development for subsistence users derive from Borough property taxes on private and state lands, royalties to Native corporations, financial support for government and non-government organizations, grants made to help local governments cope with developments on federal lands and waters, accommodations made by industry to assist Nuiqsut whalers and hunters, and increased opportunities for employment. The North Slope Borough has supported the growth and modernization of all communities on the North Slope using hundreds of millions of dollars in property taxes levied on oil development and infrastructure (see Chapter Four). This support comes in the form of direct support of infrastructure improvements such as housing, health clinics, and piped water and sewer, and indirectly through employment. The latter provides the greatest support for subsistence, as borough jobs provide the most stable year round employment for local residents, and often time off is allowed for subsistence harvesters to pursue subsistence resources. Fuel and equipment costs are significant expenditures for subsistence users, and cooperative groups form along family lines to support subsistence producers through sharing of resources and money.

The oil industry supports subsistence through non-governmental organizations, such as KSOPI, which works in cooperation with CPAI to mitigate subsistence impacts from Alpine development. CPAI sponsors a training school (Career Quest) for Nuiqsut youth at Alpine to foster local participation in wage employment without students' having to leave the community. Jobs that require residents to move to Anchorage or Fairbanks disconnect them from local subsistence activities (Ahtuangaruak 1997). CPAI and other companies may also fund special programs in the communities as part of their charitable outreach programs. Also, North Slope Borough NPR-A impact funds provided for the construction of a gas line, and CPAI and the North Slope Borough are negotiating a business plan to provide natural gas to Nuiqsut.

BP and other oil companies have negotiated agreements with Nuiqsut whalers to minimize the effects of various exploration and development activities on the fall whaling season. This includes the negotiation of conflict avoidance agreements, the use of infrastructure and facilities by Iñupiat whalers going to and from Cross Island, and industry assistance to whalers with the processing, storage, and transportation of harvested whale meat and *maktak* to Nuiqsut following the bowhead hunt. Companies have also provided gas and rescue services to whalers on occasion using helicopters and other equipment at Prudhoe Bay. Other oil companies such as CPAI and its predecessors have arrangements for allowing Iñupiat hunters use of lands and facilities during subsistence hunts.

Summary of Impacts on Subsistence Harvesting from Petroleum Development

In summary, oil and gas development has both negatively and positively (as in the case of Nuiqsut bowhead whaling) affected subsistence hunting activities. Subsistence hunters have reported reduced access, observations of reduced fish numbers, displacement of marine mammals due to industrial noise and activity, displacement and diversion of caribou to name a few examples from the above discussion. In contrast, Nuiqsut whalers have benefited from industry support during their fall whaling season. And in some cases, where impacts were forecast or observed (e.g., disturbance causing marine mammal displacement), mitigations have been implemented (e.g., minimizing industry activity during fall whaling through conflict avoidance agreements) and the problem has been averted or minimized. Management agencies of the Department of Interior have required industry to adapt to North Slope subsistence uses, as exhibited by the stipulations negotiated for the 1998 Northeast NPR-A Integrated Activity Plan (U.S. Department of the Interior, BLM and MMS 1998). In turn, subsistence hunters have continued to adapt, for the most part, with the result that harvest quantities have remained fairly stable in the Beaufort Sea communities. As development continues to expand geographically, both onshore and offshore, subsistence communities continue to voice concerns about new and cumulative impacts, which the next section addresses.

Iñupiat Perceptions of Threats to Subsistence from Petroleum Development

Iñupiat have clearly expressed their concerns with OCS oil development in public meetings on the North Slope since the first proposed lease sale in the late 1970s. The vast majority of concerns consistently expressed by North Slope Iñupiat in nearly 30 years in recorded testimony on energy-development projects have centered on subsistence issues such as damage to subsistence species, loss of access to subsistence areas, loss of Native foods, and interruption of subsistence-species migration (Kruse et al. 1983a and 1983b; U.S. Army Engineer District Alaska 1996a, b, and c; U.S. Environmental Protection Agency 2002a and b; U.S. Department of the Interior, BLM 2003a). Also of concern is an institutional overload in the case of communities like Nuiqsut where so many developments are in planning stages that it exceeds local capacity for participation in and understanding of planned activities (Ahtuangaruak 1997; Nukapigak 1997).

In the recently released National Research Council report, *Cumulative Effects of Oil and Gas Activities on Alaska's North Slope*, the Committee on the Environmental Effects of Oil and Gas Activities on Alaska's North Slope wrote:

> The 1983 observation of Kruse and colleagues [Kruse et al. 1983a:vi, TR85], that Native Alaskans' 'fears that offshore development will inevitably harm subsistence resources are both intense and widespread and themselves constitute an impact of development,' is still true. The committee was repeatedly told that this is *the* issue for the Iñupiat (National Research Council 2003:134).

Kruse et al. learned the depth of Iñupiat concerns when they met with Kaktovik leaders in 1981 to discuss the scope of work for the MMS technical report, *Description of the Socioeconomics of the North Slope Borough* (1983a, TR85). Kaktovik leaders told Kruse and his colleagues that for years Iñupiat had shared their knowledge relevant to the projection of impacts of petroleum development. Kaktovik leaders challenged them to review the statements of North Slope residents and to incorporate these statements in the report along with science-based knowledge. In response, Kruse and his colleagues identified 34 sources of public testimony during the period 1971-1982. They performed a content analysis of this testimony, cataloguing the name of the person testifying, their home community, the venue, the issue of concern, locality of concern and species involved, form of testimony, and the verbatim testimony itself (ibid., 187). This process produced 923 records representing 158 different residents from three villages (Barrow, Nuiqsut, and Kaktovik), and equivalent to almost 20 percent of the adult population at the time. The researchers then conducted and taped 19 key informant interviews to validate and extend the observations. (They also conducted an additional 30 shorter interviews that they did not tape.) The Appendix to Technical Report No. 85 contains transcriptions of the 19 taped interviews (Kruse et al. 1983b, TR85).

Of the 522 records pertaining to offshore development, 37 percent focused on potential damage to subsistence species (see Table 7.7). This discussion begins, then, by examining Iñupiat concerns about offshore development based on the early record of public testimony compiled and analyzed by Kruse et al. (1983, TR85).

Iñupiat perceptions of the potential impacts of offshore petroleum development are based on their experience as hunters offshore of the North Slope and their observations of past petroleum development activities. As Samuel Kunaknana stated in 1982 (ibid., 199), "I think that if they drill on land, it is better. You see, I have survived by hunting from the ocean. During the winter, the summer or anytime, I survive by hunting. The ice, its current, is powerful and the formation of its ridges are powerful and I know this fact. I feel better about their drilling on land."

Table 7.7: Percentage of North Slope Public Testimony Records by Topic

	Testimony on Offshore Development	All Testimony			
Subject	Entire North Slope	Barrow	Nuiqsut	Kaktovik	Entire North Slope
Damage to Subsistence Species	37%	33%	30%	39%	34%
Disruption of Subsistence Migration	19%	14%	18%	14%	15%
Sea or Ice Hazards to Development	16%	9%	10%	11%	9%
Loss of Native Subsistence Foods	11%	10%	12%	22%	13%
Loss of Local Control	6%	14%	4%	3%	9%
Cultural and Value Changes	4%	5%	7%	3%	5%
Loss of Cultural Resource Landmarks	3%	4%	6%	2%	4%
Social Impacts	2%	5%	8%	2%	5%
Opinion on Development	2%	4%	4%	3%	3%
	100%	100%	100%	100%	100%
Number of Records	522	461	155	189	923

Of principal concern was sea ice. "When the ice is coming in with 100 million tons of force, coming right at you along with the current and the wind, nothing can stop that" (Warren Matumeak, personal interview, ibid., 201). Iñupiat testified that their collective traditional knowledge about sea ice was a more dependable guide to what will happen to facilities built offshore than the much shorter time during which science-based knowledge has accumulated. They recounted experiences in which sea ice covered a 20 foot high, 200 yard-long barrier island, surged over 30 to 40 foot cliffs near Kaktovik, and destroyed a storage shed 30 feet above waterline and 100 yards from the shore (H. Aishanna, personal interview, ibid., 204). Iñupiat also believed that the sea poses a hazard to development, citing observations of 30 foot waves and "currents that carry icebergs at the speed of a tug" (ibid., 204).

North Slope Iñupiat have also had experiences with petroleum development that shaped their beliefs. Many of those testifying had personally observed petroleum exploration activities in the 1940s, the development of the Prudhoe Bay and Kuparuk oil fields, and later exploration activities in NPRA, the Arctic National Wildlife Refuge, and on the OCS. Samuel Kunaknana, for example, worked for the Navy on an oil rig near Barrow and, in 1948, witnessed a fire "so large that it could be heard from the village of Barrow (personal interview, ibid., 191). Ralph Ahkivgak testified that he saw a blowout that continued to spill oil for almost four days (ibid., 193). And as previously cited, Thomas Brower told the story of a Navy ship dumping oil into the sea after the ship had grounded (ibid., 191). Many Iñupiat believed that this type of event will occur again: "There will be a blowout[54]. There have been blowouts" (I. Kayatak, personal interview, TR85:191).

Given their beliefs about the power of the sea and sea ice and their experiences with petroleum development, Iñupiat testifying about the potential impacts of offshore development thought that offshore structures will inevitably be overridden by sea ice: "the wind and ice could slice through [a gravel island] like a knife through butter" (Thomas Brower, ibid., 205). Iñupiat testified that facilities are vulnerable in multiple seasons:

- In winter, high tides caused by winds can break up the ice and cause it to come up on the beaches and islands in deeper water. In fall, wind can push young ice on islands in shallow water. "No one can stop the ice if the wind is strong enough" (H. Ahsogeak, ibid., 205)
- Fall storms, when accompanied by heavy winds and tides, can sweep ice or waves over the natural islands, which are bigger than the artificial islands (ibid., 206)
- During spring breakup, ice pressure ridges up to 30 feet high can occur, driving "huge" blocks of ice on the islands that could push equipment and drilling wastes into the water (ibid., 206)
- Strong onshore currents will push ice onshore and build it up to 20 feet high; events such as these occurred twenty or more years ago and are conditions not witnessed in the very short duration of research by oil companies (ibid., 206)
- "Current, wind, and the waves are not going to allow [manmade ice islands] to remain the same" (Kenneth Toovak, ibid., 206).

[54] A blowout is one of the major risks of drilling an oil well and occurs when gas pressure inside the well suddenly forces out the oil

Whether as a result of sea ice override, blowouts, or pipeline spills, Iñupiat testifying about the consequences of offshore petroleum development thought that oil spills will occur, and that they will be impossible to clean up (ibid., 207). They were particularly concerned about oil spills resulting from damage to facilities located outside the barrier islands (ibid., 207).

Iñupiat testifiers thought of environmental hazards as a direct threat to their culture (ibid., 211). At the center of their concern were expectations that development could harm whales, waterfowl, fish, caribou, seals, and polar bear (ibid., 215). A third of the testimony records about perceived threats to subsistence species concerned the bowhead (ibid., 217).

Nineteen percent of the public testimony records compiled by Kruse et al. concerned disruption of the migration of subsistence species (1983, TR85; see Table 7.7). Iñupiat feared that industrial noise would divert bowhead from the normal migratory path that takes them within reach of Iñupiat bowhead whaling crews. For example, Archie Brower of Kaktovik described having heard the Exxon exploratory well at Flaxman Island from a distance of 15 miles on a calm day (ibid., 220). He also cited a gas blowout at the DOME/Can Mar well in 1978 that resulted in sighting no whales in the area that year (ibid., 220).

Based in part on experiences with onshore hunting restrictions and intimidating security guards, Iñupiat testifiers said that they feared offshore drilling would further restrict subsistence use (ibid., 223). They also were concerned that development would damage cultural resource landmarks such as grave sites. Ruth Nukapigak testified, “As you know, Powtou [POW-2] will be a drilling place, but you should also know that there are graves down there. It’s also a hunting area and animals have lived there. And the people that are drilling have ruined the place already where they have hunted animals before” (ibid., 226). Special Reports 8 and 9 address the connections between subsistence and cultural sites (Impact Assessment, Inc. 1990c, SR8 and 1990d, SR9).

Direct damage to subsistence species, dislocation of these species, and loss of access to them all have the same potential result: loss of subsistence food. The combined nutritional and spiritual importance of subsistence foods is at the root of Iñupiat culture: “If they cause one to quit taking this seal oil, my body is going to be sapped of its strength” (P. Akootchook, ibid., 227). Or as H. Ahsogeak said, “I cannot fulfill the role of an Iñupiat hunter that I have been taught to do… that I must always share what I hunt with poor people who cannot hunt. Already the hunting is getting so difficult that it is hard for me to continue the sharing I want and need to do to be a true Iñupiat hunter” (ibid., 234).

Iñupiat fears about the loss of subsistence foods raised concerns about the ability of their own institutions to protect the environment and access to it. Nine percent of the public testimony records concerned the issue of local control. Testifiers wanted to speak in their Iñupiat language in public hearings and wanted Iñupiat to be involved in decision making (ibid., 237). Relevant to this point are the observations of Impact Assessment, Inc. researchers who were present at a public meeting involving oil industry representatives and Point Lay residents: "What the oil company representatives failed to offer was a way to either reduce the risks perceived by the Iñupiat or to increase the benefits for the Iñupiat. This would be difficult in any case, as **any** possibility of harm to marine subsistence resources is seen as too large by Point Lay Iñupiat" (1989:322-324, TR139).

Public testimony recorded in North Slope communities since the early 1980s presents issues similar to those described above as well as additional concerns based on Iñupiat experiences over the intervening 20 years. This more recent testimony is associated with both offshore (e.g., OCS lease sales, proposed drilling programs, and Northstar and Liberty) and onshore (e.g., NPR-A, Point Thomson and Alpine) development. Recent testimony associated with offshore development includes OCS leases (e.g., Beaufort Lease Sale 170 [U.S. Department of the Interior MMS 1997a, b, and c] and the five year offshore leasing program from 1997-2002 [ibid., 1996b]), offshore development at Northstar (U.S. Army District, Alaska 1996a, b, and c), and the proposed offshore Liberty development (U.S. Department of the Interior MMS 2001b, c and d). Testimony associated with onshore development, including Alpine expansion (U.S. Department of the Interior, BLM 2003a), Point Thomson (U.S. Environmental Protection Agency 2002a, b, and c), and the NPR-A (U.S. Department of the Interior, BLM (2003b, c, and d, 1998a and b, 1997a and b) reflects these same issues (e.g., deflection of marine mammals, oil spills, and damage to subsistence species, sea and ice hazards to development, loss of subsistence foods, cultural change, local control, and social impacts) as well as additional concerns. These additional concerns addressed in more recent scoping testimony include pipeline heights, aircraft traffic, inability of small communities to adequately respond to the volume of planning documents and EISs, contamination, and heightened concerns related to oil spills informed by EVOS. In total, there have been over 50 oil and gas public hearings on the North Slope between 1976 and 2003.

Iñupiat concerns about offshore petroleum development have persisted since the OCS program began. As indicated in nearly 30 years of public testimony, the Iñupiat understanding of the power of the sea and sea ice has fueled their concerns, as have their observations of petroleum development to date. These concerns are heightened by the fundamental importance of subsistence to the Iñupiat way of life and cultural identity. An example of where Iñupiat subsistence meets petroleum development activity, generating strong concerns, is Nuiqsut whaling. As described earlier in this chapter, Nuiqsut is the community geographically closest to offshore development at present, and they hunt bowhead whales in the fall from their camp at Cross Island, near Prudhoe Bay. In a successful month of whaling, crews harvest as much food for the community as is harvested in twelve months of caribou hunting and fishing. The Iñupiat fear a disruption to this harvest, for example, caused by displacement of the whale migration pattern due to industrial activity, would significantly impact the community, not only by reducing the harvest of bowhead whales, but also by disrupting social relationships based on the harvest, processing, and distribution of bowhead subsistence resources. In addition to bowhead whales, harvests of other marine species seasonally sustain the community. Because so much of their harvest comes from the sea throughout the year, and because they have not been convinced that a marine oil spill could be contained and cleaned up without damaging subsistence resources, the Iñupiat testimony reflects their strong and abiding concerns about marine exploration and development for petroleum products.

Local, State, and Federal Institutional Responses to Subsistence Concerns

Answering the final question whether local, state, and/or federal institutions have been able to respond to subsistence concerns addresses the effectiveness of planning and mitigation activities associated with petroleum development. As described in Chapter One, the MMS, Alaska OCS Region Alaska has been responsible for administering and managing federal oil and gas exploration and development in federal waters offshore the North Slope since 1974 when the first federal offshore leasing program was formulated (U.S. Department of the Interior, MMS 2001a). In response, the Department of the Interior established the ESP. The intent was for the ESP technical reports to become part of the information base used by the MMS to prepare EISs, and more broadly, to inform its decision making on lease sales and mitigation activities. How well has the program accomplished these goals?

In 1994, the National Research Council published a report entitled *Environmental Information for Outer Continental Shelf Oil and Gas Leasing Decisions in Alaska*. The intent of the report was to assess the adequacy of environmental information for leasing decisions in the Chukchi Sea, Beaufort Sea, and Navarin Basin (National Research Council 1994). With respect to subsistence studies, the Committee to Review Alaskan Outer Continental Shelf Environmental Information concluded that North Slope Borough studies from 1987 to 1990 represented "an adequate baseline for at least initially determining community harvest levels and typical and preferred hunting areas" (ibid., 141) but that lacking were studies "devoted to the ways in which subsistence activities, and the broader cultural significance of given environmental settings, might be disturbed or affected by OCS oil and gas activities even in the absence of major spills"(ibid., 142). The Committee also stated that, although "credible baseline analysis of social and economic conditions in Northern Alaska" was carried out by the ESP, that work "failed to deal adequately with other issues that are critical to projecting and managing social change" (ibid., 147) such as non-spill effects, long-term socioeconomic changes, assessment of likely social and cultural impacts from development-phase activities, identification of steps to mitigate or manage effects, or address the fact that the human environment can be expected to change as soon as the potential for OCS-related activities is raised, often well before biological or physical disruptions (ibid., 148-149).

To address these shortcomings, the Committee recommended that MMS's ESP "commission social science studies that assess the impacts of OCS activities on subsistence and other significant sociocultural concerns likely to take place even in the absence of a spill" and "that greater effort be devoted to the cooperative development of studies or negotiated agreements with the North Slope Borough" (ibid., 149). The Committee also recommended that the ESP "explicitly plan longitudinal, post-leasing studies, at least in areas where development appears likely to take place, at the outset" (ibid., 151).

At the same time as the publication of the National Research Council report's recommendations, the budget of the social component of the ESP was a fraction of what it was in the the late 1970s, 1980s and early 1990s. The National Research Council Committee noted that the number of social science staff in the ESP fell from its long term level of five to two in 1992 (ibid., 150). The ESP budget for studies dropped in the 1990s. The downward trend in OCS lease sales (from 14 lease sales during the 1980 to 1991 period, to no sales from 1991 to 1996, and four sales from 1996 to 2003) explains the decline in ESP budget and staff. The ESP social science technical reports published in the nine years after the release of the National Research Council report in 1994 have been relatively few, but highly significant.[55]

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[55]The ESP social science reports published between 1995 and 2003 include the final volume of the *Social Indicators Study of Alaskan Coastal Villages* (Jorgensen 1995b, TR157); the six volume final report documenting the sociocultural consequences of the *Exxon Valdez* Oil Spill (Fall and Utermohle, editors 1995, TR160); a two-volume, 20 year history of the economic and social effects of the oil industry on Alaska (McDowell Group, Inc. and Barker 1999, TR162); a collection of social impacts information and analysis related to the *Exxon Valdez* oil spill, cleanup and litigation (Impact Assessment, Inc. 2001, TR161) and the *Long-Term Consequences of the Exxon Valdez Oil Spill for Coastal Communities in Southcentral Alaska* (Fall, Miraglia, Simeone, Utermohle, and Wolfe 2001, TR163).

MMS responded to the National Research Council 1994 recommendations over several years (see Preface for additional perspective). This lag resulted in a lack of the recommended information on the relationship of OCS activities and subsistence and other sociocultural concerns during a period of continued offshore leases. As identified by the National Research Council, this information would be useful in the analysis of the potential effects (and associated mitigation) on subsistence uses as a result of continuing North Slope offshore leasing and development. Despite the delay, several ongoing ESP studies are relevant to the National Research Council 1994 recommendations. In 2001, MMS commissioned the study, *Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Activities in the Beaufort Sea* (EDAW, Inc., forthcoming). The intent of the study is to perform a "systematic analysis of residents' observations and perceptions about how their lives and especially subsistence whale hunting activities have been and in the future might be affected by oil industry activities and other forces of modernity (U.S. Department of the Interior MMS 2001a). In large part, MMS responded to a request from the North Slope Borough and Alaska Eskimo Whaling Commission for a study of this nature. Also, in 2001, MMS commissioned the study *Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow*. The intent of this study is to develop a GIS describing contemporary geo-spatial subsistence patterns for hunting and fishing activities occurring adjacent to these North Slope communities. The GIS database will enable researchers to analyze future and possibly past changes in regional subsistence patterns (Stephen R. Braund & Associates, North Slope Borough Department of Wildlife Management, ESRI-Northwest, Encompass Data & Mapping, Kruse, and Johnson, forthcoming). The North Slope Borough is a study team participant in this project.

As described earlier in this chapter, MMS sponsored a limited ethnographic and bowhead harvest pattern study for the fall Nuiqsut bowhead hunt at Cross Island. Commissioned as part of a larger long-term environmental monitoring program (ANIMIDA), this documentation of Nuiqsut whaling at Cross Island began in the 2001 whale hunting season and has continued through 2004 (Galginaitis 2003; Galginaitis and Fund 2005, MMS 2005-025; 2004, MMS 2004-030). Cross Island is near the Northstar OCS production site and the underlying purpose of this ongoing project is to gather information useful to assess potential effects that Northstar or other offshore activities may have on Nuiqsut bowhead whale hunting. Although there was little local participation in the initial study concept and design, the North Slope Borough, Alaska Eskimo Whaling Commission, Nuiqsut Whaling Captains Association, and local Nuiqsut whalers have been increasingly involved in the design and implementation of the data gathering. As of 2004, data analysis is a minor component of the study. This study provides longitudinal, post-leasing studies in areas where development has occurred. All three of these ongoing studies are on the North Slope of Alaska, the area where development appears most likely to occur.[56]

Despite MMS's long history of working with the North Slope Borough, including invitations for involvement in study evaluations and participation in peer reviews, direct local involvement in study design, implementation, and data analysis has not been fully realized, as noted in the National Research Council (2003:151-152) report.[57]. It is likely that the federal procurement process for these contracts inhibits more direct involvement from local communities and regional organizations. MMS solicits proposals in a public procurement process involving competitive bids that are ranked based on both technical and cost considerations[58]. Communities rarely have the capacity to participate at the bidding level, although the *Ukpeagvik* Iñupiat Corporation Science Division in Barrow has co-proposed on several studies and is currently conducting the MMS sponsored North Slope Traditional Knowledge Project (*Ukpeagvik* Iñupiat Corporation Science Division, forthcoming).

While the MMS has directed the above studies on potential impact areas, focusing on North Slope traditional knowledge, the relationship of bowhead whale hunting and OCS development, Iñupiat hunting areas in the communities closest to oil development, and an annual documentation of Nuiqsut whaling at Cross Island, North Slope subsistence hunters, their families, community elders as well as city and North Slope Borough officials continue to have concerns about the consequences of on and offshore exploration and development (Itta 2001, Napageak 1990, 1997). MMS has clearly improved the quality and narrowed the focus of sociocultural information intended to inform leasing and development decisions, but in the intervening 10 years has yet to meet fully the challenges for research presented by the National Research Council in 1994, several of which MMS considers outside of their NEPA mandate.

The technical reports, EISs, and records of decision are the most tangible components of the OCS decision making process. They are not, however, the only elements of the process. Also important are public scoping meetings, ongoing consultation with other government organizations, requests for

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[56] Although outside of the socioeconomic studies, for over two decades MMS has sponsored annual bowhead whales surveys under the bowhead whale aerial survey program (BWASP) (see Treacy 2002).

[57] It is noteworthy that it is not a MMS goal to have direct public involvement in study designs. MMS welcomes public ideas for studies, but not on the method on how to perform the study.

[58] See Preface for further explanation.

comments on technical reports and EISs, public comments made at public hearings, and – our focus next – coordination and mitigation activities.

The existence of the North Slope Borough has greatly enhanced opportunities for coordination and mitigation, including the protection of subsistence harvest patterns and resources. Perhaps most importantly, the Borough took the unusual step of establishing a Department of Wildlife Management, normally a government function reserved for the state and federal governments. Staff in the Department of Wildlife Management have taken the lead in reviewing and commenting on OCS planning activities. For over a decade, the Borough has also supported the Fish and Game Management Committee, a regional committee whose members come from the eight North Slope villages. The Committee provides guidance to the Department of Wildlife Management and the Mayor's office and drafts proposals to the state Boards of Game and Fisheries and the Federal Subsistence Board concerning local subsistence and resource management issues.

Superimposed on the North Slope subsistence-related institutional infrastructure are statewide management systems. The MMS holds coordination meetings with North Slope Borough staff from time-to-time, arranges community meetings to obtain local input on plans, and holds an annual statewide meeting to review and share information on projects it has sponsored. Other federal agencies involved in resource management on the North Slope (FWS, BLM, Bureau of Indian Affairs, USGS) either channel their regulatory resource management activities as proposals through the Federal Subsistence Board process, or, as in the case of BLM-Northern Field Office, through a North Slope administrative body referred to as the NPR-A Subsistence Advisory Panel (SAP). Federal agency staff brief members of the North Slope Borough Fish and Game Management Committee and Wildlife Management Department staff at quarterly Committee meetings held in Barrow. In 1995, Nuiqsut residents formed KSOPI to identify impacts caused by oil and gas exploration and development near their community and to advise industry and agencies on suggested methods to minimize those impacts. At present (2004), there is no established communication network between the SAP and KSOPI or between either of these organizations and the North Slope Borough Fish and Game Management Committee.

The State of Alaska, Department of Fish and Game, depends on active participation by the public in its statewide Advisory Committee system. Local Fish and Game Advisory Committees consist of locally nominated and elected committee members that meet a couple of times a year to draft proposals and also review fishery and game proposals affecting its area of jurisdiction. There are no official Alaska Department of Fish and Game Advisory Committees on the North Slope. The Borough solely funds the

North Slope Borough Fish and Game Management Committee, and this body does comment on both state and federal game and fish regulatory proposals. The Department of Natural Resources uses a community meeting system to obtain comments and information from the public and other agencies. As in the case of the federal agencies, staff from the Alaska Department of Fish and Game meet with the North Slope Borough Fish and Game Management Committee to discuss current subsistence-related issues.

At this time, staff to the Alaska Boards of Fisheries and Game and the Federal Subsistence Board coordinate in some measure to ensure a degree of consistency in management and regulation of subsistence wildlife and fishery resources. Some state-federal coordination occurs in oil and gas leasing, but there is no cooperative arrangement for post-leasing monitoring of industry performance regarding stipulations to protect subsistence.

This lack of coordination sometimes leads to the convergence of nearly simultaneous oil and gas lease processes that North Slope residents are experiencing at this time (2003-2004). For example, during the same time period, BLM is presenting to the public, for its review, a North Slope EIS development document (Alpine Satellite Development Plan EIS), an Oil and Gas Lease Sale document (Northwest NPR-A), and a third document for the Northeast NPR-A Integrated Activity Plan EIS Amendment. Meanwhile, the MMS is completing a multiple North Slope OCS Oil and Gas Sale EIS review (Lease Sales 186, 195, and 202) and the State of Alaska through Exxon Mobil is developing an EIS for a gas project on state lands in northeast Alaska at Point Thompson (just outside the northwest edge of the Arctic National Wildlife Refuge) (Figure 7.6). Adding to this list the opportunities for public comment on changes to ongoing exploration programs (both federal and state, e.g., Alpine satellite expansion) and proposed expansion of offshore sites such as Liberty and Badami (Figure 7.6), small communities such as Nuiqsut and Kaktovik are under a heavy burden to review documentation, provide comments and keep current with all that is taking place on the land around them.

Communities find it difficult to respond constructively to multiple requests for reviews especially given the fast track of projects and limited review time. They also find it difficult to sort out the cumulative impacts that might occur if several projects being considered moved forward concurrently (Ahtuangaruak 1997, Napageak 1997, Nukapigak 1997). This problem led the City and Native Village of Nuiqsut and the local village corporation, Kuukpik Corporation, to submit jointly a letter asking the U.S. Army Corps of Engineers, Alaska District, to help slow the rapid rate of Alpine field changes proposed by ConocoPhillips until the community had a chance to adequately adjust to the initial project in which impacts on the community exceeded industry projections (Kuukpik Corporation 2002). Additionally, as

Alpine was being completed, two other ConocoPhillips projects (Tarn and Meltwater) just east of the community added north-south barriers to local caribou migrations (Kuukpik Corporation 2002). Clearly, direct, indirect, and cumulative effects from rapid industrial development are challenging for communities to keep up with administratively. And when access to and distribution of subsistence resources are also thought to be in jeopardy as a result of potential development impacts, the pressure to participate in the public process can strain and even exceed a community's response capability.

As described above, OCS lease sales are not the only government actions requiring a process of environmental assessment, interagency consultation, and public involvement. Examples of other government actions include NEPA process meetings held by the BLM in the NPR-A (e.g., lease sales, integrated activity plans), State onshore and offshore lease sales, federal and state permits for a myriad of development activities, coastal zone management, and capital improvement planning.

Summary and Recommendations

The OCS leasing program finally, after 25 years of exploration, entered into production at the Northstar site. The MMS faces the challenge of monitoring and mitigation at the production stage for the first time. The MMS designed the OCS program to initiate and oversee all stages of petroleum development on the OCS, from exploration to production, while simultaneously identifying, avoiding, and/or mitigating potential impacts on existing resources and uses.

In addition to mitigating exploration effects, the MMS now must also find effective ways to monitor and mitigate individual and cumulative project impacts from permanent offshore installations on Iñupiat marine and terrestrial subsistence resources and harvest patterns. At the same time, agencies will have to determine what roles they will play in managing subsistence user-lessee conflicts as offshore development proceeds.

What is clear from this chapter's review of subsistence-related research on the North Slope is that subsistence continues to be a thriving part of Iñupiat culture. It is also clear that Iñupiat have experienced impacts of petroleum development on their subsistence activities in the past. What is new is the cumulative extent of expanding onshore development and the entry into an era of offshore petroleum production. Both developments increase the likelihood of impacts on subsistence activities and, through these effects, impacts on Iñupiat culture and society.

Based on this new reality, the following general recommendations are appropriate[59]:

- Increase geographic scale and subject scope of subsistence monitoring program.
- Fund North Slope Borough resource expertise needed to stay current with planning, review, and mitigation activities.
- Fund village resource expertise needed to stay current with planning, review, and mitigation activities, recognizing the need to have parallel local and regional involvement.
- Increase formal authority of North Slope Subsistence advisory panels in screening development projects, managing subsistence impact assessment, and formulating preventive/mitigative measures.
- Fund scientific studies directed toward local concerns with input in the form of traditional and local knowledge from the communities.
- Encourage research on and maintain local stakes in preventing, containing, cleaning up, and remediating the effects of oil and chemical spills in the offshore, nearshore, and onshore environments of the North Slope. Fund efforts to maintain local skills and training in oil spill cleanup methods.

Subsistence monitoring should include local Iñupiat organizations. To avoid adding to the civic burden of community residents, the local organization could be funded through industry grants, participation as a study team member in academic or agency research associated with the community, and self sought grants. KSOPI in Nuiqsut is an example of such an organization. KSOPI is a subcontracted study team member in the ongoing MMS study combining western scientists and local Iñupiat experts reviewing existing data to address variation in the abundance of Arctic cisco [ABR, Inc., Stephen R. Braund & Assocates, Sigma Plus, MJM Research, KSOPI, forthcoming]. This MMS sponsored study is the result of local concerns with low Arctic cisco harvests in some years and combines western science and traditional knowledge. An "impact fund" could provide needed financial support to build local (North Slope Borough and community) capacity to respond to increasing oil and gas development, agency planning documents, and associated EISs. Entities that receive revenues from the development (federal, state, and industry) could contribute to this fund.

[59] These recommendations are not directed to a specific agency or institution, but are made, in general, by researchers experienced in conducting research, including impacts analyses, on Alaska's North Slope.

Chapter 8: Long-Term Consequences of the *Exxon Valdez* Oil Spill for Subsistence Uses of Fish and Wildlife

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Introduction: The *Exxon Valdez* Oil Spill as a Case Study of OCS Development Impacts

Evaluations of the potential consequences of OCS development in Alaska face a unique challenge because, unlike in other states, subsistence harvests of fish and wildlife resources are of critical importance to the economies and ways of life of coastal communities (see Chapter Seven). Based on its early social studies, the ESP recognized the important role of subsistence uses of wild, renewable resources. Consequently, a goal of the program has been to address the question of how OCS development might impact patterns of subsistence use. Addressing this question has involved documentation of baseline patterns of subsistence uses, identification of historical trends in socioeconomic and sociocultural change, analyses of impact scenarios, and development of social indicators.

The terminus of the Trans-Alaska Pipeline at the port of Valdez is 800 miles from oil fields of Prudhoe Bay. Yet, the single most striking consequence of the development of the energy resources of Alaska began on the early morning of 24 March 1989 when the M/V *Exxon Valdez* hit Bligh Reef, spilling about 11 million gallons of North Slope crude oil into northeastern Prince William Sound.

EVOS has commonly been called the most massive environmental disaster in the history of the United States (e.g., Davidson 1990; US Coast Guard 1993; Piper 1993). But this disaster also had economic, social, and cultural dimensions. The path of the spilled oil crossed harvest areas of Alaska Native communities that depend heavily on subsistence harvests of wild, renewable resources (Figure 8.1). These primarily Alaska Native communities constitute most of the communities in the spill region. EVOS was not an OCS-related spill. It did not occur under MMS jurisdiction. It was many times larger than any spill considered in OCS scenarios. EVOS can nevertheless serve to advance our knowledge of the consequences of a massive oil spill on Alaska coastal communities. It can inform analyses of the potential effects of OCS development and help to identify preventative measures that would mitigate the effects of a future spill.

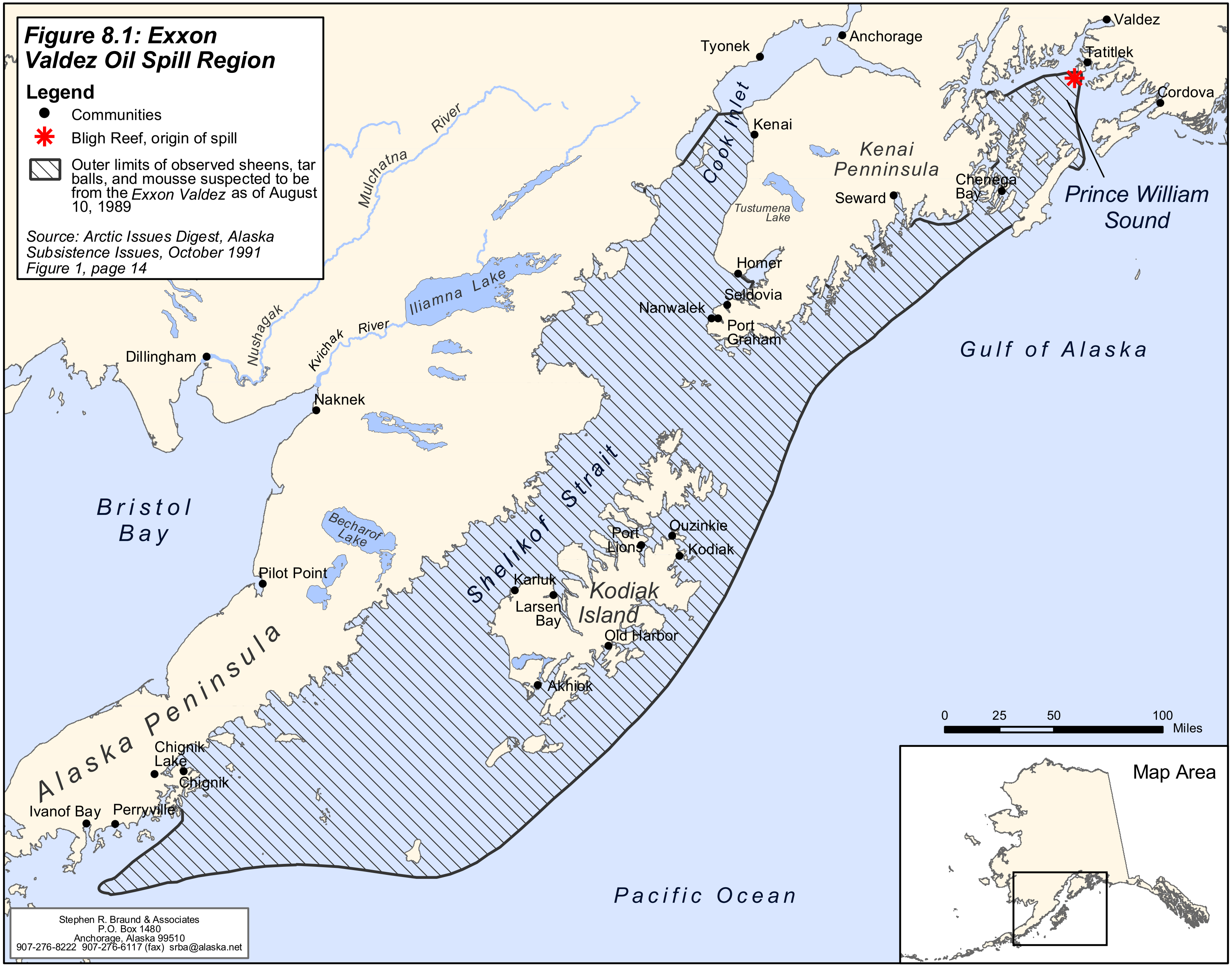
Figure 8.1: Exxon Valdez Oil Spill Region
Legend
Communities
Bligh Reef, origin of spill
Outer limits of observed sheens, tar balls, and mousse suspected to be from the Exxon Valdez as of August 10, 1989
Source: Arctic Issues Digest, Alaska Subsistence Issues, October 1991 Figure 1, page 14
Tyonek
Anchorage
Valdez
Tatitlek
Cordova
Kenai
Cook Inlet
Kenai Penninsula
Seward
Chenega Bay
Prince William Sound
Tustumena Lake
Homer
Seldovia
Nanwalek
Port Graham
Gulf of Alaska
Mulchatna River
Nushagak
Kvichak River
Iliamna Lake
Dillingham
Naknek
Bristol Bay
Becharof Lake
Pilot Point
Shelikof Strait
Port Lions
Ouzinkie
Kodiak
Karluk
Larsen Bay
Kodiak Island
Old Harbor
Akhiok
Alaska Peninsula
Chignik Lake
Chignik
Ivanof Bay
Perryville
Pacific Ocean
0 25 50 100 Miles
Map Area
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This chapter will review several MMS-sponsored studies of the long-term consequences of the EVOS on subsistence uses. It will focus particularly on key aspects of subsistence activities, namely harvest and use levels, harvest areas, sharing, and traditional knowledge. It will also selectively look more broadly at other changes brought about by the spill that had implications for the long-term viability of a subsistence-based way of life. This discussion also provides the opportunity to evaluate some pre-EVOS studies that attempted to predict OCS development scenarios for subsistence uses. In the next section, we begin with a review of seven technical reports of two types: sociocultural core studies for several EVOS area communities and four harvest disruption studies.

Sociocultural Core Studies

The first set of three studies, all of which addressed communities in the EVOS area, are part of a larger, early series within the socioeconomic studies program that addressed the sociocultural impacts of petroleum development scenarios. Bennett, Heasley, and Huey (1979, TR36) focused on two mid-sized communities: Cordova/Eyak and Seward. They based their study's findings on research conducted in the summer and fall of 1978. Their research methods (Bennett et al. 1979:3-11, TR36) differed from the ethnographic methods employed in the later harvest disruption studies. The researchers began by identifying 15 sociocultural impact categories (see Chapter Five). They used these categories as a basis for compiling information from documents and agency data, and from talks with community members and government officials. The researchers then selected "community reviewers," local residents who were "sufficiently important to the overall functioning of the system to reflect on the accuracy of the description presented in the baseline working paper" (ibid., 4). They revised their draft report based on this review. Descriptions of each of these 15 impact categories constituted the baseline upon which four development scenarios were discussed. These scenarios were:

1. No OCS development (continuation of trends identified in the baseline discussion).
2. OCS Scenario: the ninety-five percent case (low case). This involved an exploration phase only without a major development phase.
3. OCS Scenario: Mean OCS Scenario. This involved a moderate discovery of oil and gas and development, but outside the community.
4. OCS Scenario: five percent scenario (high case). This involved extensive development of major finds.

In a discussion of the category "wilderness setting," Bennett's team concluded that in the event of a major oil spill, Cordova-Eyak's primary livelihood, commercial fishing, could be seriously jeopardized (ibid., 136). In addition to the potential environmental impacts of a major oil spill, the authors anticipated the more general trends of community population growth and shifts in employment away from commercial fishing and processing.

For the Cordova portion of the research, Bennett's team briefly discussed subsistence uses of wild resources (ibid., 46- 51). The information presented derived entirely from an earlier National Park Service (NPS) study (McNeary 1978). McNeary identified key resources and described a simple seasonal round. Bennett et al. concluded that subsistence was an important source of food and "emotional sustenance" (Bennett et al. 1979:47, TR36). Most of the remaining sections of the report on Cordova discussed commercial fishing and processing. In the Seward section of the report, researchers did not mention subsistence harvests. It should be noted that Bennett and others based their impact analyses on development scenarios, none of which included a spill of the magnitude that took place following the grounding of the *Exxon Valdez*.

Payne's *Western Gulf of Alaska — Kodiak Non-Native Sociocultural Impacts* (1980:2, TR39) is a study of "the non-Native sociocultural system of Kodiak City." Davis (1979, TR41, see below) addressed the Native population, because "these groups are presumed to be culturally distinctive and therefore may respond to future events in significantly different ways than non-Native populations" (Davis 1979:3, TR41). Payne's approach was similar to Bennett's 1979 study: limited fieldwork and a strong reliance on existing literature, coupled with an analysis of the same four development scenarios used by Bennett (Payne 1980:9-11, TR39). "Impact categories" were maritime adaptation, cultural values and personality characteristics (including subsistence), political and governmental organization, social health, family relations, and the town environment." His baseline description contains a very short section on subsistence, mostly about regulations (Payne 1980:88-89, TR39). He referred to Davis (1979, TR41), "for an analysis of the cultural significance of subsistence for the Kodiak Natives." Payne noted in the context of commercial fishing that "at present, Kodiak acquires a premium price for its high quality seafood product" (Payne 1980:40, TR39).

Payne's analysis of the effects of the petroleum development scenarios, starting with a non-OCS development scenario, projected a growth in commercial fishing and processing and part of "a continued adaptation to the marine environment" (1980:145, TR39). He wrote that a spill might cause the product to lose its "reputation and its premium." Both the mean and high development scenarios assumed increased chances of oil spills (Payne 1980:162,186, TR39). Although Payne concluded that such an event "could directly damage the fishing industry," he did not address the implications for subsistence uses.

It is interesting to note that, according to Payne (1980:38, TR39), Kodiak residents took little interest in a potential oil and gas lease sale in Cook Inlet (Lease Sale No.60) until it was learned that this sale extended into Shelikof Strait. Evidently, Kodiak residents saw no threat to their area by more distant oil and gas activities, a complacency shown to be tragically shortsighted by the EVOS. This example illustrates the assumption of fairly localized impacts that characterized most of the pre-EVOS analyses of subsistence impacts.

Davis (1979, TR41) addressed the Alaska Native population of the Kodiak Island Borough, including the six villages and the Native population in the city of Kodiak. Her intent was to develop a baseline and "to identify significant factors affecting change, cause and effect of change, and to explain in detail why specific conditions exist or are likely to change over time" (Davis 1979:4, TR41). As in the two previously discussed reports, there was only limited fieldwork and a heavy reliance on agency documents. Davis also based her analysis on some useful, unpublished data collected by the Kodiak Area Native Association (KANA). Although Davis' objectives were analytical, the report reads more like an ethnography, featuring, for example, the importance of kinship in the villages. This style was likely due to the researcher's prior experience in the small Kodiak Native communities as opposed to the City of Kodiak. Although Davis tried to discuss the Alaska Native population in Kodiak city as well, she noted that "baseline data on Koniag Natives as a whole is not available, nor does information exist to the degree desirable for a comprehensive analysis and projection of anticipated results of future developments with, or without, OCS [development]" (Davis 1979:37, TR41).

The bulk of Davis' study consists of chapters on history, contemporary Native regional organizations, and brief descriptions of each of the six villages, noting "current information about the villages is extremely limited" (Davis 1979:71, TR41). There are sections on population, employment, commercial fishing, political organization, ANSCA, and the future. Regarding subsistence, the information presented was very limited. For Akhiok, for example, the report states that, "No subsistence data is available," but nevertheless "the importance of Native foods and the continuity of their use … appear central to the village" (Davis 1979:76-77, TR41).

In the report, Davis identifies subsistence as a "contemporary sociocultural issue" (Davis 1979:171-176, TR41). She cites the unpublished results of a study done by KANA involving "an informal one week survey of the use of fish and game in Port Lions and Old Harbor." The results suggested that residents of these communities use of a wide range of subsistence foods and have a high reliance on them (Davis 1979:172, TR41). She concludes that, "Subsistence activities are central to the small-scale economic systems typical of village life. They are embedded in the Native lifestyle." Respondents to the KANA survey expressed concerns that population growth associated with OCS development would bring increased competition for local resources.

Davis utilized the same four petroleum development scenarios to project changes as did Bennett et al. (1979, TR36) and Payne (1980, TR39). Under the non-OCS development scenario, she predicted that subsistence foods would remain significant and perhaps increase with greater recognition of their nutritional value (e.g., Davis 1979:195, TR41). She also predicted a shift from commercial fishing to government-funded jobs. Concerning the effects of the OCS development scenarios, she placed emphasis on the possibility of new jobs and migration from the villages to the city of Kodiak. Davis (1979:230, TR41) speculated that industry-related employment might cause a decrease in subsistence activities. She did not discuss the potential consequences for subsistence uses of resource degradation due to industrial pollution and oil spills.

Harvest Disruption Studies

Four technical reports in the OCS socioeconomic studies series constitute the series of harvest disruption studies. This series differed from the earlier sociocultural core studies conducted in the spill region described above. In all four cases, the principal investigators were anthropologists. They all highlighted subsistence uses of wild, renewable resources in the study findings as key sources of food and central factors in supporting community social organization and values. MMS had not commissioned harvest disruption studies in any communities subsequently affected by EVOS. The first three, conducted under the auspices of the John Muir Institute, followed similar methods and organization. The study communities were Unalakleet on Norton Sound (Jorgensen 1984, TR90), the St. Lawrence Island communities of Gambell and Savoonga (Little and Robbins 1984, TR89) and the North Slope community of Wainwright (Luton 1985, TR91) (see Figure 8.2). The final report, on the lower Alaska Peninsula community of King Cove (Stephen R. Braund & Associates and LZH Associates 1986, TR123), differed slightly from the other three primarily because of the importance of commercial fishing in that community.

The first three reports will be discussed as a group. The goal of the projects, which all took place within the same 1981-82 time period, was to first document current subsistence uses to establish an ethnographic baseline for assessing future disruptions in access to natural resources caused by OCS development, and then to discuss the implications of various levels of disruptions (e.g., Little and Robbins 1984:2, TR89). In all three studies, the research involved three standard anthropological methods: key respondent interviews using a protocol, archival research, and direct observation (e.g., Jorgensen 1984:302-307, TR90). All focused on the same topic. As Little and Robbins (1984:5, TR89) put it for their study, the focus was on “the relations among the harvest of renewable resources and the significant elements of St.

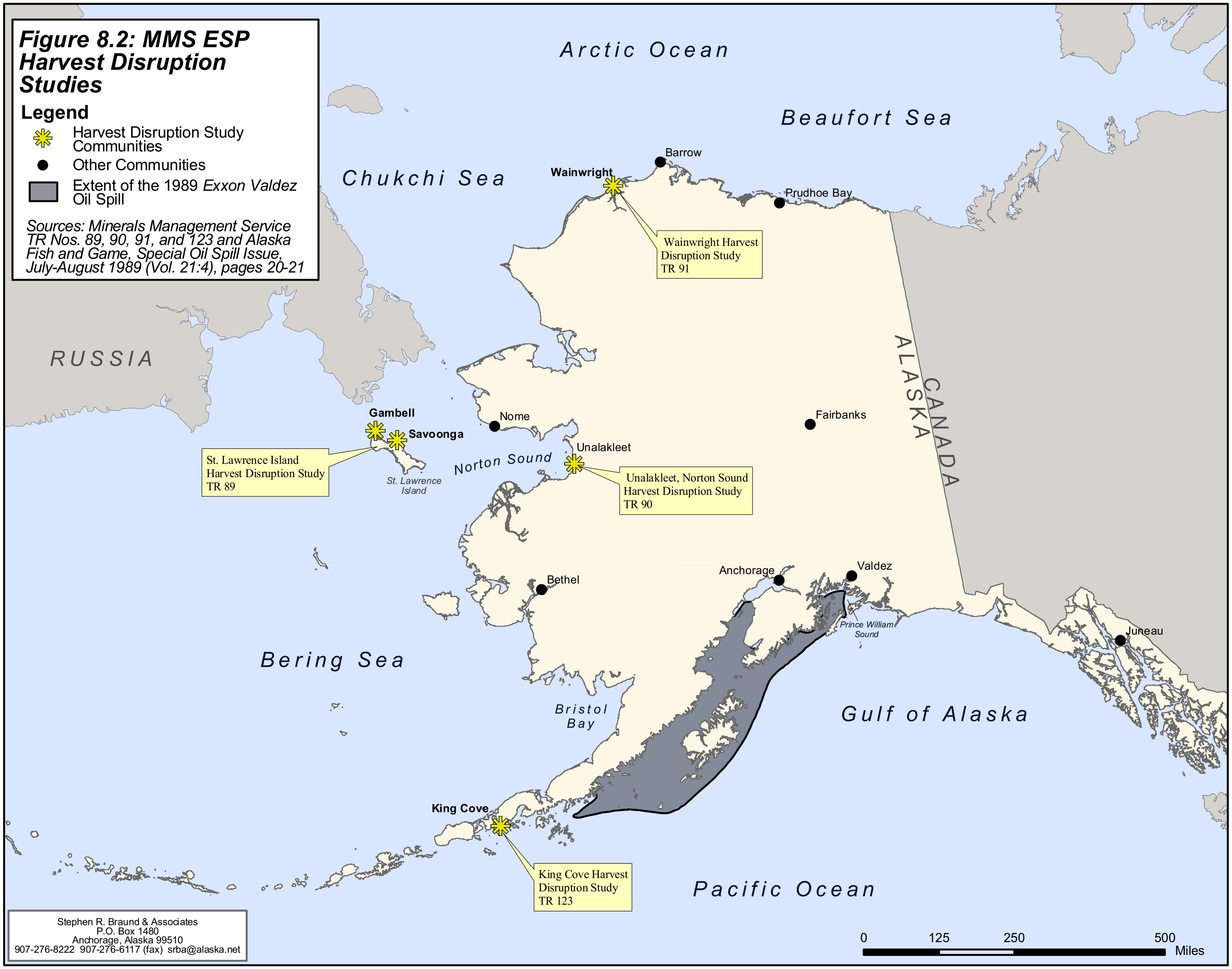
Figure 8.2: MMS ESP Harvest Disruption Studies
Legend
Harvest Disruption Study Communities
Other Communities
Extent of the 1989 *Exxon Valdez* Oil Spill
Sources: Minerals Management Service TR Nos. 89, 90, 91, and 123 and Alaska Fish and Game, Special Oil Spill Issue, July-August 1989 (Vol. 21:4), pages 20-21
Arctic Ocean
Beaufort Sea
Chukchi Sea
RUSSIA
ALASKA
CANADA
Barrow
Wainwright
Prudhoe Bay
Wainwright Harvest Disruption Study TR 91
Gambell
Savoonga
St. Lawrence Island Harvest Disruption Study TR 89
St. Lawrence Island
Nome
Norton Sound
Unalakleet
Unalakleet, Norton Sound Harvest Disruption Study TR 90
Fairbanks
Bethel
Anchorage
Valdez
Prince William Sound
Juneau
Bering Sea
Bristol Bay
Gulf of Alaska
King Cove
King Cove Harvest Disruption Study TR 123
Pacific Ocean
0 125 250 500 Miles
Stephen R. Braund & Associates
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907-276-8222 907-276-6117 (fax) srba@alaska.net

Lawrence Island culture." A notable strength of the research method was hiring local assistants to facilitate and assist with fieldwork (e.g., Jorgensen 1984:14, 292, TR90). Substantial field time was involved from February, 1982, to July or August, 1982.

The three reports include similar, frank discussions of the limitations of the research. As mentioned in Chapter One, MMS limited the use of structured interview schedules or questionnaires with more than nine people. Therefore, the project was not able to develop data for formal analysis. Another limitation for developing any analysis of causal relationships or potential change was the lack of time series data for subsistence harvests and other socioeconomic variables (Jorgensen 1984:306, TR90). Citing the need for time series data on subsistence harvests and the sensitive nature of such data, Luton (1985:13, TR91) recommended that "the collection of systematic household harvest data should be attempted with the strong and active support of the North Slope Borough."

Each of the three harvest disruption studies conducted by John Muir Institute researchers contains chapters on the natural environment, history, kinship (such as patriclans on St. Lawrence Island; Little and Robbins 1984, TR89), subsistence activities (resources harvested, seasonal round, harvest locations), and sharing as illustrative of "communitarian values" (e.g., Jorgensen 1984, TR90). The researchers present in impressive detail the kinship organization related to harvesting groups, especially in the St. Lawrence Island study (Little and Robbins 1984:154-157, TR89). They also discussed the limited nature of the cash economy in the villages (e.g., Jorgensen 1984:224-265, TR90).

Researchers acknowledged and discussed the historical processes shaping current subsistence activities to the extent that data were available. For example, the report on Wainwright noted socioeconomic and sociocultural changes brought about in the twentieth century by commercial whaling, development of a cash economy, introduction of new foods and new technology, and oil development (Luton 1985:478-9, TR91). The author concluded, however:

> In the face of such change, hunting, fishing, and gathering have remained integral to the lives of Wainwrighters. Indeed, we have demonstrated that the subsistence way of life has provided the community with needed strength and stability during a difficult period of rapid change. Thus, despite the changes that have taken place with oil development in recent years, the available, naturally occurring species continue to be inextricably linked to the socioeconomic and sociocultural systems of Wainwright and other North Slope communities (Luton 1985:479, TR91).

For Gambell and Wainwright, Little and Robbins concluded that, "The two most salient features of life on St. Lawrence Island are the great dependence on naturally occurring resources and the sharing ethic which is intimately tied to the subsistence economy" (Little and Robbins 1984:294, TR89).

Despite the limitation placed upon the research to not administer systematic surveys, the researchers were able to use key respondent protocols in all three studies as a means of collecting substantial subsistence harvest data. They used the data to rank the contribution of various resources to the total subsistence production annually and by season. (See, for example, Little and Robbins 1984:177, TR89 on seals, 217 on fish). This strategy was key to the analysis of harvest disruption scenarios in the final section of each report.

The ethnographic orientation of the three reports is evident in the list of "categories of culture assumed to be impacted by harvest disruptions" which appears in each study (e.g., Jorgensen 1984:315-322, TR90). These categories had a great deal more utility for assessing changes brought about by OCS development on subsistence activities and the way of life they support than the impact categories employed by Bennett et al. (1979:136, TR36).

All three of these studies examined three levels of disruption based on the duration of the disruption and significance of subsistence resources involved. Jorgensen's (1984:338-340, TR90) definitions of these three levels are typical:

- Low harvest disruptions (ibid., 338) are "the current situation," in which the vagaries of weather, resource population movements, and other environmental factors modify the availability of particular resources in some years. These are conditions that the communities have been adapting to for centuries. Jorgensen (ibid., 339) noted that, "These disruptions do not deny natives the resources that they seek, but they deny them access to the resources in the conditions at which they are desired."
- "Disruptions to combinations of three predominant staples and secondary food sources (any combination, one staple, two secondary or vice versa) for two consecutive seasons that render those resources inaccessible, or that destroy them after they are acquired, would constitute the base for <u>medium harvest disruptions</u>" (ibid., 339; emphasis in original).
- "Disruptions so as to render inaccessible combinations of four predominant staples and secondary food sources throughout a year would constitute <u>high level harvest disruptions"</u> (ibid., 340; emphasis in original).

For example, for Wainwright, Luton defined a medium level disruption as "disruptions to caribou for one season, or to bowhead whales or any combination of two predominant staples or three secondary food sources for two consecutive seasons" (Luton 1985:578, TR91). Luton defined a high level of disruption for Wainwright as “disruptions to caribou and whales or to either of these with a combination of two predominant staples and secondary food sources during each season for a year” (ibid., 583).

All three of these studies predicted similar kinds of impacts for medium and high level harvest disruptions. At the medium disruption level, the three research teams predicted a depletion of caches of food and pursuit of “less abundant and less preferred resources. This would result in additional costs in time and money due to less efficiency” (Jorgensen 1984, TR90; Little and Robbins 1984, TR89; Luton 1985, TR91). Traditional sharing networks would come into play: "Within the village the kinship, affinal, and friendship networks in which each family participates will redistribute preserved and freshly extracted resources to those in need, caring for the elderly and infirm first" (Jorgensen 1984:352, TR90; Luton 1985:579, TR91).

The researchers also predicted requests from the communities for subsistence foods from other communities (Jorgensen 1984, TR90; Little and Robbins 1984, TR89; Luton 1985, TR91). Luton anticipated that religious organizations would assume a role in facilitating relief (e.g., Luton 1985:580, TR91).

For Wainwright (ibid., 584), consequences of a “high level of disruption” would be “severe and protracted” requiring “very large federal transfers [of money] … in order to maintain the village’s Native population … Substantial out-migration would occur.” Also predicted were “pressure groups and social movements focused on the causes of the disruptions and their perpetrators, and attempts to bring about the immediate removal of all such activities from the region and the barring of them in the future.”

For the St. Lawrence Island village, Little and Robbins (1984 TR89) predicted permanent damage to traditional social organization from disruptions of long duration due to immigration.

Luton’s Wainwright technical report is one of the few pre-EVOS discussions of potential OCS development effects on subsistence uses that indicates an awareness of the potential seriousness of resource contamination concerns, and the only one of the four harvest disruption studies that does so. In light of the EVOS experience, the following statement was quite prescient:

> The purity and health-giving qualities of Native foods is a major present-day cultural issue on the North Slope. If a spill occurs, the effects of the death and tainting of subsistence species which does occur are likely to be multiplied by concerns and fears about eating impure or tainted meat. It is unlikely that Wainwright Natives would use an animal that has been oiled even if it were apparently healthy (Luton 1985:582, TR91).

The final ESP harvest disruption study took place in the lower Alaska Peninsula community of King Cove, most of the inhabitants of which are of Aleut descent (Stephen R. Braund & Associates and LZH Associates 1986, TR123). Again, several months of anthropological fieldwork informed the research, which involved "focused informal interviews," key respondent interviews, and participant observation. Overall, Braund's research team contacted 59 percent of the community's households. A difference from the other three harvest disruption studies was that commercial fishing played a more dominant role in King Cove's economy. Braund's research demonstrated the importance of subsistence uses in King Cove, along with their integration with commercial fishing. The marine harvests as both a commercial fishing and subsistence activity is similar to most of the EVOS communities more so than it is to the other three harvest disruption study communities. In addition to an in-depth discussion of commercial fishing (ibid., Chapter Six), the report contains a great deal of information about subsistence activities (ibid., Chapter Seven), including estimates of harvest quantities, a seasonal round chart, and maps of harvest areas.

The impact scenarios analyzed in Braund's *King Cove Harvest Disruption Study* (1986, TR123) are more narrowly defined and specific than those discussed in the other three harvest disruption studies. The first envisioned a commercial fishing closure in Unimak Pass for one year due to "a large oil spill" which also resulted in the area "being essentially off limits to subsistence harvests for one year" (Stephen R. Braund & Associates and LZH Associates 1986:11-23, TR123; see also Figure 8.3). Applying the results of the ethnographic fieldwork, the report (ibid., 11-58) notes that no subsistence activities occurred in this area except in connection with commercial fishing, and that king salmon was the most vulnerable resource. Other resources (sockeye salmon, harbor seal, sea lion) were available elsewhere. Because of lost commercial fishing income, Braund and his colleagues predicted that, under this scenario, subsistence harvests would increase, as would young people's involvement (ibid., 11-72). They predicted that the loss of income would not be so great as to cause loss of commercial boats also used for subsistence activities (ibid., 11-61,62). The researchers did not predict that there would be concerns about general contamination of subsistence resources, nor that there would be consequences of such concerns.

The second scenario involved placing a trans-peninsula pipeline and tanker terminal in Morzhovoi Bay. Such development would "impede subsistence and commercial resource harvests due to tanker traffic and 'chronic discharges' from the facility." The second scenario assumed "No impacts outside the bay" (ibid., 11-75). Because King Cove residents used the bay for subsistence, the researchers concluded that the impact under scenario two would be significant, especially for caribou and waterfowl. Higher costs to

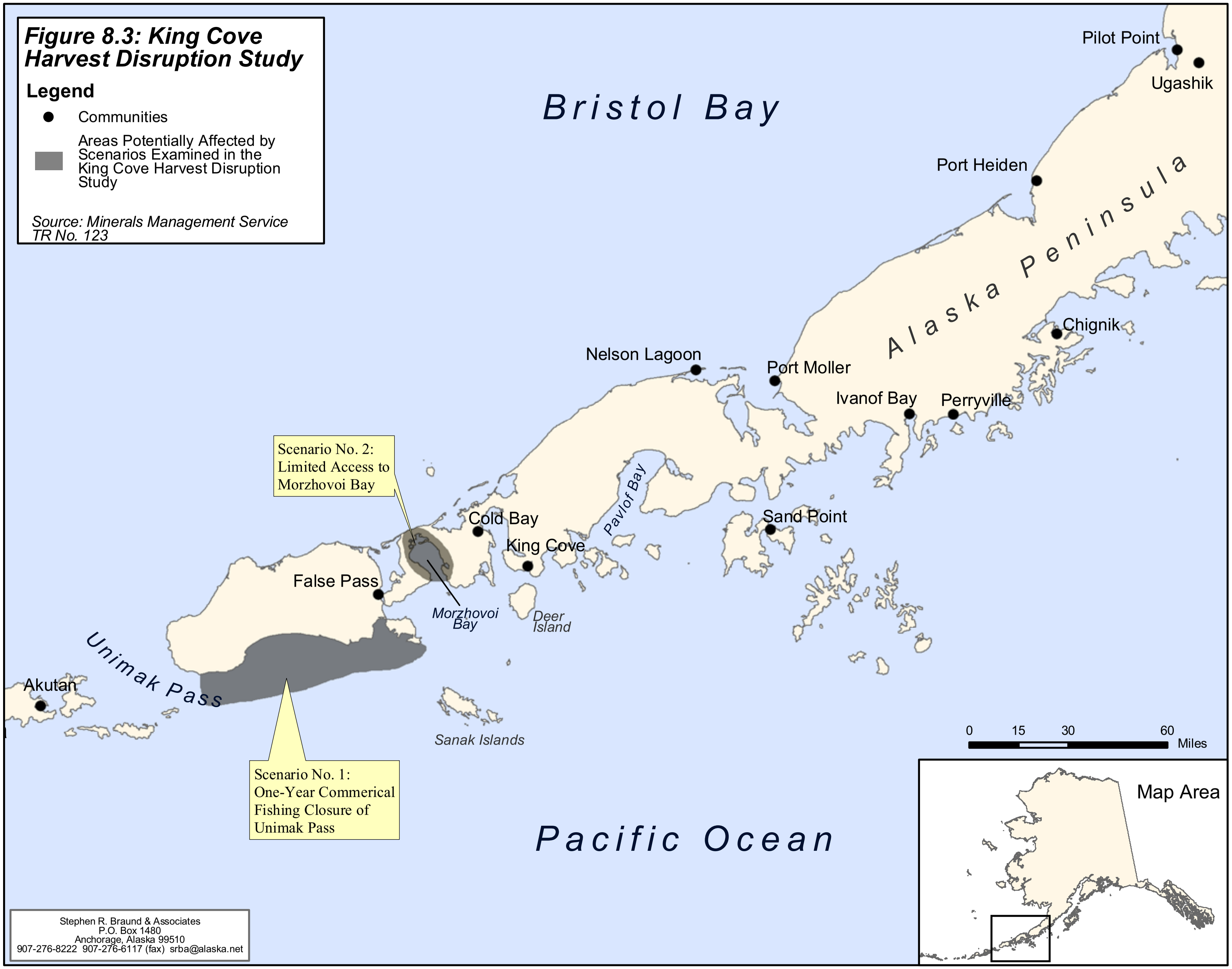
Figure 8.3: King Cove
Harvest Disruption Study
Legend
Communities
Areas Potentially Affected by Scenarios Examined in the King Cove Harvest Disruption Study
Source: Minerals Management Service TR No. 123
Bristol Bay
Pacific Ocean
Alaska Peninsula
Pilot Point
Ugashik
Port Heiden
Chignik
Nelson Lagoon
Port Moller
Ivanof Bay
Perryville
Sand Point
Pavlof Bay
Cold Bay
King Cove
False Pass
Morzhovoi Bay
Deer Island
Sanak Islands
Unimak Pass
Akutan
Scenario No. 2: Limited Access to Morzhovoi Bay
Scenario No. 1: One-Year Commerical Fishing Closure of Unimak Pass
0 15 30 60 Miles
Map Area
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harvest these highly valued resources at more distant sites would arise, and this, coupled with decreased income, might lead to substitution of less desirable but more locally available resources. Nevertheless, due to the abundance of subsistence resources and their availability through most of the year, “Harvest disruptions could change King Cove residents’ subsistence harvest patterns, costs associated with subsistence harvests, and the overall mix of species, but would not necessarily change the total quantity of subsistence foods harvested” (ibid, 11-88). The report concluded by noting the “resilience” of King Cove residents evidenced by responses to past harvest disruptions “caused by natural fluctuations in resource abundance, over-harvest of commercial resources, and changes in markets” and the likelihood that they would adapt. Based on the scenarios analyzed, the authors did not envision harvest disruptions at the scale of the EVOS.

As a final comment on all of these studies, it is worth noting that there was no prediction of what might be called “positive” effects of short to mid-term disruptions to subsistence harvests, such as the potential for revitalization of traditional activities. None of the studies envisioned anything like the restoration process that followed EVOS, the creation of the EVOS Trustee Council, and the funding of community-based projects. The studies did not discuss litigation and disaster research.

The Program of the Alaska Department of Fish and Game, Division of Subsistence

An examination of the effects of EVOS on subsistence harvests and uses draws on subsistence research conducted by the Alaska Department of Fish and Game. This section briefly describes this line of research. The Alaska State Legislature established the Division of Subsistence of the Alaska Department of Fish and Game in 1978 to conduct research “on all aspects of the role of subsistence hunting and fishing in the lives of the residents of the state” (AS 16.05.094). The division’s applied social science research program clearly was congruent with the goals of the MMS socioeconomic studies program, and from the start there was great potential for the two programs to support and supplement each other. The division began developing the time series data called for by Jorgensen, Luton, and others, and continued the systematic collection of other baseline data using social science research methods such as systematic surveys, key respondent interviews, ethnohistorical research, and participant observation (Fall 1990). A Community Profile Database was developed to make available the results of systematic household surveys at the community level. As discussed below, after the EVOS event, MMS and Alaska Department of Fish and Game took advantage of the potential for collaborative research.

Early in the development of its program, the division conducted a study of patterns of subsistence uses in six Yup'ik communities of the Yukon River Delta area (Alakanuk, Emmonak, Kotlik, Mountain Village, Sheldon Point, and Stebbins) under contract to MMS, published as Technical Report No. 72 (Wolfe 1981). This report served as a model for subsequent division research published in the Alaska Department of Fish and Game Technical Paper Series. The division intended the report as a baseline study of the economy and culture of the six communities as of 1980/81 (see also Wolfe's Chapter Six). As in the harvest disruption studies, ethnographic fieldwork was a key component of the research methodology, as was a literature review. The fieldwork involved participant observation, in-depth, systematic key respondent interviews, mapping interviews, and a systematic household harvest survey of 20 percent of the study communities' households. Although the report cautioned against using the quantitative data from these surveys as an average for the communities because the households were not selected randomly (Wolfe 1981:22, TR72), the analysis and depiction of these data became the model for subsequent Subsistence Division harvest surveys, and was the forerunner of the kinds of data to appear in the Community Profile Database. The research also contributed significantly to the development of the model of subsistence-based socioeconomic systems that informed the division's research (Wolfe and Walker 1987).

An issue raised by Wolfe's respondents became a central concern for residents of the EVOS area: what would be the chronic effects of the prolonged presence of spilled oil in the environment on subsistence resources? "The Kwikpagmiut questioned whether oil could be adequately cleaned up from the tundra of the delta. To their minds, oil absorbed by tundra would be continuously released into the riverine systems over a long time period, with negative impacts on vital fish species such as sheefish, Bering cisco, broad whitefish, and salmon smelt" (Wolfe 1981:261).

Cooperative Database Development

As noted above, as the results of systematic household harvest surveys became available, the Subsistence Division developed the Community Profile Database. In 1988, the Alaska Department of Fish and Game and the MMS entered into a cooperative agreement entitled "Subsistence in the Bering Sea" (No. 14-12-001-30418) to prepare a household level database for communities in the Bristol Bay region surveyed by division researchers using the division's standard harvest survey instrument. As part of this effort, agency researchers prepared a template for organizing these data to support further analysis.

After the EVOS, beginning in July 1990, the division and MMS entered into another cooperative agreement (No. 14-35-0001-30539) to continue to develop the household-level database in additional communities in the Gulf of Alaska area, including the communities of the EVOS area. The database included all pre-spill rounds of survey data plus data from two rounds of post-spill interviews.

Pre-Spill Research: Social Indicators Study

MMS implemented the social indicators study in coastal communities of northern and western Alaska in 1986. The goal was to develop a set of measures that "are sensitive enough that would allow the MMS to understand the impact of their activities on communities" (Callaway 1996:1). The *Social Indicators Study of Alaska Coastal Villages* included the administration of questionnaires, key respondent protocols, and ethnographic research. All three methods covered subsistence topics (Jorgensen 1995b, TR157). Subsistence related research included questions about the percentage of the annual total of meat, fish, and poultry used by the household that came from wild foods, the subsistence foods eaten the day before the interview, sharing of subsistence foods, and the range of resource harvest activities engaged in by the respondent. Social Indicator Study results are discussed later in this chapter and in Chapters Five, Nine, and 10.

Division of Subsistence Pre- and Post-EVOS Research

Prior to the EVOS, the Division of Subsistence had conducted baseline studies in the 15 predominantly Alaska Native communities of the spill area, plus the larger, mixed communities of Cordova, Kenai, Seldovia, and Kodiak. Several of these studies (e.g., Stanek 1985, Morris 1987, Stratton and Chisum 1986, Stratton 1990) resemble the MMS harvest disruption studies and Wolfe (1981, TR72) in method in following an ethnographic model: using a combination of key respondent interviewing, archival research, and participant observation. Researchers paid attention to the role of kinship in organizing harvest, processing, and distribution, and the key value of sharing (e.g., Stanek 1985:171-172). They also stressed mapping of harvests. In contrast to the MMS studies, however, the Alaska Department of Fish and Game could also conduct systematic surveys to study demography, employment patterns, and the dimensions of subsistence harvests - indeed, the Department is mandated under state law to quantify subsistence harvests (AS 16.05.094[2]). Department researchers conducted systematic surveys of subsistence harvests in all 15 Alaska Native communities, Cordova, Kenai, Seldovia, and Kodiak before the EVOS.

In 1990, the division conducted systematic household surveys in 15 spill area communities pertaining to the first post-spill year (1989) (Fall 1991). These were the same 15 predominantly Alaska Native communities for which the division had collected pre-spill data. In 1991, interviews took place in seven of the 15 communities pertaining to the second post-spill year (1990) (Fall 1997). (See also Fall 1992). These first two rounds of interviews documented the "acute" effects of the spill on subsistence uses.
As could be expected based on the harvest disruption studies, subsistence harvests declined substantially after the EVOS compared to pre-spill norms. Researchers measured declines of 57 percent in Prince William Sound villages, 48 percent in lower Cook Inlet villages, and 50 percent in Kodiak Island

Borough villages. The diversity of subsistence resources used, harvested, received, and given away declined in each of these regions by degrees similar to harvest quantities (Table 8.1).

By the second year, subsistence harvest levels and associated measures of subsistence uses rebounded to some degree in the communities of lower Cook Inlet and the Kodiak Island Borough, but generally did not reach pre-spill norms. On the other hand, there was no evidence of any recovery of subsistence harvest and use activities in the Prince William Sound villages of Chenega Bay and Tatitlek.

Harvest disruption study researchers did not anticipate the extent and the degree of the post-spill effects on subsistence. We should note, however, that the scenarios upon which the researchers based their analyses did not include a spill of the magnitude of EVOS. Soon after the spill, as signs of oiling appeared in traditional harvest areas and images of dead and dying wildlife proliferated, subsistence harvests virtually ceased. "No one's eating anything out of the ocean any more," a person from Ouzinkie told an Alaska Department of Fish and Game researcher in June 1989. The spill did not just eliminate or reduce harvests of resources most vulnerable to oiling (such as birds and marine mammals); it eliminated harvests of virtually all terrestrial mammals such as deer and bears that feed on shorelines as well as marine resources. "It feels like the environment is unclean right now," a person from Chenega Bay said. By August 1989, the disruption reached the Alaska Peninsula villages of Perryville and Ivanof Bay, more than 500 miles from Bligh Reef.

Harvest disruption study researchers failed to predict the primary cause of subsistence harvest disruption. As noted above, these pre-spill studies focused primarily on the consequences of reductions in resource populations or restricted access to harvest areas. However, the primary immediate cause of subsistence harvest declines was concerns by subsistence users about resource contamination. They were not the only ones to fail to predict the seriousness of this issue. Soon after the issue of oil contamination of subsistence foods emerged, an "Oil Spill Health Task Force," consisting of state, federal, and Alaska Native organizations plus Exxon, was formed (Field, Fall, Nighswander, Peacock, Varanasi 1999).

An extensive literature search conducted on behalf of the Task Force concluded that no studies addressed the possibilities of contaminant transfer through the food chain to humans (Nighswander 1999:37).

Table 8.1: Changes in Characteristics of Subsistence Uses by Subregion, Post Spill Year Compared to Pre-Spill Averages

Characteristic Region	Pre-Spill Average	Post-Spill Year	Change
Per Capita harvests (pounds)			
Prince William Sound	436.5	188.3	-56.9%
Lower Cook Inlet	254.3	131.4	-48.3%
Kodiak Island Borough	392.1	196.3	-49.9%
Alaska Peninsula (AKP)	287.0	346.4	20.7%
All Regions	352.0	218.2	-38.0%
All Regions, except AKP	370.5	181.1	-51.1%
Average number of resources used per household			
Prince William Sound	19.0	9.0	-52.6%
Lower Cook Inlet	22.9	12.2	-46.7%
Kodiak Island Borough	15.4	11.2	-27.3%
Alaska Peninsula (AKP)	15.7	17.6	12.1%
All Regions	16.9	12.5	-26.0%
All Regions, except AKP	17.2	11.2	-34.9%
Average number of resources attempted to harvest per household			
Prince William Sound	12.5	5.7	-54.4%
Lower Cook Inlet	16.1	9.2	-42.9%
Kodiak Island Borough	11.8	7.9	-33.1%
Alaska Peninsula (AKP)	10.3	12.3	19.4%
All Regions	12.3	8.9	-27.6%
All Regions, except AKP	12.7	8.0	-37.0%
Average number of resources harvested per household			
Prince William Sound	11.5	5.2	-55.0%
Lower Cook Inlet	15.4	8.6	-44.2%
Kodiak Island Borough	11.5	7.6	-33.7%
Alaska Peninsula (AKP)	9.8	11.4	16.9%
All Regions	11.8	8.4	-29.0%
All Regions, except AKP	12.3	7.6	-38.3%
Average number of resources received per household			
Prince William Sound	11.3	4.8	-57.5%
Lower Cook Inlet	12.3	6.6	-46.3%
Kodiak Island Borough	6.6	5.5	-16.7%
Alaska Peninsula (AKP)	9.1	9.8	7.7%
All Regions	8.3	6.5	-21.7%
All Regions, except AKP	8.1	5.6	-30.9%
Average number of resources given away per household			
Prince William Sound	9.1	4.0	-56.2%
Lower Cook Inlet	8.1	5.5	-31.8%
Kodiak Island Borough	4.5	4.3	-4.2%
Alaska Peninsula (AKP)	5.8	6.7	17.0%
All Regions	5.6	5.0	-10.8%
All Regions, except AKP	5.6	4.6	-18.6%

Source: Alaska Department of Fish and Game (ADF&G) 2001 and Division of Subsistence, ADF&G, Household Surveys

Therefore, the Task Force could not rely on previous studies to develop health advise for subsistence users in Alaska because the issue had not been adequately addressed. Failure to recognize the seriousness of this issue led to early blunders, such as early health bulletins minimizing the risks of eating subsistence foods from the spill area despite the lack of studies or standards concerning what a safe level of hydrocarbon contamination might be (Walker and Field 1991; Nighswander 1999; Nighswander and Peacock 1999). The public distrust, especially in Alutiiq communities, created by the lack of information and poor early communications took years to overcome. By 1998, almost all households in EVOS area communities were confident that most subsistence foods were safe to eat, although concerns about paralytic shellfish poisoning were strong in Kodiak Island villages (Fall, Field, Nighswander, Stein, and Bolger 1999:51-62).

As forecast by harvest disruption study researchers, communities in the spill area turned to other Alaska Native communities for assistance in obtaining subsistence foods (Fall, Stratton, Coiley, Brown, Utermohle, and Jennings 1996:119-126). The Dena'ina Athabaskan community of Tyonek, the Tlingit community of Angoon, the Chugach Alaska Corporation, and the Eyak Village Council developed emergency food relief programs featuring subsistence foods. The Russian Orthodox Church assisted with organizing some of these programs, as did Exxon (Meidinger 1999:106).

Given the vast extent of the disruption to subsistence uses and the way of life they support in the communities of the EVOS area, it is not surprising that the research documented a strong level of fear and uncertainty about the future. At the end of the first post-spill year, and extending well beyond it, residents expressed frustration and a feeling of loss. As a person from Nanwalek said, because of the lost subsistence opportunities, "it was like a year of memories being erased" (Fall 1999a:76).

The Social Indicators Post-Spill Research and the "Oiled Mayors" Studies

Following EVOS in 1989, MMS extended the social indicators project to include 12 communities, including nine in the spill area, for two post-spill waves of research. Study findings are reported in an eight-volume final report published by MMS and in several journal articles (e.g., Jorgensen 1995a; 1995b, TR157; 1996a; 1996b). EVOS communities included in the social indicators research were Cordova, Tatitlek, Valdez, Kenai, Seldovia, Karluk, Kodiak City, Old Harbor, and Chignik (Table 8.2, Figure 8.1).

Table 8.2: Study Communities and Coverage by Major Post *Exxon Valdez* Oil Spill Study with a Component that Investigated Impacts on Subsistence Activities[1]

Community[2]	Population 1990	Population 1995	Major Study Coverage: "Oiled Mayors"[3]	Social Indicators	ADF&G (with study years): Standard Survey Instrument	Social Effects Questionnaire
Prince William Sound						
Chenega Bay	94	96	X		1984/85, 1985/86, 1989/90, 1990/91, 1991/92, 1992/93, 1993/94, 1997/98	1991/92, 1992/93, 1993/94
Cordova	2,110	2,568	X	X	1985, 1988, 1991, 1992, 1993, 1997/98	1991, 1992, 1993
Tatitlek	119	124	X	X	1987/88, 1988/89, 1989/90, 1990/91, 1991/92, 1993/94, 1997/98	1991/92, 1993/94
Valdez	4,068	4,469	X	X	1991, 1992, 1993	1991, 1992, 1993
Cook Inlet						
Kenai	6,327	7,006	X	X	1982, 1991, 1992, 1993	1991, 1992, 1993
Nanwalek	158	162	X		1987, 1989, 1990/91, 1991/92, 1992/93, 1993/94, 1997/98	1991/92, 1992/93, 1993/94
Port Graham	166	170	X		1987, 1989, 1990/91, 1991/92, 1992/93, 1993/94, 1997/98	1991/92, 1992/93, 1993/94
Seldovia	459	415	X	X	1982, 1991/92, 1992/93, 1993/94	1991/92, 1992/93, 1993/94
Kodiak Island Borough						
Akhiok	77	80	X		1982, 1986, 1989, 1992/93	
Karluk	71	58	X	X	1982, 1986, 1989, 1990/91, 1991/92	1991/92
Kodiak City	6,365	7,620	X	X	1982, 1991, 1992, 1993	1991, 1992, 1993
Larsen Bay	147	130	X		1982, 1986, 1989, 1990/91, 1991/92, 1992/93, 1993/94, 1997/98	1991/92, 1992/93, 1993/94
Old Harbor	284	310	X	X	1982, 1986, 1989, 1991/92, 1997/98	1991/92
Ouzinkie	209	259	X		1982, 1986, 1989, 1990/91, 1991/92, 1992/93, 1993/94, 1997/98	1991/92, 1992/93, 1993/94
Port Lions	222	233	X		1982, 1986, 1989, 1993/94	
Alaska Peninsula						
Chignik	188	141	X	X	1984, 1989, 1991/92	1991/92
Chignik Lagoon	53	65	X		1984, 1989	
Chignik Lake	133	154	X		1984, 1989, 1991/92	1991/92
Ivanof Bay	35	28			1984, 1989	
Perryville	108	104			1984, 1989	
Arctic						
Kaktovik	224	210		X	1985/86, 1986/87, 1992/93	
Kivalina	317	349		X	1982/83, 1983/84, 1992	1992
Kotzebue	2,751	2,947		X	1986, 1991	1991
Nuiqsut	354	410		X	1985/86, 1993	1993

[1] Major references for these studies: "Oiled Mayors": IAI 1990e and f; Social Indicators: Jorgensen 1995b; Fall and Utermohle 1995, 1999

[2] ADF&G studies for Kodiak in 1982 and 1991 included the road system outside the city limits "Seldovia" population = "Alaska Native Village statistical area," including the city limits and areas connected by road to the incorporated area.

[3] The "Oiled Mayors" study occurred in 22 communities, including four not in this table: Soldotna, Seward, Homer, and Whittier.

Source: adopted from Fall and Utermohle 2001:10

A primary finding of the social indicators post-spill research was that Native and non-Natives had markedly different responses to the spill. Pre-spill cultural differences explain the different responses to EVOS. (See Chapter Nine for a more detailed discussion of the range of findings of the social indicators study.) Regarding subsistence uses, as summarized by Jorgensen:

> Without question, Native subsistence economies in 1989, immediately prior to the spill, were different from Native subsistence economies of 1889 and 1789 and 1689 in the technology, the speed and risks with which resource could be harvested, and the proportion that wild foods contributed to the diets. But in 1989, as in the three centuries that preceded it, subsistence economies were directly linked to procuring food and shelter for the maintenance of life … I will demonstrate how Native customs were invoked as a response to the spill and how non-Natives responded to the spill as well. The differences were marked. The differences are cultural (Jorgensen 1995a:4).
>
> Immediately after the spill and continuing into early 1990, non-Natives increased their harvests and uses of wild resources. Natives decreased their harvest and relied upon preserved foods harvested before the spill. By the winter of 1991, non-Natives had reduced their harvests and the amounts of wild foods that they ate. Natives had begun to resume more fully their harvesting activities. The proportions of wild foods in their diets remained below the proportions in 1989 (Jorgensen 1995b:8).

The social indicators project resulted in a series of "post-spill key informant summaries" for each of the study communities. These reports include sections on impacts on subsistence uses (e.g., Reynolds 1993:211-226, TR155; Endter-Wada, Mason, Mulcahy, and Hofmeister 1993:683-685, TR155).

The Alaska Department of Community and Regional Affairs funded the so-called "Oiled-Mayors Study" through a grant to the "Oiled Mayors subcommittee" of the Alaska Conference of Mayors. The contract to conduct the research was awarded through a competitive process to Impact Assessment, Inc. Conducted from December 1989 through November 1990 in 22 communities throughout the spill area (Table 8.2), the study set out "to investigate the types and range of social, economic, and psychological impacts resulting from the oil spill and cleanup" (Russell, Downs, Petterson and Palinkas 1996:869). The study concluded:

> A progressive 'dose-response' relationship was found between exposure to the oil spill and subsequent cleanup efforts and the following variables: reported declines in traditional social relations with family members, friends, neighbors and coworkers; a decline in subsistence production and distribution activities; perceived increases in the amount of and problems associated with drinking, drug abuse, and domestic violence; a decline in perceived health status and an increase in the number of medical conditions verified by a physician; and increased post-spill rates of generalized anxiety disorder, post-traumatic stress disorder, and depression. Alaskan Natives, women, and 18-44 year olds in the high- and low-exposed groups were particularly at risk for the three psychiatric disorders following the oil spill. The results suggest that the oil spill's impact on the psychosocial environment was as significant as its impact on the physical environment (Palinkas, Downs, Petterson, Russell 1993:10).

Post-Spill Cooperative Research between Alaska Department of Fish and Game and MMS

In order to build upon the post-spill research conducted by the division pertaining to 1989 and 1990 conditions, in 1992, the Alaska Department of Fish and Game and MMS entered into a third cooperative agreement (No. 14-35-0001-30622) to support three more rounds of interviewing in EVOS communities. The study was entitled "An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska," with investigation of the consequences of the 1989 EVOS being the major focus of the research. Selected findings, primarily organized by study community, appeared in the six-volume Technical Report No. 160 (Fall and Utermohle, editors 1995). That MMS collaborated on this study is evidence that the agency took seriously the earlier conclusion of harvest disruption study researchers that collection of multi-year data was necessary to detect trends.

Three rounds of fieldwork took place in 1992, 1993, and 1994. Study communities in the area affected by EVOS included Chenega Bay, Cordova, Tatitlek, and Valdez in the Prince William Sound area; Kenai, Nanwalek, Port Graham, and Seldovia in the Cook Inlet area; Akhiok, Karluk, Kodiak, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions in the Kodiak Island Borough; and Chignik Bay and Chignik Lake in the Lake and Peninsula Borough (Alaska Peninsula). Additionally, the study added control or reference communities in the Arctic region to strengthen the application of the findings to broad questions of sociocultural change that are related to development of the resources of the OCS. These communities were Kotzebue, Kaktovik, Kivalina, and Nuiqsut.

During the three years of fieldwork, division researchers collected most data through voluntary face-to-face interviews using two instruments. The first, the “harvest survey questionnaire,” modeled after the division’s standard survey instrument, collected data on household demography, involvement in the cash economy, resource harvests and uses, and assessments of changes in subsistence harvest and use patterns. The Alaska Department of Fish and Game funded administration of this instrument. The second instrument, the “Social Effects Questionnaire” reflected in part the questionnaires and interview protocols used in prior social indicators research funded by MMS. It addressed changes in social and community organization that OCS development could affect. These changes include sharing of subsistence resources, the influence of elders, and the teaching of subsistence skills and values to young people. Researchers obtained Office of Management and Budget approval to administer this questionnaire.

After the completion of Technical Report No. 160, Alaska Department of Fish and Game and MMS recognized the opportunity for additional data analysis and research. Consequently, the two agencies designed a follow-up cooperative research project on the EVOS in 1996 under cooperative agreement No.

14-35-0001-30788 with the title *Socio-cultural Consequences of Outer Continental Shelf Activities: Data Analysis and Integration,* commonly referred to as the *Data Analysis and Integration Project*. Its purpose was to produce an assessment of the effects of the EVOS and its aftermath and the responses of communities to these new environmental, economic, and sociopolitical conditions, placed in the historical context of the Pacific Gulf region. The study was based on an analysis and synthesis of subsistence, economic, and sociocultural data from the two previous Alaska Department of Fish and Game/MMS cooperative projects, augmented by the collection of new ethnographic information about cultural continuity and change in the communities of the EVOS area. The focus of the final report (Fall, Miraglia, Simeone, Utermohle, and Wolfe 2001, TR163) was on the EVOS of March 1989 as an example of how a consequence of OCS development could have profound implications for the communities of the Gulf of Alaska (Pacific Gulf).

Achieving the study's objectives required several interrelated tasks: 1) create an SPSS (Statistical Package for the Social Sciences) metafile (directory of raw data files) with previously-collected data; 2) conduct a review of the literature on the EVOS to identify a set of hypotheses about acute and chronic sociocultural and socioeconomic effects of the spill; 3) conduct a time-series analysis of the data set; 4) produce ethnographic case studies for a range of communities in the EVOS area (Mishler 2001, Simeone and Miraglia 2000, Stanek 2000); 5) in collaboration with local communities, plan, develop, and distribute a set of oral histories and associated photographs, maps, texts in an interactive format on CD-ROMs (called "Jukeboxes"); and 6) produce a comprehensive final report. The emphasis on integrating pre-and post-spill data and collecting ethnohistoric information reflects attempts in earlier MMS and Division of Subsistence technical papers to trace key factors that shaped trends. This emphasis was also partly in response to assertions that surfaced during litigation that the EVOS had minimal effects on the communities because of the massive sociocultural changes that had commenced with Euro-American contact and accelerated throughout the twentieth century (Wooley 1995).

After the *Data Analysis and Integration Project* began, the *Exxon Valdez* Oil Spill Trustee Council (EVOS Trustee Council – see below) funded a project to update quantitative data on subsistence harvests and other related topics approximately 10 years after the EVOS. The Alaska Department of Fish and Game Division of Subsistence and the Chugach Regional Resources Commission conducted the research. Researchers administered structured household surveys in 10 study communities. The instrument included the standard Alaska Department of Fish and Game household survey, selected *Social Effects* questions, and new questions developed in a workshop with study community representatives. The findings appeared in Fall and Utermohle (1999). The Department of Fish and Game and MMS modified their cooperative agreement to support incorporation of these survey data into the database produced under Task 1 of the *Data Analysis and Integration Project.*

Key Findings about the Long-Term Consequences of the EVOS on Subsistence Uses

This section summarizes the findings and conclusions that appear in Technical Reports Nos. 160 and 163, both of which described the consequences of the EVOS on the subsistence uses of wild renewable resources and the sociocultural and socioeconomic systems that these uses support. While their subject matter overlaps, the authors organized the technical reports differently. Technical Report No. 160 consists primarily of descriptions of study findings for each of the 21 communities surveyed at least once over the three-year project, along with a short final chapter highlighting key effects of the EVOS on these communities. Technical Report No. 163 examined the immediate and long-term consequences of the EVOS on human communities of the Pacific Gulf, with a primary focus on the Alutiiq, the indigenous people of the area. Its organization is topical and integrative.

Drawing from the ethnographic products and literature, Technical Report No. 163 described the historical ethnography of the Alutiiq and post-contact changes to demography, economy, belief systems, and sociopolitical organization (Fall et al. 2001:41-59). It identified a series of "economic transformations" begun during the eras of Russian and American colonialism to "the most recent transformation … from the relative autonomy of self-employed fishermen and trappers, to a life more deeply imbedded in capitalism" (Fall et al. 2001:59). This report then described Pacific Gulf communities "on the eve of the EVOS," noting the characteristics of the mixed subsistence-cash economy and the significant levels of subsistence harvests, as well as the important role of the Russian Orthodox Church in shaping expressive culture in the Alutiiq villages.

The report began with an acknowledgement of the disparate claims that arose about the spill's effects on human communities that contributed to alternative social constructions of the meaning of the event that in turn shaped responses to it. Pre-EVOS sociocultural impact studies and harvest disruption studies did not forecast such a debate over meaning. For residents of the 15 Alutiiq villages, the spill caused uncertainty about the future of natural resource populations and the subsistence uses that they supported. As stated by Gary Kompkoff, president of the Tatitlek Village Council (quoted in Fall et al. 2001:3):

> Mussels, clams, starfish - things are dying off and floating up on the beaches. The tides come and go out, come in and go out. The scientists do their research one day, and everything looks fine. But what about the tide coming in? There's frustration, uncertainty and fear - a fear of what the future's going to bring. We go from fear to anger to frustration with this thing. It's going to be with us for a long time.

On the other hand, anthropological experts under contract to Exxon to assist in post-spill litigation portrayed the spill as a relatively minor event in a long series of assaults on an already significantly altered way of life.

> …Put into the context of socioeconomic change and adjustments to past social disasters that the Alutiiq people have experienced, the *Exxon Valdez* oil spill was not a determinant event. Its chief distinguishing characteristic is that blame could be attached and lawsuits filed, causing problems that the oil spill itself never could have caused. The spill could thus become the scapegoat for many of the changes in the Alutiiq environment (physical and cultural) that have occurred in the twentieth century (Wooley 1995:148-149).

As noted above, the first two rounds of research by the division found that the EVOS caused major impacts on subsistence uses and the sociocultural systems that they supported. There was a definite geographic pattern to these impacts. The impacts lessened with distance from Prince William Sound. As described in Technical Report No. 160, research over the third through fifth post-spill years provided further evidence of the geographic pattern of EVOS effects on subsistence. Communities closer to the origin of the spill in Prince William Sound and lower Cook Inlet, as well as Ouzinkie in the Kodiak Island Borough, reported higher and more persistent levels of spill impacts than more distant communities. This pattern corresponded to the relative degree of oiling and the persistence of oil in the environment, a finding consistent with the dose/response relationships observed in the "Oiled Mayors" study (Impact Assessment, Inc. 1990e).

A relatively high percentage of respondents in Chenega Bay, Nanwalek, and Tatitlek through the fifth post-spill year said people shared wild foods less since the spill. Even 10 years after the EVOS, about 28 percent of interviewed households said that sharing of subsistence foods was down, although the reasons provided for this assessment were varied (Fall et al. 2001:241). There were two exceptions to this general finding. First, Jorgensen (1995b:8) noted that among Native households, sharing increased immediately after the spill as stores of wild foods harvested before the spill were distributed to compensate for lost harvests. Second, as noted below, Alaska Department of Fish and Game researchers discovered through an analysis of household level data that the most productive households in the four Alaska Native villages closest to the spill continued to supply subsistence foods to households in need in the years following the spill (Fall et al. 2001:279-280).

By the third post-spill year, subsistence harvest levels in all the communities of the oil spill area appeared to be rebounding from the low levels of the first and second post-spill years, consistent with the findings of the social indicators study research, as summarized above (Jorgensen 1995b, TR157). But there continued to be an important shift in the composition of subsistence harvests in Chenega Bay and

Tatitlek, with much lower takes of marine mammals than before the spill and a larger portion of the harvests composed of fish.

In 1994, five years after the EVOS, in many study communities, a notable percentage of households reported that subsistence uses had not recovered to earlier levels. This position was expressed strongly in the Prince William Sound villages, in Nanwalek, and in Ouzinkie. In all four villages, a larger percentage of households reported lowered levels of resource harvests compared to before the spill in 1993 than did so in 1991. By 1999, 10 years after the spill, 57 percent of households in seven Alaska Native communities in the EVOS area said that their uses of at least one type of wild food were lower than before the spill due to reasons they associated with the spill, mostly reduced resource populations (Fall et al. 2001:243).

An important shift appeared in the explanations people offered concerning why the spill's impacts reduced their resource uses. In 1989, a majority of households with spill-caused reductions in resource uses cited fear of oil contamination as the reason for the decline. By 1993, the vast majority of households who still said that the spill's effects were impacting their subsistence uses cited reduced resource populations as the cause of the decline. This viewpoint was especially strong in Prince William Sound. A large majority of respondents in Chenega Bay said that populations of deer, harbor seals, sea lions, sea ducks, and clams were down since the spill. In the fourth and fifth post-spill years an increasing majority said that salmon stocks were down as well. At Tatitlek, a majority of respondents said there were less deer, seals, sea lions, sea ducks, salmon, halibut, clams, bidarkis, and octopus.

Contamination concerns about specific resources, while substantially reduced from the levels expressed in the first few years after the spill, persisted among many households, especially in Chenega Bay, Tatitlek, Port Graham, and Nanwalek five and even 10 years after the EVOS. Substantial percentages of households reported that they had not received adequate information about the safety of subsistence foods. This example illustrates an important finding: that many households in the spill area returned to using subsistence foods despite lingering contamination fears. The economic and cultural necessities of using subsistence foods have compelled Alaska Natives of the spill area to resume subsistence harvests even at increased costs of time, money, and health concerns.

In Tatitlek and Chenega Bay, subsistence harvesters' observations of reduced wildlife populations and diseased animals (such as a viral infection in Prince William Sound herring) created substantial doubts about the overall health of the natural environment. In 1989, the spill's immediate effects caused subsistence users to distrust the safety of subsistence foods. Direct observations of dead and injured wildlife, interpreted through traditional systems of knowledge, strongly suggested to subsistence users that resources might be unsafe for humans.

The spill also created conditions very unfamiliar to subsistence users which experience and training were ill-equipped to explain. Under these circumstances, many households acted with caution. By 1993, traditional knowledge about food safety and edibility continued to inform people's decisions about subsistence uses. In addition, the Oil Spill Health Task Force disseminated public health advisories in villages. But doubts persisted that traditional and scientific knowledge were not enough to answer questions about what the spill had done. In the view of many of the people interviewed as part of this project, and especially in Prince William Sound and among Alaska Native people, the spill had caused fundamental changes to natural resource populations and the natural environment overall that had yet to be adequately explained. This uncertainty has had profound effects on the outlook for the future that people expressed in several communities, such as Tatitlek, Chenega Bay, and Cordova, and persists as an important long-term impact of the spill.

An additional social effect of EVOS was the prolonged litigation over damage claims. The U.S. federal court ruled ineligible claims by the Alaska Native Class concerning injuries to their way of life. These rulings were especially disheartening to the people whose subsistence uses had suffered following the spill. Subsistence users viewed the settlement with Exxon regarding the replacement value of lost subsistence harvests, at best, as only a partial compensation of the Native Class claims. A view persisted that the judicial process had not yet acknowledged the cultural importance of subsistence to the Alaska Native communities of the spill area nor had it acknowledged the cultural injury that Alaska Native people living in the spill area had suffered.

As a result of a settlement of civil claims against Exxon by the state and federal governments, $900 million became available for spill restoration. The state and federal governments created the *Exxon Valdez* Oil Spill Trustee Council, consisting of representatives of state and federal land and resource management agencies. The Council administers the oil spill restoration fund (Fall et al. 2001:188-190). Under the settlement, subsistence is an injured resource service (a human use) and, as a result of lobbying by Alutiiq communities, the Trustee Council directed funds toward subsistence restoration projects, supporting community involvement, resource enhancement, and cultural revitalization.

Through the Trustee Council's habitat protection program, the Council has purchased over 450,000 acres of mostly Alaska Native lands, as well as conservation easements on about another 168,000 acres. The sales created controversies in Native communities concerning the wisdom of selling Native lands and how to manage and distribute the money obtained from the sales. This new source of cash provided the means for people to leave the villages. And the sale of Native lands raised uncertainties about future access to resources and a future role for tribes in land and resource management decisions.

Technical Report No. 163 reported analyses of spill effects by types of households in order to try to understand how the domestic mode of organization in the subsistence sector performed in response to the conditions created by the EVOS (Fall et al. 2001:273-287). The analyses suggested that a relatively stable social structure in Alutiiq villages underlay the highly changeable economic activities of households during the oil spill crisis. The economic activities of households exhibited large changes in wild food production, wild food distribution, and commercial-wage employment. As noted above, these changes were triggered by the threats of contaminated foods. Yet these changes in household functions are properly viewed as perturbations of household activities within a local social structure that remained relatively stable throughout the environmental crisis. The network of kinship-based groups underlying the mixed subsistence-cash economy continued to operate during the oil spill, though the mix of subsistence and cash activities of households shifted from year to year in response to the crisis. The ability of the households to quickly respond to new contingencies triggered by the oil spill crisis was rooted in flexibility of the kinship-based production system – flexible in the sense that under the traditional system, household groups have the capacity to make the kinds of short-term economic adjustments in labor and resource allocations that were required by the disaster.

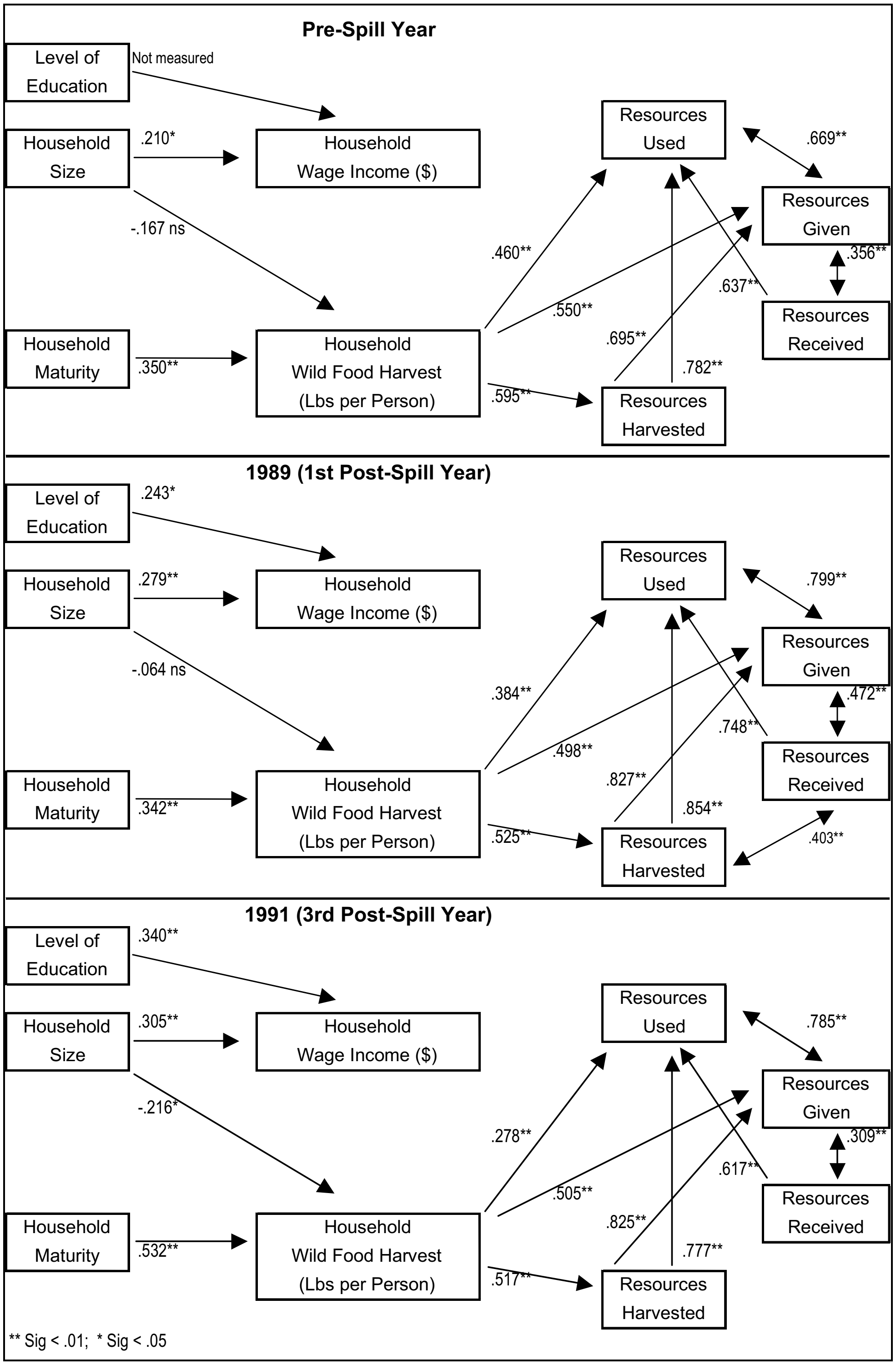
To examine the extent of structural stability within the domestic mode system, the analysis described the basic relationships between certain household factors of production and distribution before and during the early post-spill period. If the same relationships were evident in the patterning of factors across time, it would suggest consistency in the social organization of production and distribution as the disaster unfolded.

In this analysis, researchers examined relationships (in this case measured as statistical correlations) between several household-level factors in the economic sphere. In particular, the analysis examined the relationship between a household's wild food harvest level, wage earnings, and the distribution of wild foods. These were central aspects of the economic sphere in Alutiiq villages - wage earnings were part of the wage sector, wild food harvests were part of the subsistence production sector, and wild food distribution was part of the subsistence distribution system. Households participated in both economic sectors to varying degrees. For analysis, researchers combined data for Alaska Native households within four Alutiiq villages in Prince William Sound-Lower Cook Inlet (Chenega Bay, Tatitlek, Port Graham, and Nanwalek). They examined relationships for all years with information - pre-spill, 1989, 1990, 1991, 1992, and 1993. The correlations for three years are shown in Figure 8.4 (pre-spill, 1989, and 1991). The arrows suggest the causal direction of correlation, if one exists.

Looking at the four Alutiiq villages nearest the spill, the analysis showed that the household's maturational type was significantly associated with household wild food harvest levels prior to the spill. As a household matures in the normal developmental cycle, households tend to harvest more wild foods in the subsistence sector of the village economy. Among the factors examined, the maturity of the household was the factor most highly correlated with wild food production. Household maturity was not associated with household wage income. As a household matures with age, it does not tend to earn more income in the wage sector. This finding may be due to young persons having access to jobs and higher incomes because of better schooling than was available to older persons.

Researchers also found strong and consistent associations between household wild food harvest levels and the distribution system of wild foods in Alutiiq villages nearest the spill. Within the villages, households that harvested greater quantities of wild food also tended to give away more types of wild foods to other households. Conversely, households that produced smaller quantities of wild foods also tended to distribute smaller numbers of wild food types. Thus the food production and food distribution systems were directly related. Overall, high-producing households were high-giving households, as well as producing for their own consumption. In fact, giving was more strongly associated with harvest volume than was using, suggesting that high production was motivated as much by "giving" as by "acquisition." There appeared to be reciprocity in the food distribution system as was shown by the moderately strong associations between giving and receiving. The more a household gave, the more the household also received. Over the course of a year, a gift given appeared to generate other gifts received. Households that harvested a greater diversity of wild food types also used a greater diversity of wild foods within their own household. Thus, wild food production was production for use within the producing household, as well as production for distribution to other households.

Figure 8.4: Correlations Between Factors of Production of Alaska Native Households in Chenega Bay, Tatitlek, Port Graham, and Nanwalek for Three Study Years



The relative stability of the structure of the mixed economy, measured at the household level, was suggested by comparing this pattern in the pre-spill year with the patterns in 1989 (the first post-spill year) and 1991 (the third post-spill year) (Figure 8.2). While the magnitude of correlations between factors changed slightly, the basic pattern of factors of production and distribution remained essentially the same across all years. The best predictors for subsistence food production were the age and composition of household members, consistently across all study years. Also consistent across the survey period was the pattern that high-producing households distributed the most subsistence products. The relationships between wage income, education, and household size were consistent, as was the lack of relationship between the wage and subsistence sectors.

The report (Fall et al. 2001:287) concluded:

> By these measures, there was stability in the basic organization of the factors of production and distribution during the oil spill crisis in the villages of Prince William Sound and Lower Cook Inlet. This is evidence that, at the local level of extended household networks, there was no collapse triggered by the strains of the spill. While the spill created major local disruptions of food procurement and employment patterns, the spill did not transform the pattern of relationships in the subsistence sector. The traditional extended kinship networks adapted to the short-term crisis of food production and distribution at the local level without major dislocations in the underlying structure of production and distribution.

The research found that one development from the EVOS has been economic and cultural revitalization within Alutiiq villages (Fall et al. 2001:288-290). Financial support of the revitalization came through programs instituted by the villages using damage award settlements. Only after an initial period of Alutiiq tribal leaders vigorously lobbying the Oil Spill Trustee Council and other state and federal entities were they successful in redirecting a portion of the settlement money into funds for villages as a class separate from the general public and then into community based projects designed to directly benefit villages. The narrow conceptualization of injuries and injured parties within the federal and state legal systems had been a major obstacle for the Alutiiq villages to overcome. The legal system basically recognized two types of injuries: individualized injuries to private parties (such as individual commercial fishers, owners of private land, or businesses) and shared injuries to the general public. Injuries to community-based tribal groups had no separate, legally recognized status. The legal system viewed tribal interests as a part of general public interests. As such, tribes would benefit as members of the general public from projects designed to restore the natural environment. The Alutiiq villages pushed for recognition of the special injuries sustained by tribal members because of their historic socioeconomic and cultural dependencies on the injured natural environment. Eventually the EVOS Trustee Council, who administered the civil settlement money, and the Alaska legislature, who approved projects supported by the criminal settlement money, conceded this position.

Residents designed the community-based projects instituted by Alutiiq villages with settlement awards to counter injuries perceived to be shared by the tribal group. Injuries to the natural environment led to reductions in the subsistence activities of local, extended families, which in turn held the potential for eroding the transmission of cultural knowledge within the tribal group. Consequently, they designed restoration projects to restore the injured natural environment, bolster subsistence activities, and promote the flow of cultural knowledge so as to counter the injuries. Through fiscal year 2000, about $15 million of settlement awards went toward community-based projects in Alutiiq villages. The projects fell into seven general types, including fish stock enhancement, subsistence and educational facilities, cultural education projects, wild food safety, local mariculture development, other wild resource assessments, and local participation in the restoration process. The report (Fall et al. 2001:289-290) noted:

> While diverse, all projects have shared a community focus. They have been designed to benefit the injured community as a whole, rather than private parties affected by the spill. Successful projects were viewed to have outcomes that enhanced the subsistence economy and cultural values common to villages in the spill area. The "investment" of damage settlements into community-based programs has had the effect of revitalizing the local economy and traditional cultures of Alutiiq villages nearest the oil spill. This revitalization may not have developed at this pace had the oil spill not have [*sic*] occurred. The projects represent a conscious effort on the part of Alutiiq tribal leaders to redirect the public energy and resources generated by the oil spill calamity into something dynamic and positive for the Alutiiq villages.

The final chapter of Technical Report No. 163 analyzed responses to the EVOS by cultural groups (primarily the Alutiiq), households, and communities. It noted that the meaning of the EVOS varied by interest group, such as the oil industry, government, scientists, the Alutiiq, and other local residents. For the Alutiiq and some others, such as commercial fishers, the EVOS was a calamity, causing feelings of distress, grief, and loss. Others viewed EVOS as a disaster that inflicted destruction, hardship, and distress, but not as as a catastrophe with irreparable loss or a cataclysm causing revolutionary changes.

The EVOS was clearly a determinant event for the Alutiiq that elaborated and accelerated existing sociocultural, economic, and sociopolitical trends in the region. The Alutiiq endured the EVOS disaster through hard choices and the work of extended families and tribal governments. Alutiiq communities actively adapted to the EVOS in ways that protected family members and preserved traditional cultural elements of the communities' way of life. Households reduced wild food harvests 50 percent or more because of food safety uncertainties. Wild food distribution decreased. Harvesters channelled limited wild food harvests to those most in need. Subsistence harvests rebounded during the second or third years after the spill, although harvesters reported scarcities of key resources such as marine mammals and marine invertebrates and consequent greater effort to achieve desired harvest levels. Uncertainty remained regarding the safety of certain wild foods and the health of local ecosystems. Initially, while subsistence harvests declined, cash incomes rose due to cleanup employment, indicating flexibility and short-term adjustments by households between sectors of the local economy.

Discussion, Conclusions, and Recommendations

Based on its early studies, the MMS socioeconomic studies program recognized the vulnerability of subsistence-based economies to changing conditions brought about by OCS development. Further, through the harvest disruption studies and the social indicators study, the program produced models of ethnographic and survey research that have proved essential to understanding the consequences of oil and gas development for subsistence uses of wild, renewable resources. With hindsight, the utility and necessity of both ethnographic baseline research and long-term monitoring is evident. Both the MMS program and the research program of the Alaska Department of Fish and Game, Division of Subsistence have utilized both approaches and have, in addition, collaborated in the development of databases, ethnographies, and other products.

The harvest disruption studies' high impact scenarios assumed that four predominant staple species would be disrupted for a year. In the year following EVOS, the number of resources harvested per household in Prince William Sound plummeted from an average of 12.5 to 5.7. Clearly the harvest disruption study high impact scenario was of much smaller magnitude than that comparable to EVOS. It is no surprise, then that these studies did not anticipate that communities hundreds of miles from an oil spill might reduce their subsistence harvests of a wide range of resources, or stop harvesting entirely.

It is more surprising in retrospect that, with few exceptions (e.g., Luton 1985), the harvest disruption studies did not anticipate the issue of resource contamination and the unseen dangers associated with eating subsistence foods from a spill area. The harvest disruption studies also did not take into account the social and political context in which post-spill recovery would occur. The scenarios did not include the possibility of short term adjustments in the mixed economy towards wage employment in spill clean up, let alone the creation of a trustee council in control of hundreds of millions of dollars for spill restoration. Also not anticipated was that the spill-related damages to subsistence uses and to Native communities would be contested not only in the courts but also within the restoration process, nor did the studies anticipate the possibility that as a result of the spill, Alaska Natives might choose to sell lands selected by their corporations under ANCSA.

The harvest disruption studies did not forsee that litigation over the damages caused by the spill would drag on for more than 10 years. This continuing litigation remains another long-term impact of the spill, and is clearly an impact in itself to consider in future OCS developments. MMS is currently sponsoring a study of the litigation settlement following EVOS (Impact Assessment, Inc., forthcoming).

On the other hand, pre-spill impact assessment scenarios also did not consider the potential of revitalization of subsistence uses and the traditional way of life as a result of the experiences associated with coping with a large spill, or that infusion of large amounts of cash might be used by Alaska Native communities to support traditional activities. It is interesting that the social movement that developed post-spill among Alaska Native was not an anti-development one as was predicted in the harvest disruption studies but a pro-Native, revitalization movement.

Finally, the analysis of the long-term consequences of the EVOS for subsistence illustrates the adaptability of Alaska Native communities and the mixed subsistence/cash economy - as noted by several of the harvest disruption studies. On the other hand, it would be a mistake to conclude that the recovery and survival of the Alutiiq communities of the EVOS area occurred without struggle and an active commitment on the part of the leadership of the Alaska Native community.

Chapter 9: Community Impacts of the *Exxon Valdez* Oil Spill: A Synthesis and Elaboration of Social Science Research

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Introduction

This chapter will focus on the social science literature regarding community and individual impacts of the EVOS.[60] It is important at the outset to understand the limitations of the relevance of EVOS to the subject of this book, the socioeconomic effects related to offshore petroleum development to coastal Alaska. The oil spilled in EVOS was produced onshore at Prudhoe Bay. The size of the spill was 50 times larger than the largest spill considered in OCS scenarios. It is fair to say that no one imagined that so much oil could be spilled in one event. Unfortunately, however, 11 million gallons of oil did spill from a tanker into the offshore environment. That said, the fact that EVOS occurred does not mean that it constitutes the best high-end scenario for an OCS-related oil spill. Smaller spills are far more likely, particularly given the attention paid to avoiding a repeat of EVOS. For this reason, we will point out in this chapter where the consequences of a much smaller, yet significant, spill would likely have been qualitatively different. We will also point out where further research is required to understand the implications of different scales of oil spills.

Included in this review are MMS sponsored studies conducted prior to and after the EVOS event. This synthesis of published research considers issues that have been "minimally addressed" by research on spill-related community impacts, i.e., "community recovery" and "litigation" (Impact Assessment, Inc.

[60] For more detailed information on Alaska Native cultural impacts of the EVOS, especially subsistence behavior and the social organization of Native villages, see Fall, Chapter 8.

2001, TR161)[61]. Finally, the chapter presents data on the chronic community impacts of the EVOS over a nine year period and concludes with general policy directives for facilitating the mitigation of future oil industry catastrophes in Alaska.

As part of its management strategy under the ESP, MMS sponsored a variety of research projects that provided technical information necessary to manage OCS development effectively. In addition, the National Science Foundation and the Subsistence Division of the Alaska Department of Fish and Game have funded social science projects in the region. The result is a substantial body of social science research informing questions concerning the benefits and risks of energy development to Alaska communities and Native villages.

Many of the MMS sponsored studies conducted prior to the EVOS established the significant role played by traditional subsistence activities for income, culture and social organization of local communities (Little and Robbins 1984, TR89; Jorgensen 1984, TR90, Parts II, III, and IV; Stephen R. & Associates and LZH Associates 1986, TR123; Luton 1985, TR91; Jorgensen and Maxwell 1984, TR90, Part I; Payne 1980, TR39). These same MMS studies addressed the threat to ecological resources and community structure from oil development. Researchers concluded that rapid OCS development, oil spills and other disasters would disrupt the traditional pattern of community resource dependency in Alaska communities, and change the “way of life” of local residents (Payne 1980, TR39; Little and Robbins 1984, TR89; Jorgensen 1984, TR90). Figure 9.1 is a map showing the locations of studies addressed in this chapter.

Technological Disaster and Community Impacts: A Conceptual Overview

Human communities exist in “ecological fields” or “networks.” An adaptive division of labor connecting interdependent social units and their “socially-constructed” relationships to the biophysical environment forms part of the structure of these networks (Bates 1993; Picou and Gill 1996; Oliver-Smith 1998) . Communities are not simply autonomous social systems that exist apart from their biophysical environment. Indeed, complex technological systems in the modern world create hazards and introduce numerous involuntary risks (Perrow 1984). How such technological hazards and risks pose

[61] MMS is currently sponsoring a study of the effects of the EVOS litigation settlement (Impact Assessment, Inc., forthcoming).

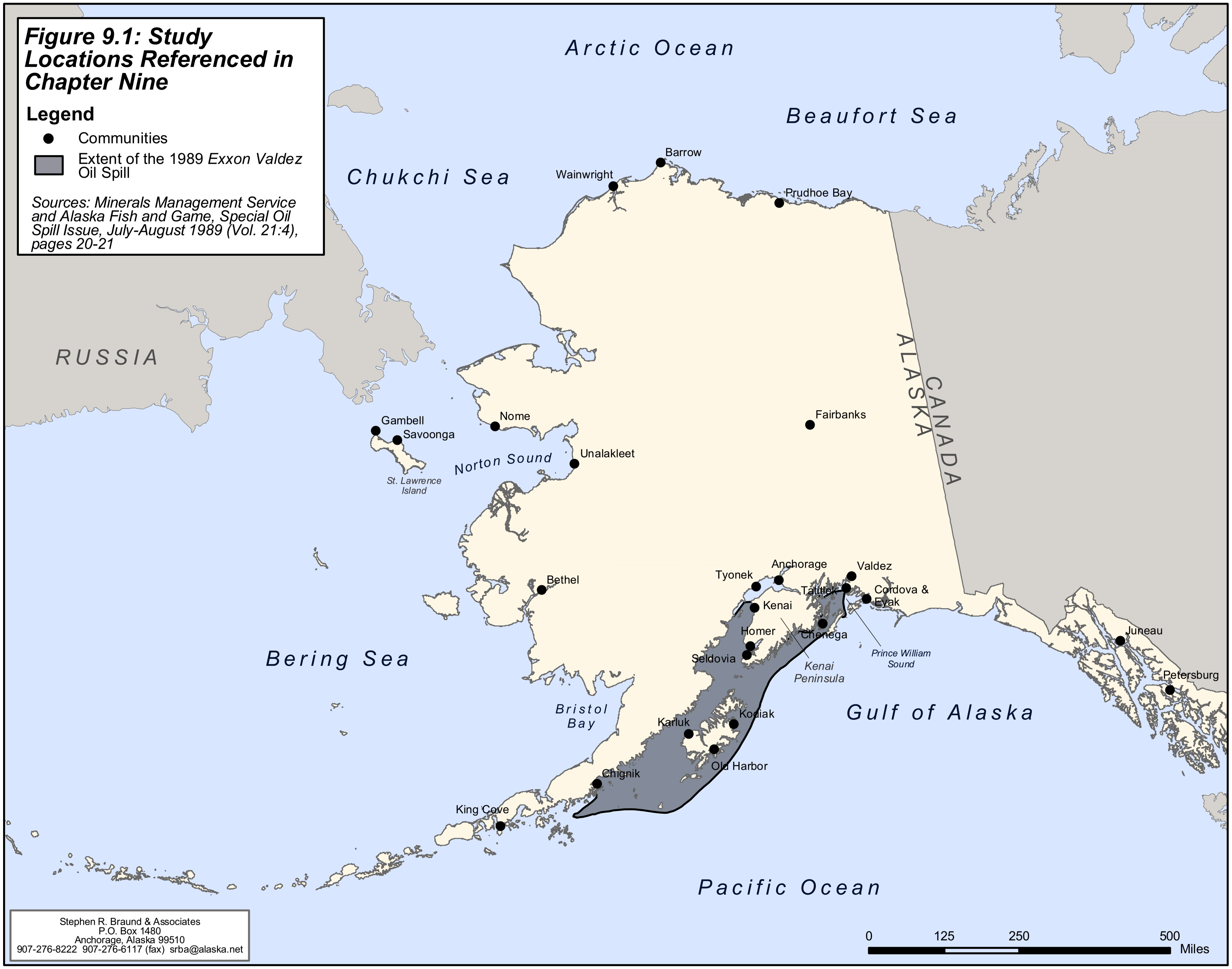

Figure 9.1: Study Locations Referenced in Chapter Nine
Legend
Communities
Extent of the 1989 Exxon Valdez Oil Spill
Sources: Minerals Management Service and Alaska Fish and Game, Special Oil Spill Issue, July-August 1989 (Vol. 21:4), pages 20-21
Arctic Ocean
Beaufort Sea
Chukchi Sea
RUSSIA
CANADA
ALASKA
Barrow
Wainwright
Prudhoe Bay
Fairbanks
Gambell
Savoonga
St. Lawrence Island
Nome
Norton Sound
Unalakleet
Bethel
Tyonek
Anchorage
Valdez
Tatitlek
Cordova & Eyak
Kenai
Homer
Chenega
Seldovia
Kenai Peninsula
Prince William Sound
Juneau
Petersburg
Bering Sea
Bristol Bay
Karluk
Kodiak
Old Harbor
Chignik
King Cove
Gulf of Alaska
Pacific Ocean
0
125
250
500
Miles
Stephen R. Braund & Associates
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Anchorage, Alaska 99510
907-276-8222 907-276-6117 (fax) srba@alaska.net

potential sources of community vulnerability to disasters depends on the nature of a community's relationship to the biophysical environment.

Local sociocultural history that establishes conceptions of culture and social organization also links communities to the biophysical environment. For example, the subsistence practices of Unalakleet residents required that they keep a "mental calendar of food resource availability" (Jorgensen and Maxwell 1984, TR90). This mental calendar of food resource availability translated into knowing how long the resource would be available, along with the proper time for harvesting. In addition, successful subsistence harvests required a certain degree of skill for obtaining the resource, as well as knowledge regarding proper resource preparation and preservation. Because households often shared and exchanged these subsistence resources with other family members, elders and neighbors, social bonds were reinforced between community members. Jorgensen and Maxwell (1984:49, TR90) also noted that subsistence "gives meaning to daily practicality and routine." Subsistence harvesting for the Unalakleet community resulted in a deep respect and reverence for earth and all living things that constitute the biophysical environment (ibid.).

Other MMS studies have also substantiated the importance of renewable natural resources to the community. Terry, Gorham, Larson, Paust, Scoles, Johnston, Smith, Orth, and Rogers (1980, TR30) noted that in 1974, approximately 75 percent of the total employment in Cordova was tied to commercial fishing, either directly or indirectly. Kodiak is one of the nation's top ports for harvests of salmon, halibut, herring, groundfish, king crab, Tanner crab, Dungeness crab, shrimp, razor clam and scallop fisheries (Terry et al. 1980, TR30). In King Cove, Braund's research team found that commerical fishing practices affected household composition. During the summer months, the number of extended family households increased as individuals from other communities migrated to King Cove to live with relatives during the fishing season (Stephen R. Braund & Associates and LZH Associates 1986, TR123). In sum, subsistence and commercial harvests intimately link Alaska renewable resource communities to the biophysical environment. As such, these communities are uniquely vulnerable to ecosystem contamination resulting from a failure of human technology.

Sociologists view disasters as "social crisis situations" which "include environmental, technological and sociopolitical events" (Kreps 1995:260; see also Quarantelli 1998). Recent sociological reviews of the concept of disaster have focused on the interrelated economic, social and psychological impacts of such events on communities, organizations, families and individuals (Baum 1987; Dynes 1993; Erikson 1994; Quarantelli 1987, 1998; Freudenburg 1997). Understanding the multidimensional impacts of any disaster requires an ecological perspective. Such a perspective articulates the interactive relationship between human communities and their biophysical environment (Kroll-Smith and Couch 1991; Oliver-Smith 1998). Kroll-Smith and Couch refer to this perspective as "the ecological-symbolic theoretical model". The model assumes that:

(1) people affect, and are affected by their built, modified and biophysical environments; and,
(2) disruptions in the ordered relationships between communities and environments are locally interpreted and responded to as hazards and disasters (Kroll-Smith and Couch 1991).

Humans' social constructions of (the meanings people attach to) culture, social organization and tradition emerge from their experience with the biophysical environment (Ingold 1992). Thus relationships between and within social units incorporate various social constructions of (the meanings people attach to) "nature" (Peacock 1991; Bates and Pelanda 1994; Oliver-Smith 1998).

These ecologically-based social relationships establish levels of community vulnerability. Culture and social organization affect a community's potential to adapt to an "extreme biophysical environment" (Kroll-Smith, Couch and Marshall 1997). Disasters can strain or even "break" the links between communities and their historically conditioned sociocultural relationships to the biophysical environment (Kroll-Smith and Couch 1991; Bates and Pelanda 1994; Oliver-Smith 1996; 1998). In sum, toxic contamination of the biophysical environment has direct social consequences in that a risky and threatening ecology challenges expectations of ecological security.

Sociologists also have focused on attempts to classify disasters. Some disaster researchers have argued that the characteristics of the triggering agent and of the biophysical environment are irrelevant to understanding disaster impacts. They argue that it is only the community response that defines and constructs any disaster (Dynes 1974; 1993; 1994a; 1994b; Quarantelli 1987; 1998). However, over the last 20 years a preponderance of studies has documented that disasters which occur because of human and technological failure are qualitatively different than natural disasters. They often result in the contamination of natural, modified and built environments, are "conflict-prone," and have long-term community impacts that last for decades (Edelstein 1988; Erikson 1976; 1994; Freudenburg 1997; Baum and Fleming 1993; Dew, Bromet, and Schulberg 1987; Green 1996; Glesser, Green, and Wignet 1981). Furthermore, studies that have compared "natural disaster" impacts to "technological disaster" impacts clearly reveal more severe, long-term social consequences for victims of the latter (Tierney and Baisden 1979; Smith, Robins, Przybeck, Goldring, and Solomon 1986; Cuthbertson and Nigg 1987).

A disaster typology developed by Erikson (1994) is informative and graphically presented in Table 9.1. This typology employs a property space that classifies disasters in terms of the cause of the event and the level of toxicity. This classification distinguishes between "natural" and "technological" disasters, as well as identifying "technological accidents" and "natural toxic releases" as alternative types of threatening events. From Table 9.1, it is apparent that the EVOS was a toxic technological disaster because it severely threatened the biophysical resources of Prince William Sound, as well as the ecologically contextualized culture and lifestyles of local fishing communities and Native villages.

Table 9.1: Erikson's Classification of Disasters

Toxicity	Cause	
	Human (Technological)	**Nature**
Non-Toxic	Fires, dam collapses, airplane crashes, explosions	Hurricanes, floods, tornados, earthquakes
Toxic	Oil spills, toxic chemical spills, radiation leaks, toxic waste contamination	Radon gas, na-tech scenarios, natural disasters that cause a technological disaster

Technological disasters generate a human response that is most often characterized by anger, uncertainty, loss of institutional trust, collective stress and litigation (Edelstein 1988; Erikson 1994; Picou, Gill, and Cohen 1997). This response pattern is not common among victims of natural disasters where, typically, a therapeutic community (i.e., mental health specialists organize a response to the disaster to assist with community and individual coping) emerges (Freudenburg 1997). One of the reasons for the different patterns of response is based on the fact that people perceive technological disasters as preventable, whereas they view natural disasters as "acts of God" and are often predictable (ibid., 1997). In fact, the very lack of a therapeutic community response to technological disasters exacerbates chronic social impacts through the evolution of "corrosive communities" (Freudenburg 1997; Picou, et al. 1997). "Corrosive communities" arise from the "contested" nature of determining damages from technological disasters (Freudenburg and Jones 1991; Freudenburg 1997). This "corrosive" context prolongs the social impacts of these events as victims experience continuing sociocultural disruption, uncertainty regarding actual damages and reparations and ineffective coping strategies that isolate and fragment local residents (Freudenburg 1997).

As Hewitt (1983:25) observed, "...natural disasters are characteristic, rather than accidental features of the places and societies where they occur." Technological disasters include and are often characterized by low-probability, high consequence social risks that may accompany energy development. The adversarial discourse that emerges from litigation also generates a series of "secondary disasters" which includes socially-constructed denials of damages by "principal responsible parties" (Picou 1996c). Unlike natural disasters, no consensus emerges among victims or with institutional authorities regarding the extent of community damage. As such, timely community recovery becomes extremely problematic following most technological disasters since "principal responsible parties" strategically use their legal rights of "discovery and appeal, thereby often taking decades before any final retribution for damages is dispensed to victims" (Hirsch 1997).

Given the multidimensional nature of disasters and the dependence of these communities on the natural environment, a variety of resources is necessary for a community to recover adequately from such a traumatic event. MMS-sponsored research has indicated that the majority of these communities lacked critical local resources, such as mental health organizations and emergency response teams, to respond adequately to disasters (Impact Assessment, Inc. 2001, TR161). One exception to this trend was Kodiak. This community had a disaster plan, that included the Emergency Services Council, that was activated before Kodiak was oiled. The Council had daily meetings to keep residents informed about any issues related to the EVOS disaster. Nonetheless, this disaster created a new level of social uncertainty for the citizens of Kodiak (ibid.).

Pre-spill Research Conducted by MMS

Prior to the EVOS, MMS funded a series of research projects through the ESP (e.g., the paired sociocultural and baseline impact studies and harvest disruption studies described in Chapter Five). These projects attempted to determine the impact of OCS activities on various Alaska communities. The objectives of these studies were to:

- Determine the impacts of oil and gas extraction on the OCS to these communities;
- Determine the extent to which these communities are dependent upon renewable resources for their livelihood; and
- Determine the economic, social and cultural impacts to community members should disruptions in the harvests of renewable resources occur.

This body of research focused mainly on Alaska Natives residing in coastal communities. Each of these studies identified the importance of a dependence on renewable resources as a source of food and income, and, for Alaska Native villages, culture. Researchers collected the data using a variety of methods, and included:

- Informal interviews with key informants
- Informal interviews with community members
- Analysis of community newspapers
- Field observations

Although this chapter focuses on the broad range of social consequences of EVOS, it also includes a discussion of a similar set of studies to those reviewed in Chapter Five (Sociocultural Research), and Chapter Eight (Long-Term Consequences of the *Exxon Valdez* Spill on Subsistence Uses of Fish and Wildlife). This is because the chain of causality from the spill to social impacts most often directly involves renewable marine resource harvests. To review briefly the importance of these harvests in Alaska coastal communities, in the case of Alaska Natives residing in Gambell and Savoonga on St. Lawrence Island, Little and Robbins (1984, TR89) found that approximately 80 percent of their food came from the biophysical environment. In Cordova, Bennett, Heasley, and Huey (1979, TR36) found that "... ties to the land and sea through subsistence or sport fishing, hunting, food gathering and related activities are shared by all in this area to some degree."

In subsistence communities, the sharing and exchange of renewable natural resources is an essential aspect of the social structure of community relations. For example, Jorgensen (1984, TR90) identified consumption of subsistence resources as an important component of the culture of Unalakleet residents. Residents viewed mealtime as a social event and involved not only family members, but hunting partners, visitors and friends who often remained after the meal to socialize and exchange stories.

While subsistence practices are of central importance to most residents of rural Alaska communities, in the King Cove community, commercial harvesting of renewable resources was a more salient activity than subsistence harvesting (Stephen R. Braund & Associates and LZH Associates 1986, TR123). Summer salmon fishing was the mainstay of the economy, and since 1978, salmon had contributed over 67 percent of the market value of King Cove's commercial fisheries. Peter Pan Seafoods, Inc. employed 46 percent of the community's population in the early 1980s. In addition, the fishing industry acccounted for a substantial portion of the community's budget.

Researchers found the commercial salmon fishery to be an important economic resource for the Cordova community. Other major employers included canneries that provided work for both residents and seasonal migrants. In addition, residents harvested over 40 different plants and animal species each year. Community residents' dependence on the natural environment was not based solely on need. Jorgensen and his colleagues found that income derived from fishing was sufficient for residents to purchase their food (Jorgensen 1994, TR154).

Other communities were dependent upon renewable resources as a source of income, although not to the degree of King Cove. St. Lawrence Islanders were dependent on the biophysical environment for cash through the production and sale of ivory and artifacts. Researchers identified commercial fishing and trapping as the main source of income for half of the families in Unalakleet. Paid employment was typically seasonal (Little and Robbins 1984, TR89).

In Homer, located on the Kenai Peninsula, resource-based activities were an important aspect of the community, both socially and economically (Davis 1979, TR41). Commercial fishing, in particular, was of central importance to sociocultural systems of the area. In addition, other local businesses, such as supply stores and welding shops were heavily dependent upon the fishing industry. Other important industries for the community of Homer were found to be recreation and tourism.

This chapter focuses on the impacts of a large offshore oil spill, specifically the EVOS, on the harvest of renewable resources by coastal communities. These impacts have three dimensions: (1) consequences to the physical environment; (2) economic impacts; and (3) social impacts. In addition, these impacts primarily have either short-term or long-term community consequences.

Stephen R. Braund & Associates and LZH Associates (1986, TR123) tested the following assumptions in their assessment of potential OCS impacts to King Cove:

- The commercial harvest of renewable resources is the primary source of income for the vast majority of King Cove households while the subsistence harvest of renewable resources provides 60 percent of the meat, fish, and other seafood consumed in the community. These commercial and subsistence efforts require the majority of time allocation in the community;
- The reliance upon these resources is significant enough to shape much of the social, political, economic, ideological, and other behavior in the community;
- A significant disruption to the renewable resource harvest activities (both commercial and subsistence) will affect residence patterns, kinship, employment, social health, ethnic relations, and political dynamics as well as other elements of village culture; and
- Because the harvest of these resources is also the main source of cash income in the community (primarily through fishing and fish processing), the ramifications of a disruption would be more far-reaching than in a community where meeting household needs is not so disproportionately dependent on the harvest of natural resources (1986:11-8).

It is important to note that at varying degrees, these assumptions are applicable to most rural Alaska communities and Native villages.

If an oil spill actually occurred, Little and Robbins (1984, TR89) predicted a host of social and economic consequences for the Gambell community. These impacts ranged from increased out-migration to the Alaska mainland to changes in the patrilocal household structure and the relationship of Alaska Natives to the federal government and the state of Alaska. In turn, these consequences would negatively impact the "way of life," or culture, of the residents of St. Lawrence Island.

To understand how oil and gas development in the OCS would negatively impact local culture requires an understanding of values, roles and norms of Alaska Natives. For example, the culture of Wainwright Natives is very similar to that of Western Native Americans. As Luton (1985:560, TR91) stated: "Symbols are assigned to the environment, land, water, air, animals, plants that incorporate values of tradition, persistence, continuity, beauty, respect, reverence, and the expectations that its features should persist intact for future generations ... Neither among Western American Indians nor Wainwright is the environment symbolized or treated as a commodity."

As discussed in Chapter Eight, Luton's Wainwright harvest disruption study predicted that, if petroleum development oiled subsistence foods, Wainwrighters would be concerned about the safety of their harvests. Luton also predicted that if the disruptions resulted from the actions of state or federal agencies or corporations, residents would file lawsuits.

While Jorgensen (1984, TR90) stated that it was difficult to predict the cultural consequences of oil extraction on the Unalakleet community, he suggested that if at least one predominant staple and a total of three predominant and secondary food sources were disrupted, subsistence harvesting practices would be seriously impacted. His analysis identified seals, four species of salmon, moose, and caribou as predominant staples in at least one season, and more than a half-dozen species as secondary food resources. As a result of such a disruption, Unalakleet residents would then have to purchase foods from local grocery stores and rely on credit as their cash reserves decreased. Social conflict would emerge among community members. If petroleum development disrupted four predominant staple and secondary food resources, Jorgensen contended that out-migration would occur along with the intensification of cultural and behavioral disruption. Non-Natives would not be affected to the degree experienced by Alaska Natives.

In their assessment of the impact of OCS development for King Cove, Stephen R. Braund & Associates and LZH Associates (1986, TR123) considered two different scenarios: no fishing in South Unimak for one year and the placement of a trans-peninsular pipeline and tanker terminal facility in Morzhovoi Bay. If OCS development closed South Unimak to fishing for one year, some of the potential OCS related impacts for the commercial fishing industry included:

- Reduction of the resource base through pollution-related events or habitat modification;

- Temporary and/or permanent usurpation of fishing grounds by OCS oil and gas-related facilities or activities, e.g., seismic surveys, oil spills, pipelines, drilling or production platforms;
- Competition for labor;
- Port congestion/competition for berthing space;
- Increased vessel traffic;
- Product marketing difficulties caused by actual or perceived tainting; (ibid. 11-30)
- Up to one-third of a loss of gross earnings to the King Cove fleet;
- Alteration of fishing practices;
- Lost raw fish tax and sales tax revenues to the city; and
- Increased alcohol consumption by some community members (ibid., Chapter 11).

MMS supported a similar study of the impacts of OCS development for the fishing community of Kodiak (Payne 1980, TR39). If OCS development did not occur, Payne (1980, TR39) predicted that Kodiak would continue to thrive as a community through the year 2000. Economically, He expected Kodiak would have increases in fish harvests, thereby increasing processing activities. He expected crime rates, as well as alcohol and mental health problems, to decrease. Payne (1980) also suggested that there would be an increase in population that would result in the urbanization of the community in terms of its physical structure and social patterns.

MMS pre-spill research provided several important conclusions regarding the community impacts of OCS development. These studies arrived at rather similar predictions regarding potential negative social impacts. Negative impacts from a high-risk, low probability technological disaster scenario predicted serious social, psychological and behavioral consequences from the contamination of the biophysical environment for subsistence-based Native villages (for example, see Luton 1985; Jorgensen 1984; Stephen R. Braund & Associates and LZH Associates 1986). Furthermore, pre-spill MMS sponsored researchers pointed out the vulnerability of communities economically dependent on commercial fishing (Payne 1980; Little and Robbins 1984; Jorgensen 1984; Stephen R. Braund & Associates and LZH Associates 1986).

The next section presents a discussion of the theoretical issues related to the impacts of the EVOS on resource-dependent communities, noting that consequences occur at three levels: the community, family, and individuals. It also includes a discussion of the actual impacts of the EVOS on communities, noting in particular that the impact scenarios presented in the pre-EVOS studies provided an accurate, but incomplete, assessment of the negative social consequences which could result from major ecological disruptions.

Social Science Approaches to the EVOS: Assumptions, Concepts and Theoretical Focus

It is useful to frame research on the EVOS along a continuum of conceptual levels. Each conceptual level offers a perspective for understanding the general relationship between social impacts and policies intended to promote community recovery. These alternative conceptual levels also help to identify high-risk communities, organizations, and groups of people, providing an initial basis for designing clinical intervention programs.

Table 9.2 provides information on the theoretical-conceptual focus of various studies of the community impacts of the EVOS event.[62] The analytical focus of these studies has ranged from the macro (community) level, to the micro (individual) level. The middle-range level focuses on the general organization of group resources which, in turn, integrates various components of social structure and personality. Research from all of these perspectives utilizes the broad assumptions of the ecological-symbolic theoretical model discussed earlier in the chapter.

For macro-level studies of the EVOS, the focus has been on community social structure and resource dependency. The organizing concept of these studies has been the "Renewable Resource Community", or some variation of this perspective (Picou and Gill 1996). The Renewable Resource Community concept ranges from "pure subsistence communities" to "urban communities" minimally dependent on direct renewable resource harvests. The degree to which a community is culturally and economically dependent on renewable natural resources provides a continuous scale from which researchers can estimate community vulnerability and potential disaster impacts. In general, studies of the EVOS suggested that the severity of socioeconomic impacts was positively associated with the degree of community dependency on renewable natural resource harvests (Picou and Gill 1996; Impact Assessment, Inc. 2001). That is, one can surmise from this theoretical generalization that community impacts were most severe for subsistence-based Alaska Native villages and rural communities economically dependent on commercial fishing. Communities with more diversified economies and less dependence on renewable natural resources were impacted relatively less by the EVOS.

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[62] For the development of this framework, we have focused on peer-reviewed publications since they should be the primary source for the development of policy directives (National Research Council 2002).

Table 9.2: Theoretical-Conceptual Approaches in Studies of *EVOS* Social Impacts

	Level of Analysis		
	Macro	**Middle Range**	**Micro**
Organizing Concept	Community	Group	Individual
Theoretical Focus	Social structure Renewable Resource Community (RRC) Model	Group Context Conservation of Resource Model (COR)	Exposure to Oil Model (ETO)
Basic Assumptions	RRCs are comprised of populations who live in a geographical area where cultural, social and economic survival are linked to seasonal harvest and use of renewable natural resources.	People are motivated to obtain, retain and protect valued assets and resources. Social resources include: (1) objects (boat); (2) personal characteristics (self-esteem); (3) conditions (marriage); (4) energies (credit).	Individuals are impacted by a dose-response type of exposure to contaminants.
***EVOS* Impact Summary**	The severity of economic, cultural, social and psychological impacts positively associated with the degree to which communities are dependent renewable natural resource harvests.	The severity of mental health impacts is positively associated with the deterioration of social and family resources. Long-term resource loss spirals produce severe depression and symptoms of PTSD.	The severity of mental health impacts is positively associated with exposure to EVOS activities.
References	Picou et al. 1992; Picou and Gill 1996	Arata et al. 2000	Palinkas et al. 1992; 1993 Russell et al. 1996

Using a middle-range theoretical approach represented by the Conservation of Resources Model (COR), the focus shifts to the social psychological group context to provide a conceptualization of social resource loss and individual stress responses. The COR stress model has been applied to both natural and technological disasters for explaining patterns of psychological distress (Freedy, Shaw, Jarrell, and Masters 1992; Freedy, Saladin, Kilpatrick, Resnick, and Saunders 1994; Arata, Picou, Johnson, and McNally 2000). Hobfoil developed the theoretical model (1988; 1989) and assumes that people are motivated to obtain, retain and protect that which they value. He defined "Resources" to include anything that people value, or that enable them to protect or obtain that which they value. This socially-contextualized view of resources includes finances, possessions, personal characteristics, interpersonal support groups, and, most important, the ability to acquire and maintain all of the above (Hobfoll 1988; 1989). In general, research on the EVOS has documented that long-term (six years) mental health impacts were associated with the deterioration of economic, social, and personal resources (Picou and Arata 1997; Arata et al. 2000).

At the micro-level of analysis, early studies of the initial impacts of the EVOS used personal exposure to oil as the theoretical criterion for predicting individual trauma from the EVOS. Psychologists use this traditional dose-response model to estimate mental health impacts. Exposure to oil was measured very broadly and not only included work in cleanup activities, but also included pre-spill activity in oiled areas, contact with spill-related activities and utilization of oiled areas for commercial, subsistence and recreational resource harvests (Russell, Downs, Petterson and Palinkas 1996). Greater exposure to oil was found to be associated with severe depression, anxiety, Post Traumatic Stress Disorder (PTSD) and a decline in supportive social relationships (Palinkas, Russell, Downs, and Petterson 1992; Palinkas, Petterson, Russell, and Downs 1993; Russell et al. 1996).

These three conceptual approaches provide convergent and complementary empirical evidence for understanding and explaining the multidimensional community impacts of the EVOS. Elements of resource dependency permeate each level of analysis and identify sources of disruption for communities, groups and individuals. Communities inextricably linked to and dependent upon renewable natural resources had the most severe disruptive impacts to their social structure. As discussed previously, pre-EVOS spill research conducted by MMS found that Alaska communities were both linked to and dependent upon their physical environment. Any disruptions to this balance of human dependency upon the biophysical environment was certain to have both short-term economic consequences, as well as long-term cultural impacts to local residents in the region (Jorgensen and Maxwell 1984, TR90; Stephen R. Braund & Associates and LZH Associates 1986, TR123).

Social Science Research on the EVOS

As discussed previously, MMS conducted a series of socioeconomic studies in Alaska coastal communities that sought to predict the community impacts of an oil spill or other disaster associated with OCS development. The predicted impacts ranged from social structural changes, such as economic losses and increased crime rates, to more individualized pathology manifested in the form of alcoholism and increased mental health problems (see Stephen R. Braund & Associates and LZH Associates 1986, TR123; Luton 1985, TR91; Jorgensen and Maxwell 1984, TR90; Davis 1979, TR41; Kruse, Hitchins, and Baring-Gould 1979, TR26). These predictions, unfortunately, became a reality for many communities and residents of Alaska coastal communities following the EVOS.

Following the EVOS, researchers initiated three major research projects: the Oiled Mayors Project, the National Science Foundation sponsored Cordova Community Study, and the MMS-sponsored social indicators study. Each project had a different focus, utilized alternative and multiple methodologies and employed contrasting research designs.

A coalition of plaintiff communities that were actually oiled by the EVOS sponsored the Oiled Mayors Project. The Oiled Mayors study (Impact Assessment, Inc. 1990e) resulted in a series of four reports that documented the impacts of the EVOS in 22 communities. Impact Assessment, Inc. collected the data in the spring and winter of 1990. The research design for this project was cross-sectional and researchers completed all surveys in the spring and winter of 1990. The study utilized a multi-method approach, as well as utilizing information from:

- A household survey of 11 affected and two control communities;
- Field interviews with community leaders, municipal department heads and other key informants from 22 communities; and
- Analysis of secondary economic data (Impact Assessment, Inc. 1990e).

The National Science Foundation primarily funded the Cordova Community Study. The Prince William Sound Regional Citizens' Advisory Council (PWSRCAC) provided interim support.[63] Researchers with the Cordova study collected longitudinal data over an 11 year period (1989-2000) in the RRC of Cordova, as well as a demographically-matched Alaska control community located outside the spill area (Petersburg). Cordova and Petersburg are both communities where residents rely on renewable natural resources for commercial and subsistence harvesting. While Cordova was not directly oiled, "the oil spill severely affected the bioregion's commercial and subsistence fisheries creating a disruption in the bioregion's renewable resources" (Gill and Picou 1998:800). This line of research documented changes resulting from the spill, as well as consequences associated with the subsequent litigation process. Researchers also collected data in the community of Valdez in 1991 and 1992 (see Picou, Gill, Dyer, and Curry 1992; Picou and Gill 1996).

The third project involved an extension of the social indicators study of Alaska coastal villages sponsored by MMS through the Alaska OCS ESP. Researchers collected ethnographic data from key informants in impacted communities and Native villages. They collected data in Cordova, Tatitlek, Valdez, Kenai, Tyonek, Seldovia, Kodiak, Karluk, Old Harbor, and Chignik in 1992 (Endter-Wada, Hofmeister, Mason,

[63] This series of projects included basic research on community impacts as well as the development and implementation of a clinical intervention program for reducing the long-term social and mental health impacts of the EVOS. For more information see Picou 2000; Arata et al. 2000; Picou et al. 2001.

McNabb, Morrison, Reynolds, Robbins, Robbins, and Rooks 1993a, TR155; Reynolds 1993, TR155). Researchers selected a Solomon Four Group Design to reduce threats to validity (Jorgensen 1993, TR153). Theoretically, researchers defined communities along five dimensions as either:

- test or control;
- hub or periphery;
- mixed or Native;
- commercial fish or non-commercial fish; or
- borough or non-borough (Jorgensen 1993, TR153).

The questionnaire used was the AOSIS developed by Stephen R. Braund & Associates, ISER, and University of Michigan Institute for Social Research (1985, TR116) (Jorgensen 1993).

In addition, MMS sponsored a comprehensive review of the literature on social impacts of the EVOS compiled by Impact Assessment, Inc. (2001, TR161). This report provided an excellent and detailed review of published research conducted in affected spill areas from 1989 to 1993. The intent of this report was to provide a series of recommendations to natural resource managers and others "… who need information about how social factors affect the response of communities to a technological disaster" (ibid., 5). The authors contended that residents of communities in the affected areas were highly dependent upon the natural environment for instrumental, cultural and spiritual values. Therefore, damages to the natural environment were certain to have a host of social consequences for affected communities. For the purpose of this report, researchers categorized communities as either "Native" or "non-Native." The non-Native communities were, to various degrees, culturally and economically dependent upon the biophysical environment. Consequently, the impacts of the EVOS on these communities were divergent. Nonetheless, Impact Assessment, Inc. researchers concluded that chronic social impacts of the EVOS related to litigation and community recovery were "minimally addressed" in the research literature (ibid., 2001). As such, this chapter will expand previous research summaries by including studies conducted from 1993 to 2000.

In order to comprehend fully the depth of devastation that resulted from the EVOS to Alaska communities, it is important, once again, to underscore the fact that Alaska community life is dependent upon natural biophysical resources and their annual seasonal cycles of availability. The biophysical environmental context in which these residents live influences the economies of these communities, as well as interactions among social institutions, cultural beliefs and values and community and individual behaviors (Impact Assessment, Inc. 2001). Picou and Gill (2000:158) pointed out that "although the EVOS did not pose a direct threat to the human residents of Prince William Sound, it placed in jeopardy the viability of subsistence culture and the economic resources of commercial fishers." This observation was also evident in many of the studies conducted by MMS.[64] For instance, Endter-Wada et al. (1993a, TR155) found that Alaska Natives residing in Cordova were fearful of harvesting, consuming and sharing their subsistence foods. This concern, in turn, resulted in significant cultural consequences for the villages of Chenega, Tatitlek, and Eyak that are discussed in the following section.

A technological disaster such as the EVOS not only poses a threat to the biophysical environment, but also threatens local human communities. Any event that damages the natural environment is likely to result in a multitude of social, psychological, and economic impacts on the affected areas, particularly in the case of RRCs. It is from this theoretical orientation that we present an overview of the community impacts associated with the EVOS. Impact categories include:

- Macro or social structural impacts which included changes to the economic, civic and occupational structure of the community, and severe strains on all community resources;
- Middle-range or cultural impacts where the way of life for residents of impacted communities was disrupted; and
- Micro or individual impacts include increased family stressors, mental distress, alcohol and drug abuse and patterns of out-migration.

It is noteworthy that these impacts do not occur independently. They are interdependent processes evident by the fact that any or all of these consequences have occurred at any given time for most communities in the spill area (Impact Assessment, Inc. 1998).

Specific Impacts

As a result of cleanup operations, many communities experienced increases in population as predicted by pre-spill MMS research (Payne 1980, TR39). This demographic shift was sufficient enough to change the overall character of these communities and ultimately, was the source for a host of other problems. Valdez, being the center of response operations, experienced an influx of personnel from Exxon, the U.S. Coast Guard, various state and federal agencies, volunteers and other individuals seeking employment in clean-up operations. The result was a five-fold increase in population (Impact Assessment, Inc. 2001). This demographic impact was the source for a host of social structural, cultural, and individual problems associated with the EVOS. The increased population severely stressed facilities for lodging, food, recreation, and transportation, resulting in the disorganization of community services. While MMS

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[64] For examples of this type of discussion pre-EVOS, see Jorgensen and Maxwell 1984; for post-spill documentation see Endter-Wada et al. 1993, TR155.

studies provided information on the potential impacts of an oil spill to communities such as King Cove, researchers did not anticipate many of the EVOS impacts in these pre-EVOS studies. For example, while pre-EVOS spill studies thoroughly demonstrated the economic consequences and demographic shifts associated with an oil spill scenario, these studies did not adequately address the ensuing social conflict, community disruption, and long-term mental health impacts which occurred in many of the affected communities.

In some instances, the EVOS produced a limited economic boom for businesses and commercial fishers. Fishers who participated in cleanup operations made money for future upgrades of their fishing equipment, which resulted in many perceived inequities from residents who did not participate in the clean up (Impact Assessment, Inc. 1990e; 2001). However, the economic boom was not without consequences for the social structure of these communities. These immediate impacts included: (1) increased health care demands; (2) increased crime rates; (3) disruption of local government activities due to labor shortages; (4) competition for labor between businesses and cleanup jobs; (5) labor shortages; and (6) short-term, divisive social conflict between community members and “outsiders” (Impact Assessment, Inc. 1990e; 2001; Russell et al. 1996).

Communities also experienced housing shortages, increased demands for childcare, disruptions to family life and a host of other problems (Impact Assessment, Inc. 2001; Gill and Picou 2001). Demand for services at the Kodiak Island Mental Health Center increased by as much as 700 percent (Impact Assessment, Inc. 1990e; 2001). The number of emergency clients and visits also increased substantially. Concerns over the future economic impacts precipitated family stress. Lack of childcare was also a problem in both Seldovia and Cordova. In some instances, parents left children unsupervised because they were involved in the cleanup efforts. Interestingly, in Kenai, crime rates decreased as transients and others left the community to work on the cleanup. In Valdez, however, arrests increased 124 percent, with police calls increasing by nearly 64 percent from the previous year (Impact Assessment, Inc. 1990e; 2001). In addition, Valdez residents complained about being depressed (Endter-Wada, et al. 1993a, TR155).

Businesses dependent upon commercial fishing lost income as result of the spill due to closed fisheries. For example, prior to the EVOS, the community of Cordova had experienced a relatively stable economy. However, in 1989, over 12 million dollars in income and revenues were lost with the closure of the shrimp, sablefish and herring fisheries (ibid.). In turn, the impact of these closures had direct financial implications for local governments due to the losses in tax revenues (Endter-Wada et al. 1993a, TR155; Reynolds 1993, TR155; Impact Assessment, Inc. 1990e, 2001). Indeed, data from commercial fishers in

Cordova indicated that, from 1990 to 1994, total economic losses averaged over $200,000 per fisher, ranging from losses of $2,650,000 to gains of $352,000 (Picou and Arata 1997; see also Cohen 1997).

The tourism industry also suffered in some communities because of unavailable rooms and services. Cleanup workers took up most of the available space in hotel rooms, leaving little room for tourists. In addition, many people canceled their summer reservations in 1989 because of the news of the spill. While lost tourism revenues for hotel rooms were offset in the short run by room revenues from cleanup workers, other tourist related services like charter services and gift shops lost business. Community leaders in Kodiak were particularly concerned about the effects of the EVOS on tourism (Endter-Wada et al. 1993a, TR155; Reynolds 1993, TR155). However, the more limited tourism industry in Cordova was also negatively impacted (Impact Assessment, Inc. 2001).

Technological disasters transform community culture (Freudenburg 1997). The communities impacted by the EVOS have multiple social ties to renewable natural resources. EVOS strained and, in some instances, severed these relationships. Residents also lost control of their "daily life routines" due to cleanup operations and the influx of outsiders. Specifically for Cordova, following the EVOS, community culture shifted from a "fishing lifestyle" to one entrenched in "cleanup operations" (Endter-Wada et al. 1993a, TR155). The issue of personal and community morals related to working for Exxon was another aspect of the social conflict identified in Cordova. Many residents felt that working for Exxon compromised their "moral principles." Those not working for Exxon referred to clean-up workers and contractors to Exxon/VECO as "Exxon whores" who accepted "blood money" and some of whom became "spillionaires." For example, a Cordova resident described this "moral conflict" in the following manner: "It was very hard on those who wouldn't work the spill. They thought it was wrong to help Exxon, after what had happened. But then they were left with no money" (Endter-Wada et al. 1993a:243, TR155).

For those who did choose to work for Exxon, many claimed that there was bias in the way Exxon awarded contracts for the cleanup. In Cordova and Kodiak, fishermen complained that Exxon used biased and unfair hiring practices during the clean up (Impact Assessment, Inc. 1990e). This led many to believe that Exxon was trying to divide the community by issuing such diverse contracts. As one local resident stated:

> Exxon was not honest at any level. They were not open. They were not forthcoming. They'd be playing us off against each other. Lots of different types of contracts were floating around. Sometimes you had to sign that oil cleanup money counted against any claim you'd make in the future. Other contracts didn't have that stipulation. Valdez got different contracts than Cordova and so on. They wanted to set people fighting amongst themselves (Endter-Wada et al. 1993a:246, TR155).

These observations describe characteristics of the "corrosive community," in which there is a "...deterioration of social relationships, resulting from the fear, anger, apprehension, confusion, conflict and stress that characterize a social milieu of uncertainty" (Gill and Picou 1998:797).

Endter-Wada et al. (1993a, TR155) also concluded that tension and conflict emerged in Valdez. However, the researchers noted that it did not reach the levels that it had in other communities such as Cordova. Unlike Cordova, Valdez was not as economically dependent upon the well-being of renewable resources in Prince William Sound (ibid.). However, there was also evidence of the "corrosive community" in Valdez. Residents reported "a new cynicism toward the town, toward oil companies and toward the institutions of society like government" (ibid., 102). Some residents believed that since these social institutions failed during the EVOS they were no longer to be trusted. Community residents also felt that Exxon deliberately established policies that treated communities differently in an effort to promote social conflict. For example, the Kenai community received $2 million for their response effort, while the Kodiak community received only $500,000, despite the argument that Kodiak experienced more negative community impacts from the EVOS (Impact Assessment, Inc. 2001).

Culturally, the oil spill disrupted the Cordova Natives' traditional practice of sharing and exchanging subsistence harvests. Sharing of resources among Natives was a "fundamental part of life" (Endter-Wada et al. 1993a:219, TR155). In addition, researchers found that, to Natives, subsistence practices were also a part of one's personal identity: "When you can't eat those foods, your body craves it. It's tied up with our traditions and values. That's part of our life. It's just tradition. When the herring doesn't come in: we just expect it, this time of year, we're going to eat herring. It's part of our life (Endter-Wada et al. 1993a:219, TR155). Some of those interviewed feared there would be more violence because individuals "wouldn't be able to release their energies, that they use on hunting" (ibid., 220-221).

The Oiled Mayors study also found that groups most vulnerable to higher rates of exposure to spill impacts included Natives, females and younger individuals (Impact Assessment, Inc. 2001). As individual exposure to the impacts increased, so did levels of mental distress. The Oiled Mayors study also documented that the more parents were exposed to the impacts of the spill, the more likely they were to report the following impacts: (1) declines in children's grades; (2) increased fear among children of being alone; (3) increased fighting among children; and, (4) increased arguing between parents and children (ibid.).

Picou and his colleagues utilized the "Impact of Events Scale" to measure spill-related stress over-time (see Horowitz, Milner, and Alverez 1979; Picou et al. 1992; Picou and Gill 1996; Gill and Picou 1998;

Arata et al. 2000). The subscale for intrusive stress measures the cognitive component of event-related psychological stress[65]. From their research, they concluded that, in 1992, Cordovans experienced higher levels of event-related intrusive stress than did residents of Valdez, a more economically diversified community, and a control community, Petersburg, Alaska. In addition, groups such as commercial fishers, who were highly dependent on the fishing harvests for their livelihood, experienced higher levels of intrusive stress than did non-fishers (Picou and Gill 1996). Possible correlates of spill-related collective stress included observations of increased drug abuse, alcohol consumption and domestic violence which, in turn, further deteriorated social relations in impacted communities (Impact Assessment, Inc. 2001).

Researchers found high-levels of psychological stress for commercial fishers residing in Cordova six years after the spill. When contrasted to normative samples, researchers found fishers to have high-levels of depression and anxiety, as well as exhibiting more symptoms of PTSD (Arata et al. 2000). Furthermore, the researchers concluded that the effects of the EVOS "have been long-lasting and appear to be influenced by the degree to which an individual found him or herself in 'investment without gain' and deteriorating social support and physical health" (Arata et al. 2000:37). Commercial fishers in Cordova suffered severe long-term social, economic and mental health impacts. This outcome resulted in a fragmented community context, which provided minimal social support structures for facilitating effective coping strategies and community recovery. The existence of characteristics of the chronic "corrosive community" were evident from this study (Arata et al. 2000).

Table 9.3 presents a summary of the community impacts documented for the EVOS. As evidenced by our discussion and the table below, the EVOS resulted in a wide variety of social impacts ranging from economic losses to increased levels of psychological stress among community residents. Furthermore, a wide-range of survey, ethnographic and secondary data provides strong convergent evidence that the EVOS severely impacted the social, cultural and economic structure of communities, as well as the mental health of residents[66].

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[65]This component is comprised of survey items such as "I thought about it when I didn't want to;" and "I had dreams about it" (see Horowitz et al. 1979).

[66] Impact Assessment, Inc. (2001, TR161) examined the major socioeconomic consequences of the *Exxon Valdez* Oil Spill litigation process for residents of the spill affected communities.

Table 9.3: Summary of Social Structural, Cultural and Individual Impacts Resulting from EVOS

Social Structural Impacts

- Increased population size[1]
- Competition for labor between local businesses and government with the cleanup industry[1]
- Housing shortages[1]
- Increased demands for childcare and services[1]
- Decrease in tax revenues[1,2]
- Decrease and increase in crime[2]
- Lack of control over the clean-up effort[1,2]
- Delayed infrastructure projects[2]
- Concerns over public perceptions on the price, quality and demand of fish[2]
- Using reserves and investments to pay for cleanup[1]
- Closure of the drift-net fishery[2]
- Loss of staff because of strains associated with excessive work[1,2]
- Economic losses for commercial fishers and support businesses[1,2]

Cultural Impacts

- Social conflict between drift and set netters fishers[2]
- Strained community relations[1,2]
- Declines in community cohesiveness[1,2]
- Disruption of a subsistence lifestyle[2]
- Some archaeological resources were damaged or stolen[2]
- Sense of place and evaluation of home as safe were threatened and/or damaged by the EVOS[1,2]
- Uncertainty about the short and long-term effects of the EVOS on ecosystems and human communities[1,2]
- Loss of trust for parties responsible for protecting the community from the threat of oil transport[2]
- Social conflict between those who worked the cleanup and those who did not[1,2]
- Public distrust of oil transportation and oil corporations[2]
- Long-term loss of social and economic resources[1,2,3]
- Community mental health organizations overstressed[1,2]

Individual Impacts

- Declines in children's grades[1]
- Increased levels of collective stress[3]
- Increased drug and alcohol abuse[1]
- Increased mental distress[1,2,3]
- Children were often left unsupervised[1]
- Disruptions to daily life[1,2,3]
- Disruptions to family life[1,2,3]
- Feelings of helplessness, betrayal and anger characterized the emotional state of community members[3]
- Increased prevalence of mental disorders such as depression, anxiety and Post-Traumatic Stress Disorder[1,3]
- Children experienced a range of problems such as fear of being left alone, problems getting along with other parents and fighting with other children[1]
- Self-isolation and avoidance of spill-related discourse[1,2,3]
- Long-term income loss spirals for commercial fishers [1,3]

[1]Oiled Mayors Study

[2]Social Indicators Study (TR 155)

[3]Picou and colleagues

Community Recovery from the EVOS: Educational Intervention as a Mitigation Strategy[67]

Technological disasters such as the EVOS pose serious challenges to community recovery. Although all disasters seriously impact and alter community organization and culture, technological disasters produce new threats and risks because of the extended "duration of sources of stress" (Baum 1987:45). Edelstein (1988:8) suggests that community recovery "is difficult if not impossible" for victims of such events. Numerous case studies of community and individual responses to a variety of these technological catastrophes have verified this hypothesis (Baum 1987; Baum and Fleming 1993; Kroll-Smith and Couch 1993a; Erikson 1994; Green 1996; Gill and Picou 1998). This body of research on technological disasters has consistently identified community disruption, psychological stress and the deterioration of social relationships as lasting up to 14 years (Green 1996; Freudenburg 1997). Given the protracted litigation following the *Exxon Valdez* spill, this may be a substantial underestimate of the duration of community disruption.

These data raise questions regarding traditional disaster intervention models and identify a need for alternative mitigation programs (Mitchell 1996; Couch 1996; Picou, Johnson, and Gill 2001). "Therapeutic communities" emerge within social collectives impacted by natural disasters, oftentimes resulting in an "amplified rebound" of material and human resources for impacted populations (Friesema, Caparoso, Goldstein, Lineberry, and McClary 1979; Drabek 1986; Solomon and Green 1992). Researchers have also found the programmatic delivery of psychosocial therapy to victims to contribute significantly to community recovery (Weaver 1995).

However, the major consequence of most technological disasters like the EVOS is the absence of the formation of a "therapeutic community." Although some immediate emergency response does occur, programmatic intervention is absent over time (Baum 1987; Baum and Fleming 1993; Kroll-Smith and Couch 1993a; Couch 1996). Resource contamination can last for decades, if not centuries. This fact places individuals and communities under continuing distress for extended periods of time. Instead of progressing through a typical natural disaster stage model that moves from "warning" to "threat," to "impact," and subsequently to "recovery" and "rehabilitation," technological disasters become routinized in the early stages. Over time, "warning," "threat," and "impact," merge into a continuing sequence (Couch 1996). Social conflict arises when some community members see the problem as "overblown" by

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[67] This section relies on previously unpublished information presented in Picou et al. 2001.

their neighbors, while others believe that residents to not take the images and threats seriously enough (Kroll-Smith and Couch 1993a; 1993b; Couch 1996). Intervention complications also exist because the disaster agent continues to be present through time such that individual and social recovery must occur in the midst of continuing social and psychological impacts (Russell et al. 1996; Picou et al. 2001).

Given that clinical interventions for mitigating the chronic (i.e., over six years following the spill) community impacts of the EVOS were not available, researchers used a community participation model to design an intervention program implemented in the community of Cordova (Picou et al. 2001). The first stage of the community participation model involved the development of a mental health profile from available data. Researchers derived the profile from social and psychological data collected in the Cordova community over the six year period following the spill (Donald, Cook, Bixby, Benda, and Wolf 1990; Picou et al. 1992; Endter-Wada et al. 1993a, TR155; Picou and Gill 1996; Gill and Picou 1998; Arata et al. 2000). The mental health profile provided empirical data for a series of community workshops that involved representatives of identified high-risk groups. Project team members conducted workshops for members of civic, educational, mental health, religious, and medical groups. The general public was also involved in several information-based presentations that summarized the mental health profile and outlined possible objectives of the community intervention program. These participatory activities resulted in agreement between residents and researchers regarding program activities and various methods of information delivery.

The second phase of program development utilized information from the mental health profile workshops to construct specific mitigation activities. Current clinical programs and traditional methods used in community psychology served as the basis for program components. Once again, with maximum participation and feedback from community residents, researchers evaluated these activities in terms of cultural appropriateness, community acceptance, and cost-effectiveness (Picou et al. 2001). The team developed a final program and implementation strategy. Two local community organizations, Sound Alternatives Mental Health Clinic and the Cordova Family Resource Center, sponsored this program in order to promote resident participation.

From January 1996 to February 1997, the team implemented "The Growing Together Community Education Program" in Cordova. The participatory model used for program development resulted in the diagnosis that community residents needed information regarding: (1) the common and expected consequences of technological disasters; (2) effective coping responses; and (3) available resources to provide support for residents' psychosocial problems (Picou et al. 2001). An outreach approach was critical for effective intervention, given that most local residents were not utilizing the limited mental health resources available to them (Picou and Arata 1997).

The "Growing Together Community Education Program" consisted of six components, described in Table 9.4. A series of nine original newspaper articles, five original radio broadcasts, and nine original educational brochures were prepared, distributed or broadcast. These educational materials focused on the community impacts of technological disasters, the nature of resulting patterns of psychological stress and effective coping skills. The team held several in-service training programs for education and law enforcement professionals in the community. An important outreach component of the program was the Peer Listener Training, which involved the recruitment and training of volunteers in lay intervention, listening and referral skills. Finally, the team collaborated with the Native village of Eyak to organize a "Talking Circle" focusing on the aftermath of the oil spill and consequences for Native culture and subsistence traditions (Picou 2000).

Table 9.4: The Growing Together Community Education Program

Program Component	**Description**	**Strategy**
Community Education Radio Series	Program on coping skills and technological disasters.	Five-part program aired four times in community.
Community Education Information Leaflets	Coping skills; stress response and information about technological disasters.	Distributed at locations throughout community. Mailed to residents.
Community Education Newspaper Series	Technological disasters and their impacts and coping skills.	Series ran in the *Cordova Times.*
Helping Others Peer Listener Programs	Adult volunteers trained and provided materials for support counseling; 13 volunteers completed the program.	Available for social support and referral.
Inservice Training Program	Scheduled information on technological disasters presented to key professional groups in community.	Delivery of information (three hour program) to clergy, teachers and law enforcement personnel.

Source: Picou et al. 2001

The goal of the program was the mitigation of the chronic social and psychological impacts of the EVOS for residents of Cordova. More specifically, the objectives included: (1) involving a significant proportion of community residents in program activities; (2) involving people in need of program activities; (3) increasing help-seeking behavior; (4) improving social relationships; (5) strengthening ties among Alaska

Natives to one another and to cultural tradition; (6) reducing levels of psychological stress among residents; and (7) developing a model for mitigating chronic disaster impacts that can be implemented in communities impacted by future technological disasters (PWSRCAC 1999a; Ka'aihue 1999; Picou et al. 2001).

An evaluation of the program implemented in Cordova revealed high levels of community participation by community residents (Picou et al. 2001). Contrasts with a control community found significantly more program awareness and participation for Cordova residents. In short, researchers found the programs reached their intended audience. The data analysis also revealed that social relationships with non-relatives improved and that a significant decline in spill-related psychological stress occurred for commercial fishers who participated in the program. Despite these positive outcomes, psychological stress levels were still significantly higher in Cordova eight years after the EVOS, when compared to the control community of Petersburg (Picou et al. 1997; Picou et al. 2001). In 2000, psychological stress levels were found to be near 1989 levels, indicating that most program benefits were short-term (Marshall, Picou, and Schlitmann 2004).

The completion of this program resulted in the publication of a two volume document by the PWSRCAC in May of 1999 (PWSRCAC 1999a; 1999b). The first volume of this document provides a "user-friendly" guidebook for responding to technological disasters tailored for community organizations, counselors, local government agencies, businesses, families, volunteers, and interested individuals. The guidebook outlines, in a very communicable style, appropriate collective and individual strategies for immediate and long-term responses to technological disasters based on the program information collected and analyzed from EVOS impacts (PWSRCAC 1999a). Volume two provides an appendix of actual program materials for communities, with information for conducting community surveys, training peer listeners, airing radio broadcasts to educate residents about appropriate coping skills, and information resources (PWSRCAC 1999b). Researcherrs distributed "Coping with Technological Disasters Guidebook" to over 100 communities throughout the United States. This document provides a tested mitigation program for communities chronically impacted by future technological disasters.

With these types of programs in place, community residents will have tools to cope with the negative social consequences of a technological disaster. In addition, these programs provide information on coping strategies relevant to the potential litigation process, a "secondary disaster." In the section that follows, we present a discussion of the complexities associated with the litigation process and the long-term impacts of this process on community members.

Chronic Community Impacts: Litigation as a Secondary Disaster

The fact that "Principal Responsible Parties" rarely take full responsibility for economic, community, social, and psychological damages precludes the timely community recovery from most technological disasters (Picou 1996c). Class-action litigation eventually characterizes most responses to such human-caused environmental contamination in the United States (ibid.). The courts become the forum for debating community "recovery," and in the courts, complex legal issues can result in decades of legal discourse. This scenario characterizes the EVOS some 16 years after the catastrophe. Although state and federal courts have addressed ecological restoration efforts, Exxon has yet to distribute punitive damage payments incurred by Exxon in civil court to class-action plaintiffs from Prince William Sound (Piper 1993; Picou 1996a; 1996b; Hirsch 1997). Indeed, direct community restoration efforts have been extremely limited and Exxon has made no punitive damage payments to communities, Native villages, municipalities, and individuals[68].

Class-action and mass tort litigation impact community social structure by defining a collectivity within the community that has been severely damaged, but has yet to receive various damage claims. The "litigant" is involved with paperwork for the documentation of legal claims, depositions and communications with attorneys. These activities serve as repeated reminders of the EVOS and, over the years, the continuing uncertainty associated with the litigation has become another source of stress to many Prince William Sound residents (Picou, Marshall, and Gill 2004).

Protracted litigation also results in a sense of frustration and loss of trust by litigants in local organizations and government agencies responsible for protecting and restoring communities and residents damaged by the reckless use of modern technology (Freudenburg 1997). Exxon's legal strategy is that most often used by large corporations facing toxic tort legal action. This approach involves a vigorous legal challenge to all damage claims with innumerable motions and appeals that serve to delay extensively the final distribution of reparations (Picou 1996b; Hirsch 1997).

Table 9.5 presents community data collected over a nine-year period (1991-2000) for Cordova. These data document the relationship of being a litigant to levels of EVOS-related intrusive stress (Horowitz et al. 1979; Picou and Gill 1996). By using a comparison of the unstandardized beta coefficients as a

[68] MMS is sponsoring ongoing research on the social effects of the EVOS litigation (Impact Assessment, Inc., forthcoming).

measure of the strength of the relationship between litigant status and intrusive stress, it is apparent that, over time, the strength of association of litigant status and spill-related stress has increased dramatically: 1991 (4.2), 1992 (5.8), 1993 (11.5). (The higher the unstandardized beta number, the stronger the relationship between the variables and intrusive stress).

Table 9.5: Correlation and Multiple Regression Coefficients for EVOS-Related Intrusive Stress, Cordova Community, 1991, 1992, 2000

Variable	Correlation	Standardized B	Unstandardized b	R^2
1991				.12
Gender	-.083	-.058	-.080	
Education	-.111	-.067	-.283	
Fisher	.306**	.176*	3.598*	
Litigant	.303**	.233**	4.208**	
n=223				
1992				.13
Gender	-.059	-.026	-.513	
Fisher	.276**	.159	3.458	
Litigant	.351**	.283**	5.78**	
n=154				
2000				.23
Gender	-.074	–.049	-1.593	
Education	-.120	-.066	-.504	
Fisher	.190**	.063	1.648	
Litigant	.422**	.494***	11.458***	
n=96				

Notes: *p < .05; **p < .01; ***p < .001

Furthermore, for the 2000 community survey, litigant status was the only significant predictor of spill-related stress, accounting for 28 percent of the variance in the intrusive stress subscale. These and other analyses clearly demonstrate that the litigation process is, in and of itself, a significant stressor for residents of Cordova (also see Picou et al. 2004). Furthermore, in 2000, over 95 percent of the residents of Cordova interviewed using random-digit dialing techniques felt that the community had not recovered from the EVOS. The chronic, spill-related social and psychological impacts of the EVOS are associated with the continuing legal discourse that precludes the distribution of damage payments to victims.

These findings reveal that litigation resulting from the EVOS has perpetuated negative community and individual impacts for over a decade. As such, litigation functions as a "secondary disaster" that denies community recovery by fostering a necessary adversarial discourse that divides and fragments communities long after the original technological catastrophe. This legal discourse results in repeated reminders of the original event and victims continue to be economically impacted, disrupted and stressed by court procedures and appeals that appear unfair and irrelevant to the original damage claims. Furthermore, the EVOS litigation has resulted in inequitable compensation for victims (Impact Assessment, Inc. 2001). The controversy associated with victims' damage claims also results in threats to social science research through defendants' attempts to deny the public release of data and dispute the confidentiality of survey responses (Picou 1996a; 1996b; 1996c; Impact Assessment, Inc. 2001). Protracted litigation is almost an inevitable consequence of any technological disaster that may occur in Alaska and should be seriously considered for establishing policies and procedures for responding to these events in the future (Picou and Rosebrook 1993; Impact Assessment, Inc. 2001; Picou et al. 2001; Picou et al. 2004).

Conclusions and Recommendations

Research on the community impacts of the EVOS has resulted in convergent empirical findings from a variety of research projects sponsored by MMS, the National Science Foundation and other agencies. These studies have identified both the immediate and long term negative consequences of the largest and most ecologically damaging oil spill in the history of North America. In the case of studies sponsored by MMS, researchers accurately predicted many of the social and cultural impacts in studies conducted prior to the EVOS (e.g., see Jorgensen 1984, TR90; Payne 1980, TR39; Stephen R. Braund & Associates and LZH Associates 1986, TR123). However, this information did little to protect vulnerable communities from a wide variety of deleterious impacts.

We analytically categorized these impacts in terms of community social structure, community relations, and community residents. Numerous studies have collected data from probability samples of communities, focus groups, non-probability ethnographic interviews, and from a variety of secondary data collected from municipal and community organizational records (For example see Impact Assessment, Inc. 1990e; Picou et al. 1992; Palinkas et al. 1992; Picou and Gill 1996; Gill and Picou 2001; Endter-Wada et al. 1993a, TR155; Endter-Wada, Hofmeister, Mason, McNabb, and Mulcahy 1992a, TR152; and Reynolds 1993, TR155). Taken together, these data support the patterns of community impacts identified for other technological disasters and point to additional consequences that should be mitigated in the event of future oil transportation. We will conclude by briefly discussing some of these policy directives below.

Community Social Structure. Alaska communities that are highly dependent on the harvest of renewable natural resources tend to be small and isolated from larger communities. EVOS disrupted daily routine activities in RRCs such as Cordova, impaired the flow of goods in and out of RRCs, and adversely affected the majority of local jobs. In Cordova, there were complaints that Exxon was slow in paying for cleanup work that left some families without money for food. One family was in the process of building a house. The carpenters who were working on the house went to work for Exxon and left the family without a place to live (Endter-Wada et al. 1993a, TR155). Over time, the continuing decline in commercial fishing harvest, as well as the lack of a legal resolution to the EVOS, has resulted in chronic collective stress, social disruption, and population changes in many RRCs impacted by the EVOS.

Local governments need to be prepared for responding to such social structural impacts by developing a community emergency response plan to minimize both immediate and long-term impacts. Major complaints among residents of Cordova were that Exxon was not adequately prepared for the cleanup operation and the federal government deferred to Exxon's cleanup strategy (Endter-Wada et al. 1993a, TR155).

Command structures should be established, such as the "Incident Command System" in which a number of agencies, including the Alaska Department of Environmental Conservation and the U.S. Coast Guard, are involved in the response effort (PWSRCAC 1999a:23-25). For Alaska communities, "local governments may sign an agreement with the Alaska Department of Environmental Conservation for cooperative responses to oil and hazardous substance spills" (PWSRCAC 1999:24). This agreement provides for direct reimbursement to communities supported by state requests for assistance. Such support is critical for financing community costs associated with responding to technological disasters.

Communities also need to organize their own structured response to technological disasters in terms of clear lines of authority and communication. Kodiak, for example, had an Emergency Services Council which provided up-to-date information to residents concerning the spill (Endter-Wada et al. 1993a, TR155). In addition, meticulous record keeping is imperative for all impacted communities. This includes documentation of fiscal impacts, as well as costs to businesses and civic organizations for nonroutine activities. This information provides an important basis for identifying legitimate damage claims to principle responsible parties (PWSRCAC 1999:28-29).

Maintaining accurate records from meetings and establishing detailed cost accounting systems provides additional information on social structural impacts. Political leaders of impacted communities should keep daily logs of all activities and document conversations and agreements made with government, military and corporate representatives (PWSRCAC 1999).

Communities at risk for such catastrophes can reduce the social structural impacts of technological disasters through proper preparation, planning, and organization. Furthermore, communities could establish relationships with larger regional state and federal organizations and agencies that are responsible for supporting local community needs through various programs and policies designed to assist community recovery. Because the impacts of future technological disasters may vary according to community dependence upon natural resources, communities and villages that are most vulnerable to ecological contamination deserve special attention. Government could identify and provide support for funding the development of community structures to those communities and villages determined to be at "high risk" for community and individual impacts from technological disasters associated with mineral resource extraction and transportation.

Community Relations. Technological disasters produce a "corrosive community," spawned by conflicts between local groups and organizations, oftentimes resulting in a fragmented, adversarial context for community relations. This situation was evident in many communities. For example, in Cordova community divisions clearly emerged between residents who worked the spill and those who did not (Endter-Wada et al. 1993a, TR155). In addition, there was the perception that Exxon fostered conflicts within the business community so as to avoid, or delay, payment of damage claims (ibid.). This contested, conflict-prone response results from the fact that "principal responsible parties" often make public promises to victims, but later deny that their activities resulted in any harmful damages. This adversarial pattern continues throughout litigation, producing the social uncertainty, economic loss, and psychological distress for victims (Picou et al. 2004).

An important response to such impacts requires that local groups understand the divisive character of technological disasters, as well as the importance of communicating information and resource availability to all sectors of the community. Social and civic organizations within the community that have longstanding established reputations should encourage understanding and participation by their members to any disaster response. Such organizations can distribute training, service delivery and informative materials, providing a strategy to minimize inaccurate information and maximize an informal, concerted response from residents. Local churches, non-government organizations, civic groups, educational organizations, law enforcement, scientific organizations, and government agencies need to establish communications regarding the disaster and potential mitigative responses to ongoing social impacts (PWSRCAC 1999a).

Community Residents. Technological disasters such as the EVOS result in long term mental health impacts to residents of impacted communities. The EVOS was no exception to this pattern. The deterioration of social relationships within impacted communities led to coping strategies that were ineffective and to severe levels of anxiety, depression, and post-traumatic stress disorder for commercial fishers (Arata et al. 2000). Renewable resource communities have very small mental health organizations, as well as limited staff to respond to the increased demands caused by the EVOS. The problem of professional burnout was very real for local mental health experts. Outside agencies can augment local resources with professional counselors (PWSRCAC 1999a).

Intervention programs designed to mitigate longer term mental health impacts should be identified and implemented. One such program was reviewed in this chapter. Researchers developed the "Growing Together Community and Education Program" from resources provided by the PWSRCAC using a participatory program model. This clinical intervention provided information regarding coping skills, trained local volunteers in peer listening and problem solving techniques and established outreach strategies to educate all residents about the deleterious mental health impacts of the EVOS (Picou et al. 2001). The Native village of Eyak used a participatory program model to augment this clinical intervention with culturally appropriate healing activities for Alaska Natives (Picou 2000). Families and individuals need to reach out actively to relatives and community residents who have been severely impacted in order to foster a sense of social support and therapy for victims. The evaluation of the "Growing Together" program indicates that its implementation helped to reduce the negative effects of broken social bonds and psychological stress (Picou 2000; Picou et al. 2001).

The deleterious community impacts of the EVOS, one of the worst technological disaster in U.S. history, were both immediate and long-term. Many communities suffered a variety of social structural, cultural, and individual impacts that have persisted from 1989 to the present. Continued monitoring would advance our understanding of the full impacts of EVOS and contribute to community recovery efforts. In addition, government could begin to identify what community resources are lacking in the region in order for a community to recover adequately from such an event. This type of information would be directly useful for other regions of the country should this type of event occur elsewhere. Given the expansion of oil exploration in the U.S., the probability of another catastrophic oil spill, such as the *Exxon Valdez,* is real and requires preparation.

Chapter 10: Further Reflections

MMS asked three experienced social science contractors to address the question: "What specific aspects of the social research experience in Alaska should be emphasized for additional consideration"

Reflections on Social Science Research Related to OCS Development

Rosita Worl

Public policy driven research, such as that required by the ESP of the MMS - Offshore Program, has made important contributions to social science literature in Alaska. While the primary objective of these studies has been to assist the Federal government in its decision-making process, they have produced an enormous body of valuable data relating to the status and sociocultural changes experienced by Alaska Natives in rural coastal communities over a thirty year period. These studies, which were conducted by trained social scientists, have the potential to provide a greater theoretical understanding of how indigenous traditional cultures react and change and/or persist in response to modernization forces.

The MMS invited me, as one of the researchers who conducted a number of the earlier studies, to offer my perspective on the synthesis of these research efforts. However, I should acknowledge that my perspective is likely to be shaded by other spheres of influence, such as my role on a national scientific committee overseeing the EVOS studies. In addition, I spent two grueling years attempting to formulate and implement policies and governmental action relating to Alaska Natives and Rural Alaska as a special staff assistant to a former Governor of Alaska. I currently serve on a statewide Native political advocacy board that is directly engaged in policy issues relating to the status and challenges facing the Native community. Thus, I believe that I can readily offer a commentary on the relevancy and applicability of MMS social research efforts to science and current affairs.

Prior to a discussion of the significance of these studies and the findings they yielded, I would like to begin with three observations. First, it is worthy to note that these ESP studies heralded a major shift in American policy. Until the enactment of NEPA (42 U.S.C. 4321 et seq.), decisions to develop resources were largely based on financial factors. The effects of industrial development on the environment, including the human environment, were not formerly evaluated in such decision-making processes. Certainly, the impacts of resource development on indigenous cultures were not considerations, as more often the historical norm was to simply move Indian populations from their homeland to clear the way for development. NEPA changed the historical practices and required that the relationship of people to the environment and the potential impacts from industrial development on the human environment be assessed. This policy change implicitly recognizes that cultural diversity and pluralism is a national resource to be considered along with financial factors prior to initiating development activities that might affect Native societies.

This policy shift also led to the infusion of some $24 million to support social scientific research in Alaska during the past three decades. Until this time period, social scientific research was not generally considered a priority or even a necessity by any governmental entity. The available research dollars to conduct social scientific inquiries were extremely limited. Although the National Science Foundation Polar Programs Committee, which oversaw research in the Arctic and Antarctic, included a social scientist, its primary focus and funding was limited to physical and natural scientific research until the 1990s[69]. In the introductory chapter of this book, Braund and Kruse outline the paucity of social scientific research in Alaska until the inception of the ESP program. In the absence of the ESP research funds and the focus it brought to social science, it is more than likely that few social scientific studies would have been conducted in Alaska. Nothing extraordinary occurred that would entice scientists to Alaska nor prompt a windfall of research dollars by funding agencies.

It is also noteworthy that the ESP studies were initiated prior to government policies that have resulted in changes in the way scientists conduct their research. Federal legislative acts, such as the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3002-3005), and Presidential Executive Orders issued in 1994, 1998 and 2000 mandate consultation with Native American tribes in matters of cultural heritage prior to the initiation of research or action that may affect Indian tribes. These federal initiatives have provided a means for Native participation in scientific endeavors.

Although OCS hearings were held in rural communities, and researchers of their own accord often collaborated with Alaska Natives, local residents had little control or participation in the development of research objectives, methodologies and projects initiated under the ESP program. The new legal initiatives enacted in the 1990s and in later years have set the stage for consultation and greater participation of American Indians and Alaska Natives, who have often been the objects of scientific research.

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[69] I sat as a member of this Committee and was not successful in persuading my fellow committee members to advance a social science agenda until the National Research Council Polar Program took up this agenda.

One of the major findings identified in the synthesis relates to the significant role that subsistence hunting and fishing maintains in Native rural communities. Its importance is addressed throughout the text and highlighted in two separate chapters of the book. Today scientists and policy makers or the public may not view this finding as extraordinary. However, the dominant assumption that persisted until well into the 1970s held that Alaska Natives and Rural Alaskans were abandoning their traditional cultures and were rapidly assimilating into the Western or American culture, wage economy, and society. The ESP studies uniformly reported on the importance of subsistence and furthermore demonstrated its relationship to the survival of indigenous cultures.

The ESP studies also collectively expanded the existing knowledge and understanding of subsistence as socioeconomic and sociocultural integrated systems that were operating in the thirty-year study period. During the latter half of the 1970s and the early 1980s, the prevalent assumption had been that subsistence could not be defined. Alaska Native themselves simply described it as a "Way of Life." However, the ESP studies provided substantial data and analyses that demonstrated that subsistence functioned as an economic system and that it was adapting to the presence of a wage economy.

The studies and the synthesis included discussions of the social organization of subsistence production and distribution and concluded that subsistence was an activity conducted by families or kin-based groups. However, the investigations appear not to have determined whether the same group orientation and practices that governed subsistence activities were present in other components of the society, such as in child-rearing practices or political processes.

The communal nature of subsistence practices was readily apparent to researchers conducting their studies in rural coastal communities, and perhaps the same group orientation and practices that may have been present in other domains were not as evident to the social scientist. One would assume that if the communal value is present and significant in the economic system of a society then communal practices would likely be found in other components of the society. It is an aspect of modern Native culture and societies that warrants further social scientific investigation particularly in the face of the cultural encounters that Natives experience with the individualistic orientation and laws of the larger society.

The findings posed by the ESP studies have suggested that subsistence was central to the survival of Native cultures. While this may in fact be the case, it may also be instructive to determine whether group orientation is a core cultural value central to Native societies, and if so, whether this group orientation, rather than subsistence alone, is the basis of cultural survival of Native cultures in the face of ongoing changes impacting their communities.

One might expect that the communal orientation of the subsistence economy would conflict with the individualistic orientation of American values and practices of the wage economy. Many Alaska Natives have maintained that the Native corporations, which were organized as a result of the settlement of Native land claims in 1971 and which are organized around individual ownership of stock, conflict with Native values. However, the ESP studies found evidence to the contrary and suggested that the subsistence and wage economies were compatible. The synthesis emphasizes that higher incomes among residents were associated with greater reliance on subsistence foods.

What remains largely unanswered is how a dual or mixed economy - comprised of the communally-oriented subsistence economy and the individualist wage and capital economy - co-exist. A question to be more thoroughly assessed is how Natives integrate these seemingly conflicting economic systems and values.

The studies generally reported on an expansion of the wage economy and indicated that variations existed in the participation in the wage and subsistence economies among the rural coastal residents. Neither the studies nor synthesis, however, elaborate on the effects of this differential participation or note whether it contributed to class distinctions characteristic of capital economies. Perhaps the differential participation and productivity replicated and reinforced the differences that are present in the traditional system of the Inupiat between the umealik or “rich man” and other community members. One characteristic that is clear in the studies is that some regions and communities experienced greater access to the capital economy while others remained fairly underdeveloped and impoverished.

The development and intensification of the capital economy within the coastal communities was bound to have differential impacts. In some regions, the capital development was largely based on the modernization of the traditional economy. For example, commercial fishing built on traditional fishing practices. In other regions, the capital economy was characterized by the introduction of new forms of commercial development such as that associated with oil field service opportunities. One would expect that these new forms of capital development were accompanied by major changes in the communities and community life. Sometimes these new wage opportunities required coastal residents to rotate between jobs in enclave development sites and their home communities. Actually this work pattern was a notion advanced by Natives to allow them to continue their subsistence pursuits. Many of these jobs also required specialized training, and without these capabilities Natives were often relegated to labor positions which lacked the special status as that associated with the role of hunter and provider. Can one make the assumption that it was far easier to adapt to the transformation of subsistence economies into commercial enterprises than those that required completely new employment patterns? Understanding these differences, if any, could very well allow decision-makers to structure the expansion of wage opportunities to minimize the adverse impacts of industrialization.

The new Native institutions, such as the regional non-profit corporations, that were flourishing and expanding within many of the coastal communities throughout the ESP study period, also provided new wage opportunities. The Federal government enacted policies beginning in the late 1970s that allowed Native organizations to contract to administer services that were formerly provided by the Bureau of Indian Affairs and the Alaska Native Health Service. These institutions, including the Borough governments that were created in some areas of northern and western Alaska, also provided increased political control as well as economic opportunities to local residents.

The regional and village Native corporations created under ANCSA of 1971 added to the complexity of institutional changes experienced in all regions of the state. ANCSA allowed Native communities to own large tracts of land, and in some regions greatly expanded the economic opportunities available to Alaska Natives. Collectively the Native corporations were able to leverage their economic strength into political power at both the statewide and national level and so presumably, were also able to deal more effectively with industrial change and opportunities.

Another point of great interest is that during the period of these studies, rural women were entering the wage economy in large numbers. As reported in the synthesis, the employment opportunities were generally spurred by oil revenues, governmental expenditures and the new Native institutions. The ESP studies highlighted the dramatic changes that rural Native communities experienced, although they did not necessarily focus on the differential rates of changes associated with gender roles.

The differential rates of change between men and women that apparently emerged during the ESP study period appear to have implications in other elements of community life and perhaps should have been more closely analyzed. Later studies and observations that emerged from outside of the ESP, suggest that sociocultural changes were associated with gender differences in other arenas beyond employment. For example, educators noted that Alaska Native women tended to be more successful in higher education and were graduating from college at a rate as much as three times greater than Native males. As the former

Publisher of the Alaska Native News magazine, I had reported on these findings to bring attention to this issue.

Statistical data compiled by the statewide Native organization, AFN, also highlighted gender differences and prompted the development of social programs to address the myriad of problems facing Native men. It was fairly well established that young Native men were committing suicide at an alarmingly higher rate than other males and Native women. Alcoholism and other self destructive and violent behavior were rampant in rural communities. Additionally, Native men in prison represented more than twice the percent of the Native population represented in the State of Alaska. AFN was successful in obtaining $50 million over a three-year period from Congress to address these problems. These funds were distributed to the regional Native non-profit organizations which developed "Wellness Programs" to combat alcoholism and other social problems experienced by Alaska Natives.

While the ESP studies were able to emphasize the significance of subsistence to the rural coastal community, the debilitating effects of the alcoholism, suicides and other patterns of violent behavior within the rural coastal communities did not fully emerge as a significant finding of the ESP studies. The question that should be addressed is how these social pathologies, which must have been present or in their formative state during the period of these studies, did not emerge as a major finding for systematic analysis. However, the ESP studies offered invaluable benefits in terms of the data they provided in substantiating the importance of subsistence in the face of the debates and challenges to the subsistence priority and rights of rural residents.

Although the ESP studies were developed to meet the needs of Federal agencies, the sheer amount and diversity of the data and analyses amassed within the reports over the thirty year period have great potential to contribute to an enhanced understanding of social scientific methodological and modernization theories. However, in some cases it appeared that the studies were constrained by a lack of a uniform methodology governing specific aspects of research. For example, Wolfe (Chapter Six) emphasized this limitation with regard to subsistence studies. Another constraint which may have hampered scholarship was the tendency to focus case studies on a single region and a single cultural group, rather than comparative studies involving multiple regions and different cultural groups. Nonetheless, some of the published scholarly works that were based on ESP research attest to the greater contribution that these studies can make to social scientific theories relating to social and cultural change. Such broad applications of ESP research should be more actively pursued, and hopefully this book will assist in that endeavor.

Reflections on the Social Indicators Monitoring Studies

Joseph G. Jorgensen

The Social Indicators Monitoring Studies constituted a significant and ambitious new direction in social research at MMS that spanned the years 1983-1998 and produced a total of 15 Technical Reports and 20 published volumes among multiple authors. This essay synthesizes some of the key findings of the portion of research that I directed from 1986-1993, which resulted in 6 Technical Reports as 8 distinct published volumes. The findings establish that Alaskan Native views and uses of natural resources as subsistence consumers are substantially different from that of non-Natives, and that these differences are meaningful, measurable, and persistent, even as they are responsive to changes in technology and harvest disruption from a major offshore oil spill. The essay concludes by also reviewing key contributions of the entire Social Indicators project to the MMS social research agenda, with implications for potential analytic utility in the future.

Background

In 1986, my associates and I were contracted by the MMS to study 31 coastal Alaskan villages with the aim of creating a slate of social indicators that would allow the agency to monitor subsistence, economic, political, health, and ideological conditions in coastal villages. Indicators, as the word implies, are measurable social phenomena, such as income, self-reported health, or amounts of sharing of resources among kinsmen and friends, which indicate by their presence in a given area the existence of certain conditions. We sought a small number of valid indicators which would be sensitive to social and economic change and which could be measured cheaply and quickly on a regular basis to provide assessments of conditions in Alaskan villages and regions so as to avert or mitigate social and economic problems. Toward this end, we sought indicators that discriminated between oil-related factors and other types of factors that could influence social and economic conditions.

To obtain the indicators we created a multi-method, multi-data set design which employed formal elements – a questionnaire and a protocol (a list of questions to which responses were open-ended) – and less formal anthropological observations, which facilitated interpretation of responses to the questionnaires and protocols. Whereas each methodology possessed unique strengths and each produced a unique data set, each also had inherent weaknesses. The multi-method and multi-data-set design was structured so that the strength of each formal method compensated for the weakness of the other method, and the informal method (anthropological observations) allowed for close analysis of the construct validity of items in each formal method.[70]

Three years into our research (March 24, 1989), the *Exxon Valdez* foundered, spilling nearly 11 million gallons of North Slope crude oil in and around Prince William Sound affecting the biological, physical and social environments of a large area in Southcentral Alaska. Two of the 31 villages in our original sample were located in the spill area. Since we were already conducting our third wave of research in the villages directly affected by the spill, we possessed solid empirical measures at three points in time prior to and during the spill for those villages, but our sample was far too small to allow us to generalize to all villages affected by the spill. With MMS approval we incorporated another 10 villages into the spill-area sample.

Research among the 41 villages conducted from January of 1987 through March of 1991 employed a Solomon Four Group Design with embedded panels comprising 2,655 interviews and re-interviews of

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[70] Our multi-method, multi-data set design, known as a 'Solomon Four Group with embedded panels,' was necessary to distinguish 'oil-related' factors from other factors. For example, we compared a pre-test sample, randomly selected, in 1988 with a post-test sample, randomly selected from the same villages in 1990 (following the Exxon Valdez oil spill). We desired to measure whether changes had occurred between the period a year prior to the spill and the period a year following the spill, and we sought to learn whether changes that may have occurred were attributable to oil-related factors or other factors. In 1990, we re-interviewed a panel drawn at random from the 1988 pre-test sample. Differences between the pre-test and post-test samples reflected recent transiency in pursuit of employment (seeking cleanup-related work, and leaving because of closing of commercial-fishing waters). The pre-test/post-test design with embedded panels demonstrated that differences were products of change wrought by the Exxon Valdez oil spill, and not testing artifacts, or fortuities, or any other factors among the hundreds which we analyzed (multivariate). Panel respondents were stable, whereas significant proportions of the pre-test and post-test samples were much less stable and responded to oil-related factors as our many measures indicated.

questionnaire and protocol samples,[71] as well as ethnographic observations and institutional protocols administered to persons identified as village leaders (political, business, educational, religious).[72]

In our pursuit of valid indicators, we sought information on a wide variety of topics that would vary in response to oil-related activities. Inasmuch as coastal Alaskan villages comprised Native (Eskimo, Aleut, Indian) and non-Native residents, and because some villages were small and homogeneous (principally native residents) with modest infrastructures and services, and some were large and heterogeneous (non-Natives comprising more than 25 percent of residents) with well-developed public and private infrastructures, we created several theoretical contrasts to distinguish village types. We hypothesized that the relative complexity of villages would indicate differential responses to oil-related activities.

Each of the contrasts provided powerful differences over a range of variables in every one of the topics we addressed: public- and private sector economies, subsistence resources, use of subsistence resources, education, income, household organization, Native language fluency, and so on. But among all of the theoretical contrasts that we employed, the simple distinction between whether respondents were Natives (Eskimo, Aleut, Indian) or non-Natives proved to be the most powerful indicators of differences in our samples, regardless of the types of villages in which they resided, or the occupations they pursued, or the length of residence in a village, or any other factors.

The importance of the distinction was obvious in our large research waves conducted during 1987, 1988 and 1989, but the significance of the measures also proved to be highly sensitive to reactions to the EVOS as measured in 1989, 1990, and 1991. Issues concerning the acquisition and uses of naturally occurring resources were known to be important for the daily lives of Natives and perhaps less so for non-Natives, although equal legal rights in subsistence pursuits for Natives and non-Natives was a contentious issue before the federal and Alaska state governments during the duration of our research. I shall focus, albeit

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[71] Complete descriptions of the methodology and the results of the reliability and validity tests appear in Joseph G. Jorgensen and Steven McNabb. (Social Indicators Study of Alaskan Coastal Villages (SIS), volumes II and V).

72 T. Brelsford, A. Fienup-Riordan, J. Jorgensen, S. McNabb, P. Petrivelli, and L. Robbins (SIS I, Part 1); J. Endter-Wada, J. Hofmeister, R. Mason, S. McNabb, and J. Mulcahy. (SIS I, Part 2); J. Endter-Wada, J. Hofmeister, R. Mason, S. McNabb, E. Morrison, S. Reynolds, E. Robbins, L. Robbins, and C. Takada Rooks (SIS IV).

briefly, on natural resources, their uses by contemporary village residents prior to the oil spill and subsequent to the spill, with special attention as well to employment and income.

Pre-spill Sample Results

At the outset of our research we investigated the importance of natural resources to persons and households because of the well-established significance of the harvests, exchanges, and consumption of naturally occurring resources for households, and because many naturally occurring resources in coastal regions were vulnerable to oil activities.

We documented that Natives maintained a variety of practices that were common features of the lives of their forebears. Extraction of mammals of land and sea, fish, birds, bird eggs and wild plants; the sharing of food, labor, and even cash for survival; eating meals with relatives and friends in their homes, frequent visits with friends and neighbors, and the active participation in affairs of the village were highly correlated and proved to be powerful indicators of the retention of traditional practices in the fabric of Native lives in the 1990s. Resource extraction by Natives was a part of a large bundle of traits that involved a wide network of kinspersons and friends, some within the village and some beyond. Native respondents typically resided in significantly larger households with significantly less income (less than $40,000 annually), harvested and shared more naturally-occurring resources, and espoused different and greater understanding of their local environment than non-Natives.

Knowledge that a resident in a coastal village was not a Native proved to be the best indicator that he or she did not engage in subsistence extraction activities, that subsistence foods were not eaten in the previous two days; that subsistence foods constituted small proportions of the annual diet, that few meals were eaten with relatives in other households, that few persons resided in the respondent's household, that the respondent's income was greater than $40,000 annually (non-Native incomes were twice the Native average), and that ties with persons in other villages were few and of modest importance for the non-Native.

A small subset in our aggregate sample comprised non-Natives married to Natives ("mixed" marriages). These couples were twice as likely as non-Natives, whether single or married, to have extracted several varieties of naturally-occurring resources, to have eaten meals in a relatives' home, and to have received subsistence foods from persons in a household other than their own. The Native partner was the facilitator for these practices. Nevertheless, the best prediction among mixed racial couples was that no meals were eaten in relatives' homes during the preceding two days and that the respondent had not eaten in a relative's home recently. That is, whereas non-Natives married to Natives were more apt to have eaten in a relatives' home than were single or married non-Natives, the best prediction for a non-Native respondent is that he (or she) had not eaten in a relative's home recently.

The differences between Natives and non-Natives in regard to harvesting, processing, distributing, consuming, and sharing naturally occurring resources were marked and significant. Native subsistence economies were embedded in a communitarian social fabric of acts and sentiments in which hunting, fishing, and other extractive activities – some solo and some with relatives or friends – formed its important base.

Subsistence Tradition or Sport Tradition?

Whereas the harvests and preparation of wild animals may occur as subsistence activities and also as activities within a subsistence mode of production, the restriction of activities to a few species of large land mammals and salmon indicates a sport "tradition."

When extraction, preparation, distribution (a panoply of sharing practices), and consumption of a wide variety of plants and animals are organized within kinship-friendship networks, and are embedded in a nexus of visiting customs, the relations among these variables indicate a subsistence mode of production "tradition," i.e., a set of related customs that have persisted over time.[73]

In our pre-spill samples, six (6) percent of non-Natives hunted several species of land mammals and fished for several species of fish and established camps for several extraction activities each year–all

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[73] Over the past 45 years, a large anthropological literature has focused on the importance of visiting behavior among American Indian and Eskimo societies. Visiting, without invitation, is common etiquette among relatives and friends and, unless a person is aged, infirm, and living alone, is usually reciprocated. Visiting on a regular basis is generalized within communities and among many households, rather than exclusive to a few. Moreover, visits are occasions for meals to be shared; for the aged and infirm to be assisted; for food to be borrowed; for help of one kind or another to be proffered by guest or host; for information about resources to be passed, for political issues to be discussed; and for gossip to be indulged and disputes to be resolved. For examples of these and other relations common to a subsistence mode of production from the MMS research literature, see H. H. Luton, Jr., 1985 (TR 91), Little, R. L. and Lynn A. Robbins, 1984 (TR 89), and Jorgensen, J.G. with J. Maxwell and V. Katchatag, 1984 (TR90).

recognizable as "traditional subsistence" activities engaged in by Natives. The non-Natives so engaged were between the ages of 35 and 59, had resided in the village in which they were first interviewed for more than ten years, some had Native spouses, and almost all earned more than $50,000 annually. Yet less than 50% had eaten at a relative's home, or received food from a person in a household other than the respondent's, or gained more than 50% of the meat and fish in their annual diets from naturally-occurring resources.

In sum, the multiple factors, taken together, that account for non-Native participation in several subsistence activities associated with Native subsistence modes of production are: mixed marriage, more than ten years residence in a village, middle-age (35-59), high income (over $50,000 in 1988 dollars) and employment in the public sector (the source of most high paying jobs in most villages). Exercising all of these controls, the best prediction is that if a person is a non-Native, he or she participates in one or less subsistence activity, eats few subsistence foods, does not eat at the home of relatives within a two-day time frame, and does not receive subsistence foods from others. The vast majority of non-Natives who engaged in extraction were sport hunters, or fishers, or both.

Post-spill Sample Results

The effects of a single external event, the plunge of international oil prices that began in 1985, dramatically affected Alaska as measured by unemployment, bankruptcies, foreclosures, out-migration and other economic and social indicators. The plunge in oil prices pushed Alaska into the bust portion of a boom-bust cycle. The bottom of the bust had not been reached when a second major external event occurred, the EVOS. The spill precipitated a brief boom-bust cycle – 8 to 12 months – nested within the bust caused by oil prices. Oil cleanup served as the multiplier for the boom.

The spill boom-bust cycle was so short-lived that had we not employed a longitudinal Solomon Four Group Design with embedded panels, we could not have understood the dynamics of that cycle. Through activities related to the oil cleanup, the boom brought cash to commercial fisherman, many other Alaska residents, and job-seekers from the lower 48 states. Yet, the spill also was one factor in pushing downward the prices fetched by Alaskan wild fish.

The consequences for the Native and non-Native residents of the oiled area were manifest, and our indicators were sensitive to many of the changes that occurred. I cannot address all of the responses here, so I shall focus attention on the measures of income, cognitive attitudes about the environment, and subsistence production, distribution and consumption.

There were very large discrepancies between non-Native and Native incomes in each of the six waves of our research from the winter of 1987 through the winter of 1991.[74] Throughout our inquiry, non-Native households were smaller than Native households while enjoying incomes twice those of Native households.[75] Two years after the spill the incomes of non-Natives were less than they were immediately following the spill, while paradoxically the incomes of Natives were higher two years after the spill than they were in 1989. Native respondents earned about 50% of what non-Natives earned in 1989, and about 60% in 1991. The short-lived boom assisted Natives and non-Natives in 1989 and 1990, while Natives, in particular, benefited from specific local programs related to spill consequences two years after the spill.

The increase in Native employment and incomes in 1991 were, for the most part, by way of short-term jobs (between one and nine months) related to spill restoration. The larger incomes among people who were not employed full time from 1989 through 1991 correlate positively with every form of sharing, significantly with sharing of resources – giving and getting – in and out of the village.

So, what was done with money that circulated in spill village communities before, during, and after the spill? From 1989 through 1991, Natives invested more of their incomes into the harvests of wild resources than did non-Natives, but in 1991 when Native incomes peaked, they invested less into harvest than they invested in 1989. A similar pattern of change occurred in the variety of species harvested. Natives harvested a greater variety of species than did non-Natives in 1991, but less than Natives had harvested in 1989.[76]

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[74] We conducted two research waves in 1989, one before and one after the spill. The Key Informant Protocol variable K4 measures household annual income. It is based on an estimate provided by the respondent for the aggregate income of all members of the household. The household comprises co-residents under a single roof, but includes persons residing in attached housing whose domestic activities are integrated with those of the main residence.

75 Fuller analyses of the sensitivity of the social indicators in measuring economic and social responses to the oil spill appear in SIS VI and Joseph G. Jorgensen 1995 “Ethnicity, Not Culture: Obfuscating Social Science in the Exxon Valdez Oil Spill Case” American Indian Culture and Research Journal 19.4: 1-124.

[76] The Key Informant Protocol ordinal variable K1 measures the household’s subsistence harvesting expenses as an estimated percentage of total annual income. The expenses include the purchase and repair of equipment, purchase

In terms of cognitive attitudes, that is, what people knew or thought, Native residents prior to the spill were very different from non-Natives in the same area. Native residents expressed normative expectations that a person should acquire personal skills to assist one's family, kinspersons and friends. They also cognized the environment as possessing spiritual meaning beyond the resources which comprised it, and they identified huge numbers of naturally occurring species in their local environments. Natives participated broadly and frequently in village political affairs, in kinship and friendship networks, in harvests of a wide variety of natural resources, in sharing food, labor, and cash, and in eating meals with friends and relatives.

The consequences of the oil spill are apparent in the measures of the proportions of wild food in the diet. The proportion of Natives reporting 50% or more in 1989 was 52%, yet that proportion dropped to 46% in 1991. Surprisingly, 24% of non-Natives in the spill area reported diets containing more than 50% wild foods in 1989 and 26% reported doing so 1991. These percents were far greater than pre-spill reports for non-Natives. Non-Natives, then, reported a slight increase while Natives reported a decrease.[77]

There were fewer species and less biomass harvested by Natives in the 18 months following the spill than in the 18 months prior to the spill. There were, consequently, less wild resources to eat and less wild resources to share during 1990 and early 1991. That some non-Natives increased their consumption of wild foods during the two years following the spill is consonant with some changes in their sharing

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of fuel, purchase and repair of clothing, purchase of ammunition, food, and incidentals required for travel and camping. The ranks range from (0) None to (4) High (30% and over). The ordinal variable K2 measures the variety of naturally occurring resources harvested annually by the informant's family household. The responses are classified into 5 ranks in which (1) = no naturally occurring species harvested, (5) = more than 3 species in each of the following categories for which species are available in the respondent's local environment: land mammals, sea mammals, waterfowl or seabirds, marine invertebrates, fish (fresh, anadromous, and/or saltwater species), and plants (marine or land). Ranks (2) thru (4) measure intermediate amounts of varieties harvested.

77 The Key Informant Protocol ordinal variable K3 measures the proportion of naturally occurring harvested protein (wild meat) in the annual diet of the household. It is an aggregate estimate for household members and includes items that are harvested by members of the household as well as items that are received by household members through gifting, sharing, or exchange. The range is from (1) less than 25% to (4) 76% to 100%.

activities. The drop in the proportions of Natives reporting 50% wild food in their diets in 1991 is in largepart explained by destruction and tainting of wild resources in areas affected by the spill. Indicators of sharing account for a fuller explanation.

The sharing variables – distributions of cash, labor, and resources as donor or recipient – were especially sensitive to the spill and reveal incommensurable differences between Native and non-Native subsistence activities, the ways in which those relations are organized, and the cognitive ideas that rationalize them. We used several measures of sharing–cash, labor-services, and goods-resources–which we divided into donors and recipients, and divided again into whether the sharing occurs between persons in the same village or different villages. Inter-village sharing, in good times and bad, proved to be enduring activities among Alaska's Natives. Regardless of the season, most sharing between households occurred within villages. The sharing was characterized by small quantities of food, short-term uses of equipment, and small services, such as tending children or repairing windows.

Sharing also took place between persons who resided in different villages. Our data demonstrate how inter-village sharing worked and also how it increased following the spill as fewer resources were harvested. In general, as incomes increased and wild resources decreased between 1989 and 1991, all forms of regular sharing increased within and among villages.

The increases in sharing by Natives from 1989 through 1991 were functions of (1) the decrease in wild resources available, and (2) their reluctance to harvest tainted resources. Native spill area residents benefited from wild foods given to them by kinspersons and friends, often from distant villages, who extracted non-tainted resources in their local areas. Our pre-spill data demonstrated that economic exigencies were more influential than either the availability of resources or the reluctance to harvest tainted resources in accounting for the increases in non-Native sharing practices during the emergencies of 1989 and the resumption of the bust cycle of 1991.

Non-Natives, too, increased the extent to which labor, in particular, and resources (cash, but also some food and equipment) were shared directly among households between 1989 and 1991. Non-Natives donated labor within the village nearly 2.5 times more frequently in 1991 than 1989 (the Native rate was 2.7 times greater). Beyond their home villages, non-Natives also increased their donation of labor (the Native rate was 1.8 times greater) and resources (the Native rate was nine times greater). Although there was a marked increase in the regularity with which non-Natives gave and received resources, that resource most frequently given was cash, and even that was provided at a rate 2.2 less than that of

Natives. The increase in non-Native sharing activities were clearly responses to the exigencies created by the spill, occasioned by the large, if short-term, incomes earned through cleanup or related employment.

Responses to the spill and the damages it caused were conditioned by cultural expectations about what Natives do in various contexts and instances of adversity and what non-Natives do in similar situations. Native responses were consonant with Native cultural practices invoked when responding to immediate and to protracted privations. Natives exhibit expertise at adjusting to environmental variations – whether or not those variations are influenced by human actions. Non-Native responses were consonant with non-Native behavior to crises situations elsewhere in the United States. Persons relocate for short-term work, remit cash home, and provide some assistance to persons in need until the crisis subsides.

Discussion

The research demonstrates that empirical differences in cognition, behaviors, and structure between Native society and non-Native society are real and valid, but it also demonstrates much more. Indeed, the Social Indicators project was a considerable success for MMS. For purposes of monitoring the conditions in coastal Alaskan communities, the project systematically identified more than 160 protocol and questionnaire variables (aggregate) that are sensitive to, and provide valid measures of changes over time. The variables in each of the two instruments comprise sets of related phenomena including employment, income, health, subsistence activities, activities in local political affairs, knowledge of the environment, visiting activities, and ethical precepts and practices. Because many of the variables within each set correlate positively and highly with other items in their set, it is possible for future researchers to use as few as 15 questions, either by protocol or questionnaire, to monitor conditions within Alaska's coastal communities. The savings in research time and associated costs by using valid indicators to monitor village conditions are obvious.

Inexpensive and systematic monitoring will surely reveal public frustrations with government agencies, such as the responses that frequently accompany the public discussions attending EIS hearings and the proposals before the state and federal government concerning subsistence resources. In the case of the *Exxon Valdez* spill, we discovered the frustration of persons who lost employment, who claimed discrimination in clean-up hiring practices, who feared harvesting and eating tainted wild resources, whose households relied on relatives and friends in distant villages for wild foods, whose households fluctuated in size as some members sought work to maintain the household, who vented displeasure in local public meetings, who lost income as commercial fishers, who increased their sharing practices within and beyond their own villages, who were displeased with Exxon, VECO, the federal and state governments, and who reported divisiveness within their communities.

The results of such monitoring can be instrumental in prompting new and informed efforts to enhance public and/or private cooperation. With regard to oil spills in particular, the Social Indicators research establish that one priority should be redirecting oil spill response strategies so that environmental, economic and political concerns of local populations in spill affected regions are addressed in conjunction with the plans to clean-up the spill.

Reflections on the Alaska Offshore Studies Paradigm

John Petterson

At the time the MMS studies program was initiated, the prevailing model for anticipating and understanding the human impacts of oil and gas industry activities on the OCS was the "boomtown", or "classic" SIA model. This essay examines how shortcomings in the classic SIA paradigm affected the quality and utility of the resulting MMS socio-economic study efforts and products. It explores the evolution of the study program over time, and the difficulties encountered in attempting to examine long-term social and economic change with the tools and methods derived from traditional SIA. The conclusion focuses on the advantages of a more robust approach that accommodates the long-range and cumulative effects of offshore development.

Background

The traditional SIA model developed as social scientists were called upon to document and assess the effects of large-scale events and processes on small communities in rural areas of the United States. Following Luton and Cluck (2004), early SIA work can be summarized as follows:

> … We label as "classic SIA" the model that emerged from a group of impact studies conducted in the 1970s and early 1980s that addressed large, government-sponsored projects such as coal-fired generating plants, strip mines, and hydroelectric dams, mostly in rural areas of the western United States. While this model is often called the boomtown model, we label it classic because it was the first SIA model, the root from which later versions grew, and because it established an underlying logic, set of goals, and list of concerns that still resonate in SIAs that later emerged… This model was formulated to measure impacts: (1) in small and easily definable areas (e.g., communities, counties); (2) from single, often one-dimensional causes (e.g., a generating plant); (3) of developments of relatively short duration (e.g., several years); (4) where the impacting agent is externally imposed; and, (5) where the impacting agent overwhelms the community's institutional structures, infrastructural capacities, and labor force.

In rural Alaska, the classic model was applied to explore assessment of the effects of offshore oil and gas development. All of the early Alaska oil development scenarios implied precipitous development in close proximity to remote, non-English speaking, very small Native villages where residents were almost entirely unprepared for such events. The prevailing SIA framework was useful for understanding such populations and the manner in which they might immediately be affected during the initial years of oil and gas industry activities on the OCS. As such, MMS administrators rendered the agency's EIS and lease sale processes responsive to analysis generated under the classic framework.

But a few observations concerning the MMS Alaska OCS ESP must be made from the outset. First, its mission was specifically focused on offshore development scenarios. It was not mandated or tasked to consider the effects of oil development resulting from onshore activities in Alaska (see Preface). Its mandate to focus on the OCS led the agency to treat MMS lease sale activities as largely independent and unrelated to the ongoing and precipitous changes that were occurring in association with onshore development on the North Slope. The situation resulted in a persistent effort to differentiate sources of impacts actually or potentially resulting from onshore development from impacts (only) potentially occurring on the OCS. In retrospect, this weakened the ability of MMS to examine impacts in a comprehensive manner. More specifically, it obviated analysis of the way in which coastal communities were affected in the long-term by: (a) ongoing onshore development, (b) the possibility of offshore development and associated speculative and actual political, socio-cultural, and economic processes, and (c) the combined or interactive effects of both onshore development and offshore development possibilities.

Second, a technical strategy was adopted from the beginning to organize lease sales by geologic basins – i.e., "OCS Planning Areas." This allowed MMS to more readily assess potential industry interest in leasing oil tracts within narrowly defined geographic regions, and to prepare its required studies and analyses and conduct its lease sales accordingly. The geographic sequencing of lease sales thus imposed on the ESP a need to define corresponding onshore impact regions (petroleum development regions) and to conduct impact studies in coastal areas corresponding to these geologic basins. Yet, virtually all of the coastal Alaska petroleum development regions incorporated small and remote, non-English speaking Native village communities which exhibited many important differences (and commonalities). While the agency preference would certainly have been to consider impacts occurring at the larger regional level, the need to focus on community-level effects became increasingly evident, and the ESP responded accordingly.

Third, the focus on individual lease sales and the promise each held for productive offshore wells imposed urgency on MMS study efforts and, as a natural consequence, an emphasis on short-term impacts. Indeed, the structure of the EIS paradigm was such that the MMS study program increasingly focused on the anticipated immediate and short-term effects of exploration and/or development resulting from specific proposed lease sales, and concentrated primarily on the material and measurable economic consequences of associated scenarios. This was to be expected given that under NEPA planning horizons, a five-year projection scenario is considered to be "long-term."

Limiting analysis to specific lease sale areas and to the near-term necessarily conditioned the types of variables that were examined at the level of the community. Emphasis was placed on variables that would indicate direct and measurable effects of potential OCS activities in specific locations and time frames. This situation had several parallel consequences. First, study ideas initiated by the agency under this framework tended to be reproduced over time. The titles, structure, and content of studies previously undertaken were part of a genre of work conducted under the existing EIS paradigm. Contractors tended to look to the previously developed reports when structuring their own research, considering the earlier "variables" as valid and well-defined means for understanding the community effects of OCS development. The MMS, for its part, was constrained in its ability to critique the report structure, methods, models, analysis, or conclusions insofar as these met established precedent. The unfortunate consequence of this natural process was the routinization of the study products. As such, the sensitivity of the variables that were used as indicators of change reached a condition of stasis, despite the fact that we now know that the interaction of offshore oil and gas development and adjacent communities is highly variable, complex, and dynamic.

Significantly, the emergent MMS focus on direct and clearly associated effects of its lease sale activities effectively eliminated from analysis the broader spectrum of indirect and secondary effects of onshore and near-shore oil development in Alaska. As noted above, it also reduced any practical basis for consideration of the "interactive" and "cumulative" impacts of that development. Once these early patterns were established, the focus on short-term impacts and on the potential effects of OCS activities on employment, demographic conditions, harvest disruptions (oil-spills), and the like was inevitable and, from a programmatic perspective, unfortunate. Even methodological advances initiated later in the program, such as the "socio-cultural monitoring" studies, in-depth ethnographic "case studies," and "social indicator" studies, were never framed in a way that would allow consideration of the entire range of impacts of oil development (both direct and indirect) or delineate the differentiation of actual onshore from potential offshore impacts.

Finally, while the methodological orientation of the studies themselves evolved over the 30-year period in concert with changes in the underlying scientific disciplines of sociology, anthropology, history, and economics, the general EIS paradigm of the studies program has remained fairly constant. Despite the evolving capability of the social sciences to address spatial and temporal change, again, studies were normally conducted at the level of the lease sale itself - Norton Sound, Beaufort Sea, Bristol Bay, etc. - with emphasis on the effects of the specific sale on communities within the specific geographic reach of the project, and with variables limited to measurement of relatively short-term effects.

Conceptual and Methodological Issues

The classic SIA model involved development and use of several necessary components. These include the following: (a) careful description of past trends and current conditions across a wide range of social and economic variables; (b) projection of these trends and conditions into the future as a "baseline" scenario; (c) prediction of an OCS development scenario, consisting of changes in the social and economic variables associated with the proposed development; and (d) assessment of the differences between the baseline and OCS development scenario (or scenarios) quantitatively and qualitatively presented as the "impact assessment."[78]

It is fair to say that description of current conditions, while subject to considerable variation in quality from one set of researchers to another, was in general carefully developed. Moreover, associated quantitative and qualitative information has retained its value into the present and continues to be useful as baseline information against which changes occurring in rural Alaska towns and villages can be measured. Yet the framework for selecting the variables, and the methods for collecting the necessary information, lacked a clear relationship to the broad range of activities through which oil impacts had been affecting, and would in the future affect, the communities in question.

A broad range of variables and factors were used in SIAs conducted for the ESP and other research programs in Alaska. But many that could have served as useful quantitative indicators of both short- and long-term social change, and as foundation for understanding cumulative and interactive effects, were

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[78] Useful discussion of this framework is provided in "A Conceptual Approach to Social Impact Assessment," Rabel J. Burdge. 1994. Social Ecology Press: Middleton, WI. Regulatory applications of the model are discussed in "Guidelines and Principles for Social Impact Assessment," prepared by the Interorganizational Committee on Guidelines and Principles. 1994, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) Tech. Memo, NMFS-F/SPO-16. Silver Spring, MD.

largely neglected. Examples include: changes in community income; amounts, sources, and uses of transfer payments; distribution, use, and effects of subsidies and in-kind benefits such as those relating to housing, power, sewer systems, and roads; changes in the skew of income distribution across local populations; changes in the number and distribution of occupational titles; and so forth. With the benefit of hindsight, we now also see that political and associated social-structural factors are particularly important in conditioning offshore leasing efforts. As such, SIA practitioners might also have developed detailed baseline understanding of the internal socio-political effects, and the informally communicated external response to both onshore development and its array of effects, and to prospective offshore development and its corollary effects.

This basic problem was compounded and magnified in the effort to project future conditions – the so-called non-OCS baseline scenario. Ideally, an MMS "baseline" projection would be founded on a thorough understanding of the "present community," and designed to represent how that community was likely to change over time in the absence of any externally imposed OCS development activities. The description of current conditions was based on facts and actual observations, whereas the non-OCS baseline scenario projections were based on hypothetical changes occurring over the subsequent five, ten, or twenty years in the absence of OCS development. Simply stated, because we confined our analyses of current conditions to the exclusion of the larger social and economic effects of ongoing oil development in Alaska, and then based our projections on those narrowly defined conditions and variables, the projections had little prospect for real accuracy or utility for the purposes of understanding the effects of future OCS-specific, or more generalized, oil and gas industry activities.

The most fundamental problem with the projection exercise, however, relates to selection for sake of analysis of activities associated with future oil and gas related development, and the relationship between these projections and the associated "impact" variables. Obviously, because offshore oil or natural gas was never developed on the Alaska OCS during the 20th century, we cannot speak to the accuracy of industry development scenarios or projections. While we cannot say today that development could not have happened as projected, it seems, in retrospect, that the basic underlying logic of the development scenarios - remote, socially and economically self-contained, direct-to-tanker extraction and supply systems - was unrealistic.

The Case of Education

In order to elucidate how these shortcomings affected the analysis and conclusions of the early impact assessments, we now select a single indicator (education) as a good example with which to consider alternative conceptual approaches. Let us imagine a "table exercise" to investigate the potential effects of OCS-related activities on localized education in a community of 300 persons located within an OCS lease sale area. We begin by asking: what education-related impacts might be associated with offshore oil *exploration*? Try as we might to imagine how an offshore drilling rig or vessel might affect the local education system (i.e., unauthorized landing, unanticipated local purchasing, unexpected labor demand on the community, an accident scenario), the potential immediate and short-term effects of the exploration activities on local educational institutions appear relatively minor and fairly remote.

The effects of a *development* scenario, on the other hand, could be significant if the adjacent community was used as the principal support base. However, over time, it came to be accepted that any projected support system would be consistent with the one that in reality evolved in association with industry operations at Prudhoe Bay (i.e., living in Anchorage and commuting to local oil worker-only enclaves in one-week-on, one-week-off work patterns). Little consideration was given to the possibility that large numbers of oil workers might reside in, or heavily utilize, a particular existing community. Thus, it became difficult to envision a likely scenario by which community educational systems might be directly affected by oil exploration or even production activities on the OCS. This, in fact, was the conclusion most often drawn from secondary data collection and field investigations.

But consider all that has been left out of the analysis. We also need to consider the larger context of social change at the State level, and the pervasive influence of North Slope oil development. The period between discovery of oil at Prudhoe Bay in 1968, and completion of the initial series of MMS lease sale activities during the early 1980s, was a time of profound social and economic change. During that span of time, villages established ‘permanent’ sites, were pushed to incorporate and establish local governments with associated formal hierarchy (in order to receive massive State largesse), ANCSA was passed and Natives organized into regional and local corporations (profit and non-profit), a housing boom ensued that was funded under HUD (Housing and Urban Development) construction assistance with state supplements, the Alaska Permanent Fund was established and annual payments were distributed to each resident family, and television and telephones were introduced. All of these changes were directly related to the rapidly growing income accruing to the State of Alaska as a result of oil development on the North Slope. Many other state policies, concerning fisheries and timber, for example, were indirectly affected by the availability of this growing oil wealth.

Simply stated, the revenue and processes associated with extraction of oil and natural gas from State leases have been the dominant force of social change in Alaska since 1968. The gross state product in

1963 was $5.6 billion, of which $145 million was derived from oil. The statewide population at that time was around 250,000. Seven years later, in 1970, oil contributed $1.4 *billion* - a ten-fold increase, with a population of 309,000 persons. A little more than a decade later, in 1981, oil contributed $11 billion, and the statewide population was 434,000. On a per capita basis, oil revenues from state oil leases amounted to $580 in 1963. In 1981, per capita revenues amounted to over $25,000. Today, the Alaska Permanent Fund alone contains over $28 billion and earnings from the fund now contribute more to the state budget than royalty revenues from ongoing oil development itself!

This discussion considerably understates the magnitude of the sudden statewide economic impacts associated with oil development. Not included in this revenue stream, for example, is the economic impact of construction of the Trans-Alaska Pipeline System which, at its peak, employed 28,000 workers (almost 20 percent of the state's total workforce), with over 70,000 different employees working on the project over the two-year period. Also ignored are the impacts of oil firm operations; associated Fairbanks, Juneau, and Anchorage construction activities; and oil industry hiring, profits and investment.

A Native resident who left home for an education "outside" in the early 1970s would have had difficulty believing what she found on her return just five years later. Almost every community would have established its "permanent" location, would have built a "community" center / government office, and would have constructed dozens of permanent homes on graded streets. Each home would have been provided with electricity, and with indoor plumbing. Satellite telephones would have been connected, and many communities would have already installed televisions in their new community centers. Finally, she would also have discovered, normally on the edge of town, a brand-new school, identical in form to those established in virtually every small community in Alaska - schools built to exacting standards, equipped with the entire spectrum of facilities, cafeterias, and gymnasiums with hardwood floors. These were constructed at astronomical cost (compounded by distance and the absence of ground transportation). Our hypothetical student, who had to leave home to pursue an education, would have been astonished. What brought about all these changes in such a short period of time?

Certainly, a key watershed event was the issuance of the Consent Decree in 1976 (*Tobeluk v. Lind*), which settled the 1972 class-action lawsuit filed against the Alaska school system.[79] The legendary lawsuit is

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[79] Some additional background may be useful for those not familiar with Alaska education history. The Alaska Organic Act of 1884 required the Department of Interior to provide education for all Alaska children and, in 1885,

referred to as the "Molly Hootch" case, named after the lead plaintiff, who asserted that the existing pattern of dual school systems (white vs. Native) was discriminatory. Deciding in favor of the plaintiffs, the Court directed Alaska to remedy the situation. After much wrangling and delay, the suit was finally settled with a consent decree that established minimum physical size and quality criteria for elementary schools to be constructed in Alaska rural communities. In the settlement, the State agreed to cover the costs of meeting these standards in every one of the 126 villages included in the litigation. The outcome of this decision was the construction of $2.5 million dollar schools (in 1975 dollars) in each community.

The decision is properly regarded as a pivotal event in the history of Alaska education. But the point here is that the legal decision achieved its momentous effect by virtue of oil production and the large revenues it generated for use by the State Legislature. School construction costs alone would have represented a major percentage of the total state budget in 1975, and few legislators would have prioritized the construction of elementary schools over other pressing issues for such a small number of rural village residents. But the decision was reached at a time when Native communities were expanding their political power, when state coffers were filling with revenues from construction, and when oil royalties seemed inexhaustible. It was within this political economic matrix that the State agreed to build village schools with an initial cost of construction of $315 million (in 1976 dollars), and committed to massive annual support, maintenance, and faculty costs. This outcome is simply unimaginable in the absence of the immense revenues available to the State of Alaska from North Slope oil royalties.

The immediate impact of the construction of the schools in each rural community was significant. The

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the first General Superintendent for Education was appointed. By 1895, 19 grade schools had been established, most of which were run by missionaries - with Christian doctrine as a core component of the curriculum. The objective of this education was to promote the adoption of Christian values and the abandonment of "old customs." Alaska became a U.S. Territory in 1912, and by 1917 the Territorial Legislature had established a standard school system reserved for non-Natives, with the U.S. Department of the Interior schools continuing its acculturative curriculum for the Native population. In 1926, Native vocational schools at Eklutna, Kanakanak, and White Mountain were founded. In 1931, the Bureau of Indian Affairs assumed responsibility for the Native population, continuing the established "assimilation" agenda, which then continued through the end of WW II. For more advanced (secondary) education, highly qualified Native children were removed from their families and sent to Mt. Edgecombe, a boarding school in Sitka. Following the war, the Bureau of Indian Affairs transferred responsibility for local schools to the Territory of Alaska (in 1951). Following statehood in 1959, all these schools became part of the State-Operated School System in 1966.

social effects of the *operation* of these schools, however, were far more profound. Suddenly, the community would have to accommodate the necessary number of "school teachers" which, as a percentage of the population, was significant. Alaska was already suffering from a dearth of good teachers and had been drawing on newly graduated teachers from Washington, Montana and, most heavily, from Minnesota. Thus it was that many hundreds of mostly young and inexperienced school teachers suddenly appeared in the 126 rural Native communities at nearly the same time. Special housing “enclaves” were created for white teachers, and the complexity of local social and political relationships increased dramatically. Moreover, teachers were paid exceptionally high salaries compared with the lower-48, and these were many times greater than the salaries of other residents. Thus, economic relationships were also complex and confusing. Before long, the teachers’ enclave would become a community within-a-community, with economic independence, and permanent “alien” status (from a legal perspective). Teachers typically were committed to educating the “Native” population to the best of their ability, and despite cultural differences with the residents, they were unavoidably deeply embedded in village social life across many dimensions.

Suffice it to say that the arrival of teachers aggravated and confused the residents even in those communities that had most actively promoted the idea of community-based schools. At the time, many reported that they had never really considered the full implications of bringing in so many young, white teachers - most with no prior teaching experience, most trained in the methods and curricula of 1975 Minnesota. Not one spoke Alutiiq, Iññupiaq, Tlingit, Yup'ik, or other Native languages. Many of the children would later remember the experience of going to school and pretending to understand their teachers, of being snapped on the wrist for speaking their Native language, and of going home crying in frustration. Many recall the distress of trying to remember the names of items familiar to any Minnesotan, but entirely absent in rural Alaska. Most adults, and almost all elders, spoke no English. Teachers attempted to integrate themselves into "their" communities, but it would be years before friendships could be established, and it continues to be the dominant pattern today that the teachers return "home" to the "lower-48" for their summers.

Our table exercise of the potential impact of a specific lease sale on "education" in coastal Native Alaska communities seemed to indicate little chance for positive or negative impact. Now, in light of a better understanding of the larger context of the impact of oil revenue on the State economy, and the broad array of profound and pervasive effects that revenue (and directly derived state and local decisions) brought on the community, it becomes clear that the "additional impacts” of oil development off the coast of any community could have been dramatic - even if no measurable “direct” impact ever occurred. The potential addition of extra residents or even visitors, in the context of five or ten new "alien" teachers taking up residence in the community, was likely to have been significant. In fact, many leaders expressed concern over the potential local impacts of oil and gas development occurring on the OCS, although their concerns seemed vague and unlikely at the time. In retrospect, it is now clear that these communities were undergoing change at an unprecedented pace and concerns about the additional impacts of prospective offshore development were well-founded.

Had we understood, at the time, not simply the intent of the Court decision, but the underlying rationale and financial logic involved in implementing the Consent Decree, we could have ‘connected the dots’ directly between the availability of oil revenues and the construction of massive educational facilities in even the smallest of villages. Had we understood the oil-related premise of the implementation decisions, we would have been able to see the potential effects of offshore development in the context of "cumulative" impacts - impacts that would have been added to an already accelerated process of social change in the community. Had we fully investigated the indirect connections between oil revenues, the school, and the presence of significant numbers of young and inexperienced teachers in each village, we would have understood the potential impacts of OCS development as a prospective additional source of change in social and cultural relationships in small Native communities.

Through this exercise, we have identified a subtle but significant flaw in the agency’s adaptation of the traditional SIA paradigm. The effort to differentiate the effects of potential offshore oil development (those falling under the legislative mandate of MMS) from those associated with the large-scale ongoing development of onshore and near-shore oil development on State of Alaska lands, over time led the agency to disregard the pervasive effects of the latter on the entire State economy, and on virtually every aspect of rural village life in Alaska. Use of the traditional SIA model, in combination with the specific geographic, temporal, and technical constraints of agency operations, essentially prevented the observation and documentation of long-term and large-scale impacts occurring in these communities as the direct and indirect effect of development at the oilfields of Prudhoe Bay.

Systematic Shortcomings

An important systematic shortcoming of the traditional SIA model was failure to appreciate the importance of accelerated social change. This is, in fact, a shortcoming endemic to social science itself. Humans adapt, communities adapt, societies adapt. But adaptive processes are most easily understood and have been considered primarily as they occur over extended periods of time. But when major external changes occur abruptly, adaptive processes are necessarily put to the test, and social and cultural disruption often results. In such cases, measurable impacts are most evident. Thus, had White school teachers been introduced, one-by-one, into these very small isolated Native communities over a period of a decade, the effect would have been more modest. The same can be said of the construction of local schools, HUD homes, roads, power plants, community centers, and so on, if taken individually. All things being equal, television, telephones, elected government, village corporations, or English-language requirements might have been accommodated with relatively less disruption had they been introduced over a ten or twenty-year period. As it was, the imposition of all of these changes at virtually the identical moment in history profoundly and forever altered Alaska Native society - and these changes are all bound directly to the discovery and development of oil in Alaska.

Some rural Native communities, such as those in reasonable proximity to Anchorage, had been exposed to new technology and socio-cultural processes in bits and pieces, and hence were more 'pre-adapted' to eminent events than were others. But all underwent unparalleled change. While the specific issues may be unique to Alaska and the precise historical epoch, they reflect a core problem for the discipline because it is the immediate interaction and response of societies that tends to shape subsequent long-term response and change. This initial interaction is the most important point in time to identify and track patterns of response. While much is known, piecemeal, about those transitional events, much has been lost and we are now left only with historical reconstruction.

We can now better appreciate the importance of the pace of adaptation over time. Following the introduction of each novel social and cultural factor, individuals and, therefore, societies, make adjustments to accommodate and respond to a given agent of change - they necessarily adapt. In the earliest stage, adaptation can be profound, precipitous, and resistive. As such, in response to new political structures, new forms of social, economic, and political hierarchy emerge. Ideally, social scientists are on hand to document such processes, since once formed, these new structures and relationships become the social mechanisms for responding over the longer-term to additional subsequent changes. In the absence of detailed understanding of village-level response to the aforementioned large-scale changes occurring in the 1970s, we are now less than fully capable of developing a comprehensive, longitudinal, and empirically-derived understanding of response to changes occurring today.

Implications for Future Research

These past methodological shortcomings have implications for the MMS program today. The first implication, for MMS, is that an opportunity has been lost to understand the most profound changes induced by oil development in Alaska - these happened in the 1970s and cannot recur. Had oil or gas been discovered and developed anywhere on the Alaska OCS, MMS would have become enmeshed in deciphering the extent to which social impacts were magnified or accelerated by their lease activities. As it was, such development has only begun to occur, and only modestly, in the last few years - and in the same location and within the same general context of ongoing onshore and near shore State lease activities.

A second implication is that, after three decades, we can expect to identify only relatively modest changes in any of our social variables resulting from incremental changes in onshore or offshore oil development. The major changes have already occurred and have been accommodated by village societies. MMS, as an agency, must therefore adjust its objectives and methods accordingly. What can now be measured are the more subtle (but potentially important) changes occurring as a result of specific facets of future OCS development (e.g., the risk to marine mammals), and the cumulative impacts of both onshore and offshore oil and gas development.

The third implication concerns the agency's responsibilities for, and approach to, understanding future OCS-related impacts within this historical context and framework. Because the most profound and enduring impacts of oil development in Alaska occurred in the 1970s, and social, political, economic, and cultural adjustments have been underway for the last thirty years, the additional incremental impacts of future oil development are likely to be relatively limited, and centered narrowly on factors that are unique to a given new development - i.e., the fact that OCS development will take place at sea. While MMS recognizes the importance of this distinction, and the intensity of local concern about potential or actual impacts to traditional marine mammal use patterns around which traditional North Slope Native societies continue to be organized, the agency may not have adequately anticipated the severity of political response to the threat posed by OCS development.

The forth implication is that the MMS may not fully appreciate the nature of change that has occurred over time in its own relationship with traditional Native communities - particularly those on the North Slope. Local concern regarding the continuous expansion of the Prudhoe Bay complex and the accelerated expansion of onshore oil development in NPR-A largely dwarfs the perceived benefits of development on the OCS in the Beaufort Sea. These changes threaten to alter abruptly and permanently the political balance that has long been sought by agency administrators working under competing mandates to develop resources on the OCS while accommodating the needs and interests of local stakeholders.

It is also increasingly important to emphasize the need to document the entire range of impact variables, including both outcomes that are intuitively considered "adverse" and those that are considered "beneficial." It is a well recognized, but often unacknowledged fact that "impact assessments" tend to emphasize the search for "negative" consequences. This is natural and useful in many ways (particularly in response to agency requirements to mitigate, minimize, or avoid adverse impacts), but nevertheless biased. Researchers should be carefully attuned to identify such adverse impacts, but they must also carefully document all of the positive or beneficial effects of the causal or associative agent or agents of change - even if these are indirect or secondary. This is very important to decision-makers and ensures that all information necessary for balanced decision-making is represented in the assessment. It is also the case that seemingly "positive" outcomes, such as increased numbers of jobs, higher paying jobs, improved SAT scores, and so on, have their own consequences and, may, on their withdrawal, result in their own set of impacts. Key variables must be carefully collected and monitored across the entire spectrum of potential impacts so as to ensure their long-term analytic utility.

Conclusions

If the early MMS social research efforts had taken a longer-term perspective, and instituted a broad-based social monitoring program at the outset, while continuously enhancing methodologies to accommodate improved understanding of social consequences as they evolved, we would be able to document and quantify the entire spectrum of impacts of the oil development process as these are recognized today. More importantly, had we recognized at the time, the scope and dire importance of cause-effect relationships between statewide oil and gas development and local social conditions, we would have been in a better position to avoid, mitigate, or reverse some of the more adverse consequences.

Alternatively, if the State of Alaska had been obligated from the outset of Prudhoe Bay development to follow Federal guidelines in analyzing onshore socio-economic impacts, then we presume that the large gap in analytic coverage described and explained above would not have emerged, at least not to the same degree. The MMS could then add analysis of hypothetical offshore development scenarios to the corpus of research that would exist regarding the process and effects of actual onshore development. But this comprehensive coverage did not occur. As such, the challenge to measure and analytically address the broad range of social impacts on coastal communities that have consequently emerged as a result of statewide and regional oil and gas development, and which could occur in association with activities on the OCS, remain the issues of concern.

We now know that early MMS impact assessments were being conducted during a period of great social, economic, and political upheaval. Profound changes were occurring over very short periods of time, especially from the perspective of Alaskans who were so rapidly experiencing new ways of life. But it was difficult for field researchers to appreciate the pace or full significance of those changes. This is the same problem faced in conducting impact assessments of government actions of virtually any duration or significance, and a principal reason why monitoring methods and longer-term demographic and analytic approaches must be developed and utilized.

But what are the implications of rejecting the traditional SIA model in favor of a more robust monitoring methodology, reliance on long-term measures of change, and consideration of truly large-scale and pervasive agents of change? One important methodological consideration would be the need to develop consistent and reliable measures of the changes and adaptive responses we expect, given knowledge of such processes occurring in the past. Methods should address and seek to measure changes that potentially relate directly to future or ongoing OCS oil and gas activity, and indirectly to the agents of change that by virtue of scope and intensity may supersede and obscure OCS-effects.

While the factors that brought about change in Alaska villages in the 1970s cannot again occur, other agents of meta-level change seem likely, and their effects must be systematically considered relative to the more confined effects of contemporary and future industry actions on and associated with the OCS. In the case of the MMS Alaska OCS ESP, the need for cumulative effects analysis may require an analytical shift away from project-specific emphasis, and toward a longer-term monitoring perspective in which specific projects are examined with special attention both to the effects of important and relevant precedents, and to the "additional contribution" that new development could make to established local and regional social patterns and trends.

In conclusion, the history of the MMS studies program must be evaluated on the basis of: (1) what was achieved within the context of meeting specific federally-mandated planning requirements; (2) how those studies have been employed to advance the science and improve the projection and anticipation of impacts potentially associated with future OCS discoveries and development; and (3) what wider social benefits have accrued as the indirect consequence of carrying out these mandates. Review of ESP research products makes clear that MMS closely followed its mandate to evaluate the potential effects of oil and gas industry activities on adjacent communities. The collection is descriptively rich and invaluable for many reasons. Indeed, the products have proven to be of great utility to planning and decision-making entities throughout Alaska.

Those who applied the classic SIA approach to effects-analysis faced difficult challenges in envisioning and addressing the long-term, cumulative, and overshadowing effects of oil and gas development in Alaska. It was apparently overwhelming to see and fully engage the immensity and immediacy of social change underway in the 1970s. In the absence of such vision, the standard approach was, at the time, perceived as suitable to the required analysis. Such shortcomings, however, were not specific to the application of social science in Alaska, nor are they specific to social science as a whole. Indeed, progress by trial and error is the nature of all scientific endeavors, and it is only through past labor that significant findings are achieved. Thus, we move into this new century with knowledge of the need for an approach that is sensitive not only to the immediate and spatially-limited effects of OCS development, but also to the critically important history and broad range of social processes that have and will in the future condition life in the coastal zone of Alaska.

Chapter 11: Summary and Conclusions: Toward Future Social and Economic Research

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Imagine it is 1976. You are responsible for designing an evaluation component for a 30-year research program. The intent of this new program is to gather and analyze information to inform the assessment of potential social and economic impacts of offshore petroleum development and to support sound decision-making on the mitigation of these potential impacts. What would your evaluation design look like? [80]

Most likely you would have assumed that, over those 30 years, there would have been substantial offshore petroleum development. It therefore makes sense that a core element of your evaluation design would be to periodically compare actual with projected impacts and to examine the role of mitigation strategies in reducing or avoiding impacts.

Thirty years have passed, and we have recently experienced the first offshore oil production in federal waters. Our evaluation design would not have worked. Other than seismic testing activity and its effect on bowhead whale hunting[81], there are virtually no direct (e.g., occurring at the same time and place) impacts to use as a basis of comparison[82]. What can we say, then, about the effectiveness of the social component of the ESP?

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[80] The standard method in use at that time was the SIA model used to address changes in "boom towns" in the lower 48. As discussed in Chapter Four and Appendix 2, this method was not easily adaptable to Alaska due to the unique geographic and cultural setting of the predominantly Native, coastal Alaska communities.

[81] Offshore seismic testing and associated logistical support of these efforts using helicopters, tugs and barges, and the construction of temporary drill platforms in nearshore waters of the Central Beaufort have had short term effects on marine mammal behavior which required changes in hunter behavior. These changes have reportedly included increased travel distances, more aggressive whale behavior, and hunters traveling further offshore to harvest whales, putting the crews, harvest, and meat at greater risk. Offshore construction of causeways, while not supporting offshore oil and gas development, have been of concern to Iñupiat who see them as blocking the westward movement of whitefish species.

[82] The process of conducting baseline data collection and NEPA proceedings such as scoping is a direct effect on the communities. Factors that have directly affected the community response to the NEPA process are the frequency of scoping and other meetings, the volume of EIS and related information for each project, the lack of local

Imagine it is 2005, and you are responsible for designing an evaluation of a 30-year research program that tried to anticipate the impacts of developments that, in fact, did not occur. What would your evaluation design look like? One approach is to continue in the evaluation phase the “what if” strategy used in the research itself. "What if" there had been substantial offshore development, how effective would the research have been?

The design might start with three questions. First, did the scope of research reflect the unique aspects of the human system in Alaska? After all, it was the uniqueness of the human system in Alaska that provided the justification for the expanded social component of the ESP. To be effective, the program would need to take these unique conditions into account. Second, did the research produce an understanding of the processes by which OCS development and Alaska’s human system would interact to produce impacts? Put another way, was the basis for projecting impacts sound? Embedded in this second question is an understanding of the role of mitigation strategies. Third, did the research provide a baseline against which the impacts of development could be measured?

Reflecting the Uniqueness of the Alaska Human System

A brief glimpse at Figure 5.1, *Geographic Scope of ESP Community Sociocultural Studies*, provides a quick answer to the first question: yes. Behind the 145 communities shown as dots in Figure 5.1 are 62 sociocultural studies spanning all twelve Native claims settlement regions. These studies documented how people live, how they relate to each other, and how they interact with the natural environment. The studies cumulatively reflect the diversity of Alaska Native peoples and the diversity of communities within culturally defined regions. Even the socioeconomic studies that focused on projecting population and employment reflect Alaska’s uniqueness. Their models take into account community and regional differences. It is difficult to imagine a research program better designed to capture the uniqueness of the Alaska human system.

In addition to a broad geographic scope of the social component of the ESP, the diversity of study approaches also added to the program's ability to capture the uniqueness of coastal Alaska communities. As described in the previous chapters in this book, the ESP in Alaska included socioeconomic and

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institutional capacity to address these demands, concerns and worry associated with a potential offshore oil spill, and the Iñupiat perception that their participation and opinions have no weight in terms of changing, let alone stopping or pausing, the pace of oil and gas development.

sociocultural baselines descriptions, case studies, social indicators, institutional monitoring, subsistence studies, harvest disruptions, bowhead whaling studies, and traditional knowledge studies.

Understanding the Processes by which OCS Development and Alaska's Human System Would Interact.

The answer to the second evaluation question is not so easy. No one study or group of studies specifically addressed this issue (with the exception of this current synthesis book project). The answer is largely hidden in the lengthy sociocultural descriptions of how Alaska communities operate. As described in Chapters One and Five, early in the ESP program, MMS contracted researchers to conduct the descriptive baseline ethnographies and also to project hypothetical impacts. This approach did not last long. Early in the evolution of the sociocultural studies, MMS dissociated the direct linkage between a baseline description and an impact assessment within the contracted studies. Researchers became responsible for the former, and MMS analysts became responsible for the latter in the agency EIS analyses. Many of the socioeconomic studies, in contrast, applied models to directly link community conditions today with projections of conditions both with and without OCS development. Clearly embedded in the models are assumptions about key relationships such as local labor force participation and migration. Without the researchers being asked to make a direct link between sociocultural systems and OCS impacts, it is much more difficult to identify key processes underlying projected impacts.

We can see, however, that MMS took steps to explicitly advance understanding of processes underlying sociocultural impacts. Perhaps the biggest step was to initiate a series of harvest disruption studies. As discussed in Chapters Four through Nine, the most consistent finding in the sociocultural studies was the importance of natural resource harvesting to the social organization and welfare of communities. This finding temporarily begged the question, what would happen if OCS development disrupted established patterns of natural resource harvesting? The harvest disruption studies subsequently focused directly on this question, framing the analysis in terms of variations in the duration of the disruption and significance of subsistence resources involved. The studies had two important limitations, however. First, the analyses were hypothetical exercises. They were based on logic and an understanding of the system, not on empirical analysis of actual disruption events. Second, the harvest disruption analyses tended to be qualitative as the researchers did not collect voluminous primary data through structured interviews. Researchers could, for example, identify common patterns of natural resource harvesting, but they could not reliably estimate the proportion of households following each pattern.

While EVOS was not an OCS-related event, it provided a real-world case of harvest disruption. MMS recognized this fact and collaborated with the Alaska Department of Fish and Game in a multi-year study of the effects of the spill on natural resource harvesting in the regions affected by the spill. EVOS is, one would hope at least, an extreme case of harvest disruption. It tells us much about the devastating effects of a marine oil spill to marine-based societies. The EVOS experience does not, however, do much to improve our understanding of the effects of routine OCS activities (e.g., supply boats, helicopters) on natural resource harvesting, nor even the effects of the small spills that are much more likely than one on the scale of EVOS. (MMS has also studied the effects of smaller spills unrelated to OCS activities, including *Glacier Bay* [Northern Economics, Stephen R. Braund & Associates, Jon Isaacs & Associates and ResourcEcon 1990, TR146] and the recent *Selendang Ayu* [Impact Assessment, Inc., forthcoming].)

Together, the sociocultural core studies, the harvest disruption studies, and the EVOS post-spill research studies provide an excellent road map of the types of activities and relationships that potentially link OCS development and sociocultural change. By this we mean that we know qualitatively[83] what species people harvest, key harvest areas and times, how people organize themselves to conduct the harvest and to process and distribute it. We know qualitatively how people operate in a mixed economy that combines cash work and domestic production. Our biggest limitation is that we don't know much about the shapes of the relationships. That is, we don't know if twice the disruption results in twice the impact. Perhaps the one exception to this statement is our acquired understanding of the cumulative effects of onshore development activities on the community of Nuiqsut (see Chapter Seven).

The focus of sociocultural and harvest disruption studies was on the community level. Another set of processes linking petroleum development and the Alaska human system operate at the statewide level. These processes involve the interactions between petroleum economic activities and the Alaska economy. The major player in these interactions is the state government. The state, and at the regional level the North Slope Borough, are important agents of change. They affect the flow of petroleum dollars into the state economy, both in amount (e.g., through tax rates) and economic impact (e.g., in how state funds are spent). The MAP model discussed in Chapter Three is more than a projection tool; it is also a process model. Relationships embedded in the model represent processes in the state economy. The evolution of the MAP model is synonymous with the evolution of our understanding of these economic processes. The

[83] The post-spill MMS/ADF&G studies also provide quantitative measurements of post-spill harvest amounts that are compared to pre-spill amounts.

MAP model has enabled researchers to conduct sophisticated comparisons of the effects of alternative government policies. MMS contributed a great deal to the development of the MAP model through the ESP.

Measurement of Impacts

We think the social component of the ESP reflects the uniqueness of the Alaska human system. We are less sure that ESP research has clearly defined the key processes that link petroleum development with the human system. ESP researchers have gone the furthest in formally describing (i.e., in models) what we know about processes linking OCS development with the statewide economy. Despite a concerted effort to understand the sociocultural processes involved when there is a disruption of harvests of natural resources, ESP researchers have not quantitatively described relationships that link oil development with the human system. This quantitative limitation brings us to the third and final question, did the research provide a baseline against which the impacts of development could be measured?

If we want to compare a baseline against an impact, what we really need is a baseline projection. We can be sure that the world will not stand still; we must assume that we will be comparing a projection of what a community or region is likely to be at some point in the future without OCS development with a scenario projection of that same community or region at the same point in time with OCS development. The MAP regional and statewide projections discussed in Chapter Three and the RAM community projections discussed in Chapter Four meet this ideal. Had OCS development occurred, we could have compared a projection based on a similar development scenario with what actually happened. In fact, the model scenario used could have been adjusted to take into account what actually happened besides OCS development (e.g., a major dam project), so that the model comparison run would be as realistic as possible. In this way, we could evaluate how well the processes embedded in the model mirror reality.

It is intriguing to think about how much we could have learned about economic and demographic processes had OCS development occurred throughout the preceding 30 years. Fortunately, opportunities for learning about these processes were not limited to OCS development. Other large forces for change have been operating: expansion of onshore petroleum development on the North Slope, dramatic growth in state spending, a burgeoning service sector, and an expansion of the tourist industry are several examples. We have learned a great deal by comparing projections of economic and demographic change with what has actually happened. Models developed in the ESP have been important tools in this learning process. In the case of socioeconomic variables, we think the research did provide an effective baseline against which the impacts of development could be measured.

The ESP has included two research initiatives in their completed studies that, potentially at least, have especially improved our ability to measure the sociocultural impacts of development: subsistence harvest studies and social indicator studies. We need to preface our discussion of these two initiatives by stating that the larger body of sociocultural core studies is, we believe, a necessary step toward the goal of measuring impacts. At a minimum, these studies provide a critical context that gives meaning to a much smaller body of quantitative data with which we can begin to measure actual change. More than context, the sociocultural studies are road maps to identifying what is important. These studies link social organization and cultural values to natural resource harvesting activities for example. As pointed out in Chapter Five, the body of sociocultural studies provide a comprehensive set of variables with which to examine sociocultural change. We can use these variables and relationships to identify parts of the social system that are most vulnerable to disruption.

When we compare what the sociocultural core studies and the socioeconomic core studies produced we can readily see the difference in how far they go toward the goal of measuring impacts. The socioeconomic core studies yield projections of alternative futures, starting with quantitative descriptions of the present and working outward in time 20 years or more. The sociocultural studies usually lack quantitative descriptions of the present, never make quantitative projections with OCS development in the future, and certainly never quantitatively compare baseline projections with OCS scenario projections. It is this limitation of sociocultural core studies that brings us back to two initiatives: subsistence harvest studies and social indicator studies.

Following its own legislative mandate, the Alaska Department of Fish and Game initiated an ambitious program of subsistence harvest studies in 1978, yielding over 260 technical reports covering 180 Alaska communities (see Chapter One). This body of work complemented the sociocultural studies produced under the ESP, providing quantitative estimates of natural resource harvesting that could be compared over time, assuming repeat waves of data collection. Interestingly, however, community natural resource harvest data in the area of greatest OCS development potential, the North Slope, was largely absent in the Alaska Department of Fish and Game database in the mid-1980s[84]. The Alaska Department of Fish &

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[84] We think this is largely due to the sensitivity of harvest data to Iñupiat living on the North Slope and the associated reluctance of Iñupiat to participate in harvest studies. Often harvesters viewed harvest studies as gathering information that would be used to limit their ability to harvest in the future. In 1977, for example,

Game, however, did not systematically collect data regarding harvests by location, and was unable to repeat surveys on a periodic, planned systematic basis, leaving multi-year gaps and clustering some years together as funding and resources were limited to perform the household surveys.

The North Slope Subsistence Study sponsored by the ESP produced quantitative harvest estimates and hunting locations for two communities: Barrow and Wainwright (see Chapter Seven). These studies represent an important second step in the measurement of sociocultural impacts. The first step was the understanding of social systems provided by the sociocultural core studies. The second step yields a quantitative description of natural resource harvests at a point in time. Note, however, that the North Slope Subsistence Study does not take one to the point of projecting changes over time.

Following the EVOS, MMS and the Alaska Department of Fish and Game collaborated on a comparison of pre- and post-spill estimates of natural resource harvests. Fortunately, the Alaska Department of Fish and Game had included in its program of subsistence harvest studies 19 communities which were later affected by the spill. It was therefore possible to collect post-spill data and compare the estimates (see Chapter Eight). These pre- post-spill comparisons assume that, without EVOS, harvest levels in 1989 would have been the same as when they were measured in pre-spill studies. Again fortunately, the pre-spill studies took place in the early to mid 1980s, and were thus recent enough to be credible estimates of current harvests.

Also useful for the goal of measuring impacts (but obviously unfortunate for the communities affected by the spill) was the fact that the spill's effects were so devastating that there was no question that the observed declines in harvest were primarily due to the spill. Imagine, however, that the spill was closer to the size considered in the harvest disruption studies: a 50th the size of EVOS. Imagine also that the pre-spill subsistence harvest estimates were 10 years old. Under these circumstances, the ability to measure the impacts of the spill on natural resource harvests would have been questionable. The MMS-sponsored North Slope Subsistence Study estimates, for example, are now over 15 years old. Were it not for the

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researchers decided not to include harvest measures in a comprehensive survey on the effects of energy development on the North Slope because the state was concerned about the decline of Western Arctic Caribou Herd and the International Whaling Commission was concerned about the bowhead whale population (Kruse, Kleinfeld, and Travis 1982). Also, MMS sponsored North Slope subsistence studies (Stephen R. Braund & Associates and ISER 1993a and b) in the mid-1980s, and thus the state did not duplicate these studies.

North Slope Borough's and the Alaska Department of Fish and Game's ongoing programs of subsistence harvest studies, we already are in an era of questionable ability to measure the possible impacts of OCS development on North Slope community natural resource harvests.

Before leaving the topic of the value of subsistence harvest studies, we should repeat a point made in Chapter Six that the research findings from the studies of EVOS proved to be valuable as a basis for dialogue between interest groups as they attempted to develop mitigation strategies. Results were also used to litigate claims, and informed the development of regulations to mitigate conflicts between commercial fishing, sport fishing, and subsistence harvests.

The second multi-year initiative undertaken to improve the ability to measure sociocultural impacts was social indicators. The idea behind social indicators is simple to explain but proved extremely difficult to implement within the ESP[85]. The idea was to develop and implement quantitative measures of living conditions in Alaska Native coastal communities over time. Some of these indicators could be gleaned from existing government records, but most would have to come from primary data collection, that is, from interviews with people. MMS conceived of the social indicators initiative early in the ESP. The first social indicators technical report was published in 1983 (Louis Berger & Associates TR77). The second report, TR116, was prepared by a different research team, and the third series of reports (TR151-157) was prepared by a third group of researchers. We think the evolution of the social indicators initiative provides a fascinating glimpse into the diversity of thinking represented within the social science disciplines.

The point here is that MMS initiated social indicators early on with the goal of being able to measure empirically the sociocultural impacts of OCS development. It took many years to design and implement a first round that would become a social indicators system, in part due to the diversity of views on how to do it. In the meantime we have not seen widespread OCS developments, certainly not on a scale that would be expected to produce a change in the social indicators distinguishable from what one would expect as a result of other, ongoing, forces for change. Perhaps the best we can say is that the jury is still out on the social indicators approach to measurement of sociocultural impacts.

[85] See the Jorgensen essay in Chapter 10 for a detailed discussion of the MMS social indicators monitoring studies.

Suggestions for Future Social Research in the ESP

Thus we conclude, the MMS ESP studies reflected the unique aspects of the human system in Alaska. The ESP has also contributed to understanding the processes by which OCS development and Alaska's human system would interact to produce impacts and to provide a baseline against which impacts could be measured. Ongoing research initiatives continue to address these latter two topics while continuing to improve the ability to measure the sociocultural impacts of development. For example, an ongoing study, *Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Activities in the Beaufort Sea* (EDAW, Inc., forthcoming) is designed to address the potential impacts of offshore activities on bowhead whale activities in the Beaufort Sea as perceived by North Slope residents. This study, funded at the request of North Slope residents and organizations, will provide quantitative survey information that will articulate the linkages between bowhead whaling and OCS activities.

Another ongoing study will also enhance MMS's ability to assess effects of development on subsistence activies. Under NEPA, direct impacts are defined as caused by the action and occurring at the same time and place as the proposed action. Thus, a prerequisite for determining the direct effects of a development activity is knowledge of where subsistence activities occur. In 2001, MMS commissioned a subsistence harvest mapping study to develop a new GIS methodology that will describe contemporary subsistence patterns in Barrow, Nuiqsut, and Kaktovik for selected resources (Stephen R. Braund & Associates, North Slope Borough Department of Wildlife Management, ESRI-Northwest, Encompass Data & Mapping, Kruse, and Johnson, forthcoming). This study will provide relevant spatial information to assess impacts in the area of Alaska experiencing the most oil and gas development, both onshore and offshore. In addition, it will provide a methodology for continuing documentation of subsistence use areas.

MMS's mandate, and hence its ESP program, has been and is focused on offshore development and the potential effects caused by offshore activities. It included onshore activities, but only to the extent that they were produced from offshore development. However, by far the largest oil development has occurred onshore on the North Slope of Alaska. To understand the effects of offshore development it is necessary to understand the contributions to change made by other major activities. This is exactly the approach taken in the statewide economic and demographic analysis sponsored by MMS. Extending this appraoch to the other social research components of the ESP requires a comprehensive review of oil related impacts on the North Slope. A holistic approach would integrate onshore and offshore oil development on the North Slope. Iñupiat harvest in both the marine and terrestrial environment, onshore development has been expanding with associated effects, and it is impossible to measure the impacts of offshore activities without knowing the impacts of onshore activities as well. As described in Chapter Ten (Petterson),

> it [social impact assessment methdology] obviated analysis of the way in which coastal communities were affected in the long-term by: (a) ongoing onshore development, (b) the possibility of offshore development and associated speculative and actual political, socio-cultural, and economic processes, and (c) the combined or interactive effects of both onshore development and offshore development possibilities.

Onshore development has proceeded rapidly from being a future problem to a reality encircling Nuiqsut and rapidly approaching Barrow and Kaktovik as NPR-A is developed and interest grows in the coastal plain and nearshore waters of the Arctic National Wildlife Refuge. The concerns of Iñupiat subsistence harvesters expressed over 20 years ago and presented in Kruse and his team's early 1980s study (Kruse et al. 1983b, TR85A) are still valid, but many of the concerns regarding offshore development did not occur in the offshore environment. Onshore development had more effects than the Iñupiat anticipated when development began in Prudhoe Bay. We therefore conclude that perhaps the most important focus of future MMS social research should be on quantitative assessments of the cumulative effects of change in regions most likely to be directly affected by offshore development.

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Appendix A: Social and Economic Studies Technical and Special Reports

Minerals Management Service, Alaska OCS Region

Report No.	MMS No. [86]	Year	Title, Author
SR1		1979	Statewide Impacts of OCS Petroleum Facilities Development in Alaska. Institute of Social and Economic Research, University of Alaska.
SR2		1980	Northern Shelikof Strait Petroleum Facilities Siting Study. Dames & Moore. Contract No. AA550-CT6-61.
SR3		1980	The Marketing and Equivalent Amortized Costs of Bering-Norton Oil and Gas. Dames & Moore.
SR4		1980	Small Community Population Impact Model. Huskey, L. and J. Kerr, Institute of Social and Economic Research, University of Alaska.
SR5	MMS 85-0014	1985	Review of Cumulative Impact Assessment Literature and North Slope Borough Development Projects. Dames & Moore, Maynard & Partch, and Stephen R. Braund & Associates. Contract No. 14-12-0001-30058.
SR6	MMS 85-0080	1985	Proceedings of a Workshop: Review of Outer Continental Shelf Economic and Demographic Impact Modeling for Rural Alaska. Lawrence Johnson & Associates. Contract No. 14-12-0001-30195 (Ao7/PB 87-204699/AS).
SR7	MMS 89-0084	1988	Regional and Village Corporation Employment Profiles. Kevin Waring Associates with Gillian Smythe & Associates. Contract No. 14-32-0001-30385 (A04/PB 90-164419/AS).
SR8	MMS 90-0038	1990	Subsistence Resource Harvest Patterns: Nuiqsut. Galginaitis, M. and J.S. Petterson (P.I.) of Impact Assessment, Inc. Contract No. 14-35-0004-60146.
SR9	MMS 90-0039	1990	Subsistence Resource Harvest Patterns: Kaktovik. Galginaitis, M. and J.S. Petterson (P.I.) of Impact Assessment, Inc. Contract No. 14-35-0004-60147.
TR1		1978	Definition of Alaska Petroleum Development Regions. Peat, Marwick, Mitchell & Co., URSA, CCC/HOK and Dames & Moore. Contract No. AA550-CT6-61 (A05/PB 291915/AS).
TR2		1977	Literature Survey. Peat, Marwick, Mitchell & Co., URSA, CCC/HOK and Dames & Moore. Contract No. AA550-CT6-61 (A21/PB 269244/AS).
TR3, Part 1,2		1977	Beaufort Sea Basin Petroleum Development Scenarios for the Federal Outer Continental Shelf (Parts 1 and 2). Interim Report. Peat, Marwick, Mitchell & Co., URSA, CCC/HOK and Dames & Moore. Contract No. AA550-CT6-61.

[86] In the mid-1980s, MMS replaced the Technical Report series with the MMS OCS study number sequence. Thus, all Technical Report numbers higher than 115 are most properly identified by the MMS OCS study number. In hopes of minimizing public confusion, this appendix provides both the sequential Technical Report number and the official MMS OCS study number for those studies completed after the transition (or TR115).

Report No.	MMS No. [86]	Year	Title, Author
TR4		1978	Prudhoe Bay Case Study. Crittenden, Cassetta, Cannon/Hellmuth, Obata and Kassabaum, Inc. (CCC/HOK, Inc.). Contract No. AA550-CT6-61.
TR5		1977	Baseline Studies of the Physical and Manmade Environment: The Beaufort Sea Region. Interim Report. Crittenden, Cassetta, Cannon/Hellmuth, Obata and Kassabaum, Inc. (CCC/HOK, Inc.).
TR6		1978	Beaufort Sea Petroleum Development Scenarios for the State - Federal and Federal Outer Continental Shelf. Dames & Moore. Contract No. AA550-CT6-61 (A22/PB 283236/AS).
TR6A		1978	Beaufort Sea Petroleum Development Scenarios for the State - Federal and Federal Outer Continental Shelf: Executive Summary. Dames & Moore. Contract No. AA550-CT6-61.
TR7		1979	A Case Study of Copper Center, Alaska. Reckord, H. Contract No. AA550-CT6-61 (A11/PB 296961/AS).
TR8		1978	Beaufort Sea Region - Manmade Environment. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A13/PB 281634/AS).
TR9		1978	Beaufort Sea Region Sociocultural Systems. Worl Associates. Contract No. AA550-CT6-61 (A13/PB 281634/AS).
TR10		1978	Beaufort Sea Region Natural Physical and Biotic Baseline. Dames & Moore. Contract No. AA550-CT6-61 (A03/PB 284567/AS).
TR11		1978	Beaufort Sea Region Socioeconomic Baseline. Peat, Marwick, Mitchell & Co. Contract No. AA550-CT6-61.
TR11A		1978	Beaufort Sea Region Socioeconomic Baseline: Executive Summary. Peat, Marwick, Mitchell & Co. Contract No. AA550-CT6-61.
TR12		1978	Anchorage Socioeconomic and Physical Baseline. Ender, R.L., J. Gehler, S. Gorski, and S. Harper. Contract No. AA550-CT6-61.
TR12A		1978	Anchorage Socioeconomic and Physical Baseline: Executive Summary. Ender, R.L., J. Gehler, S. Gorski, and S. Harper. Contract No. AA550-CT6-61.
TR13		1978	Beaufort Sea Petroleum Development Scenarios Impacts on Anchorage, Alaska. Ender, R.L., J. Gehler, S. Gorski, and S. Harper. Contract No. AA550-CT6-61.
TR14		1978	Alyeska-Fairbanks Case Study. Wordsmiths. Contract No. AA550-CT6-61 (A04/PB 284570/AS).
TR15		1978	Historical Indicators of Alaska Native Culture Change. Davis, N.Y., Cultural Dynamics. Contract No. AA550-CT6-61 (A08/PB 294180/AS).

Report No.	MMS No. [86]	Year	Title, Author
TR15A		1978	Historical Indicators of Alaska Native Culture Change: Executive Summary. Davis, N.Y., Cultural Dynamics. Contract No. AA550-CT6-61.
TR16		1978	Governance in the Beaufort Sea Region: Petroleum Development and the North Slope Borough. Morehouse, T.A. and L.E. Leask, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61 (A12/PB 294316/AS).
TR16A		1978	Governance in the Beaufort Sea Region: Petroleum Development and the North Slope Borough Executive Summary. Morehouse, T.A. and L.E. Leask, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR17		1978	Monitoring Petroleum Activities in the Gulf of Alaska and Lower Cook Inlet Between April 1975 and June 1978. Dames & Moore. Contract No. AA550-CT6-61 (A05/PB 285408/AS).
TR18		1978	Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts. Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR19		1978	Beaufort Sea - Petroleum Development Scenarios Man Made Environment Impacts. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A10/PB 294314).
TR20		1978	Beaufort Sea Petroleum Development Scenarios: Transportation Impacts. Dennis Dooley and Associates. Contract No. AA550-CT6-61.
TR21		1978	Beaufort Sea Petroleum Development Scenarios: Natural Physical Environment Impacts. Dames & Moore. Contract No. AA550-CT6-61 (A06/PB 224571).
TR22		1978	Assessment of Change in the North Slope, Beaufort Sea Region Sociocultural Systems. Worl Associates. Contract No. AA550-CT6-61 (A06/PB291919).
TR23		1978	Beaufort Sea Petroleum Development Scenario: Summary of Socioeconomic Impacts. James Lindsay and Associates. Contract No. AA550-CT6-61.
TR24		1979	Design of a Population Distribution Model. Huskey, L. (Institute of Social and Economic Research, University of Alaska), W.I. Serow (University of Virginia) and T. Volin (Systems Consultant). Contract No. AA550-CT6-61 (A07/PB 299658/AS).
TR25		1979	Second Program Summary Report. Peat, Marwick, Mitchell & Co. Contract No. AA550-CT6-61 (A05/PB80-159825).
TR26		1979	Developing Predictive Indicators of Community and Population Change. Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61 (A22/PB 80-111628).
TR27		1979	OCS Visual Resource Management Methodology Study. Harmon, O'Donnell & Henninger Associates, Inc. and Merlyn J. Paulson, Inc. Contract No.

Report No.	MMS No. [86]	Year	Title, Author
			AA550-CT6-61.
TR28		1979	Socioeconomic Impact of Selected Foreign OCS Developments. Habitat North, Inc. Contract No. AA550-CT6-61 (A14/PB 297114/AS).
TR29		1979	Northern Gulf of Alaska Petroleum Development Scenarios. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BA, Job No. 8699-016-20) (A18/PB 294229/AS).
TR29A		1979	Northern Gulf of Alaska Petroleum Development Scenarios: Executive Summary. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BA, Job No. 8699-016-20).
TR30		1980	Northern and Western Gulf of Alaska Petroleum Development Scenarios: Commercial Fishing Industry Analysis. Terry, J.M., A. H. Gorham, D.M. Larson, B.C. Paust, R.G. Stoles, R.S. Johnston and F.J. Smith, F.L. Orth and P.W. Rogers, Alaska Sea Grant Program, Oregon State University and Frank Orth & Associates. Contract No. AA550-CT6-61.
TR31		1980	Northern Gulf of Alaska Petroleum Development Scenarios Transportation Systems Analysis. Eakland, P. and R. Joshi, Peter Eakland and Associates.
TR32		1979	Northern and Western Gulf of Alaska Local Socioeconomic Baseline. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A23/PB 296971/AS).
TR33		1979	Northern Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A19/PB 80-154487).
TR34		1979	Northern Gulf of Alaska Petroleum Development Scenarios: Economic and Demographic Impacts. Huskey, L. and W. Nebesky, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61 (A16/PB 297722/AS).
TR34A		1979	Northern Gulf of Alaska Petroleum Development Scenarios: Economic and Demographic Impacts Executive Summary. Huskey, L. and W. Nebesky, Institute of Social and Economic Research, University of Alaska.
TR35		1979	Western Gulf of Alaska Petroleum Development Scenarios. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BA, Job No. 8699-016-20) (A17/PB 294281/AS).
TR35A		1979	Western Gulf of Alaska Petroleum Development Scenarios Executive Summary. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BA, Job No. 8699-016-20).
TR36		1979	Northern Gulf of Alaska Petroleum Development Scenarios Sociocultural Impacts. Bennett, M.E., S.O. Heasley, S. Huey. Contract No. AA550-CT6-61 (A14/PB 300699/AS).
TR37		1980	Western Gulf of Alaska Petroleum Development Scenarios Transportation Systems Analysis. Eakland, P. and R. Joshi, Peter Eakland and Associates. Contract No. AA550-CT6-61.

Report No.	MMS No. [86]	Year	Title, Author
TR38		1979	Western Gulf of Alaska Petroleum Development Scenarios: Economic and Demographic Impacts. Huskey, L. and W. Nebesky, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR39		1980	Western Gulf of Alaska Petroleum Development Scenarios Kodiak Non-Native Sociocultural Impacts. Payne, J.T. Contract No. AA550-CT6-61 (A10/PB80-166648).
TR40		1979	Western Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A13/PB80-108855).
TR41		1979	Western Gulf of Alaska Petroleum Development Scenarios Kodiak Native Sociocultural Impacts. Davis, N.Y., Cultural Dynamics, Ltd. Contract No. AA550-CT6-61 (A13/PB 80-158124).
TR42		1980	Lower Cook Inlet Petroleum Development Scenarios: Economic and Demographic Analysis. Lane, T. and B. Withers, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR43		1979	Lower Cook Inlet and Shelikof Strait OCS Lease Sale No. 60 Petroleum Development Scenarios. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BB, Job No. 8699-017-20) (A12/PB 300701/AS).
TR43A		1979	Lower Cook Inlet and Shelikof Strait OCS Lease Sale No. 60 Petroleum Development Scenarios Executive Summary. Dames & Moore. Contract No. AA550-CT6-61 (Task 9BB, Job No. 8699-017-20).
TR44		1980	Lower Cook Inlet Petroleum Development Scenarios: Commercial Fishing Industry Analysis. Terry, J.M., R.G. Stoles, and D.M. Larson, Alaska Sea Grant Program, University of Alaska. Contract No. AA550-CT6-61 (A23/PB 80-212475).
TR45		1980	Lower Cook Inlet Petroleum Development Scenarios Transportation Systems Analysis. Eakland, P. and R. Joshi, Peter Eakland and Associates. Contract No. AA550-CT6-61.
TR46, Vol. 1,2		1980	Lower Cook Inlet Petroleum Development Scenarios Local Socioeconomic Systems Analysis. Alaska Consultants, Inc. Contract No. AA550-CT6-61 (A15/PB 80-210289).
TR47		1980	Lower Cook Inlet Petroleum Development Scenarios Local Socioeconomic Systems Analysis. Braund, S.R. and S.R. Behnke, Stephen R. Braund & Associates. Contract No. AA550-CT6-61 (A19/PB 80-166655).
TR48, Vol. 1		1980	Gulf of Alaska and Lower Cook Inlet Petroleum Development Scenarios Anchorage Socioeconomic and Physical Baseline Volume I. Ender, R.L., J. Gehler and S. Gorski, Policy Analysts, Limited. Contract No. AA550-CT6-61 (A17/PB 80-166663).

Report No.	MMS No. [86]	Year	Title, Author
TR48, Vol. 2		1980	Gulf of Alaska and Lower Cook Inlet Petroleum Development Scenarios Anchorage Impact Analysis Volume II. Ender, R.L., J. Gehler and S. Gorski, Policy Analysts, Limited. Contract No. AA550-CT6-61 (A12/PB 80-166671).
TR49		1980	Norton Basin OCS Lease Sale No. 57 Petroleum Development Scenarios. Hanley, P.T., W.W. Wade, G.S. Harrison and D.F. Jones, Dames & Moore. Contract No. AA550-CT6-61 (Task 9CG, Job No. 8699-019-20) (A21/PB 80-166689).
TR49A		1980	Norton Basin OCS Lease Sale No. 57 Petroleum Development Scenarios Executive Summary. Hanley, P.T., W.W. Wade, G.S. Harrison and D.F. Jones, Dames & Moore. Contract No. AA550-CT6-61 (Task 9CG, Job No. 8699-019-20) (A21/PB 80-166689).
TR50		1980	Bering-Norton Petroleum Development Scenarios Economic and Demographic Analysis. Porter, E.D., Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR51		1980	Western Alaska and Bering-Norton Petroleum Development Scenarios: Commercial Fishing Industry Analysis. Terry, J.M., R.G. Stoles and D.M. Larson, Alaska Sea Grant Program, University of Alaska. Contract No. AA550-CT6-61.
TR52		1980	Bering-Norton Petroleum Development Scenarios Transportation Systems Analysis. Peat, Marwick, Mitchell & Co. and James Lindsay & Associates. Contract No. AA550-CT6-61.
TR53		1980	Bering-Norton Petroleum Development Scenarios Local Socioeconomic Systems Analysis. Policy Analysts, Limited (Ender, R.L., S. Braund, S. Gorski and G. Harrison). AA550-CT6-61 (A99/PB 80-212624).
TR54, Vol. 1		1980	Bering-Norton Petroleum Development Scenarios and Sociocultural Impacts Analysis Volume I. Ellanna, L.J. Contract No. AA550-CT6-61 (A20/PB 80-219264 and A20/PB 179004).
TR54, Vol. 2		1980	Bering-Norton Petroleum Development Scenarios Sociocultural Systems Analysis Volume II. Ellanna, L.J. Contract No. AA550-CT6-61.
TR55		1980	Monitoring Oil Exploration Activities in the Lower Cook Inlet. Northern Resource Management. Contract No. AA851-CTO-14 (A11/PB 82-190158).
TR56		1980	St. George Basin Petroleum Technology Assessment. Hanley, P.T., W.W. Wade and M.F. Feldman of Dames & Moore in association with Santa Fe Engineering Services Co., Brian Watt Associates, Inc., G.S. Harrison and Walter S. Harris, Inc. Contract No. AA851-CTO-3 (Task 9DA, Job No. 8699-023-20) (A13/PB 81-105116).
TR57		1981	St. George Basin Petroleum Development Scenarios Economic and Demographic Analysis. Tuck, B.H. and Huskey, L., Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR58		1981	St. George Basin Transportation Systems Impact Analysis. Peat, Marwick, Mitchell & Co. and ERE Systems, Ltd. Contract No. AA851-CTO-27.

Report No.	MMS No. [86]	Year	Title, Author
TR59		1981	St. George Basin Petroleum Development Scenarios Local Socioeconomic Systems Analysis. Alaska Consultants, Inc. Contract No. A19/PB 190141.
TR60		1981	St. George Basin and North Aleutian Shelf Commercial Fishing Industry Analysis. Earl R. Combs, Inc. Principal Contributors: J. Tobolski, L. Guluka, L. Kwang and D. Trefethen. Contract No. AA851-CTO-34 (A22/PB 82-139817).
TR61		1981	St. George Basin Petroleum Development Scenarios Anchorage Impact Analysis. Ender, R.L. and S. Gorski, Policy Analysts, Limited. Contract No. AA851-CTO-38.
TR62		1981	Statewide and Regional Economic and Demographic Systems, Beaufort Sea (71) Impact Analysis. Nebesky, W. and L. Huskey, Institute of Social and Economic Research, University of Alaska. Contract No. AA550-CT6-61.
TR63		1980	North Aleutian Shelf Petroleum Technology Assessment OCS Lease Sale No. 75. Hanley, P.T., W.W. Wade and M.F. Feldman of Dames & Moore with Santa Fe Engineering Services Co., Brian Watt Associates, Inc., G.S. Harrison and Walter S. Harris, Inc. Contract No. AA851-CTO-3 (Job No. 8699-023-20) (A09/PB 82-139833).
TR64		1981	Beaufort Sea Sociocultural Systems Update Analysis. Worl, R., R. Worl and T. Lonner. Contract No. AA851-CTO-57 (A11/PB 82-190166).
TR65		1981	Transportation Baseline Update and Forecast of Conditions without the Planned Lease Sale, Beaufort Sea (71). Peter Eakland and Associates. Contract No. AA851-CTO-27.
TR66		1982	Western Alaska Transportation Systems Analysis. ERE Systems, Ltd. Contract No. AA851-CTO-27.
TR67		1983	North Aleutian Shelf Basin Sociocultural Systems Analysis. Payne, J.T. and S.R. Braund, James T. Payne and Associates. Contract No. AA851-CTO-33 (A18/PB 85-172914).
TR68		1982	North Aleutian Shelf Statewide and Regional Demographic and Economic Systems Impact Analysis. Knapp, G., P.J. Hill, and E. Porter, Institute of Social and Economic Research, University of Alaska. Contract No. AA851-CTI-30 (A14/PB 83-174813).
TR69		1982	Western Alaska Local Socioeconomic Systems Analysis. Alaska Consultants, Inc. Contract No. AA851-CTO-42 (A16/PB 83-176354).
TR70		1982	Navarin Basin Sociocultural Systems Analysis. Fienup-Riordan, A. Contract No. AA851-CTO-24 (A25/PB 83-176347).
TR71		1982	Alaska Peninsula Socioeconomic and Sociocultural Systems Analysis. Earl R. Combs, Inc. and S.J. Langdon. Contract No. AA851-CTO-34 (A18/PB 83-189019).
TR72		1981	Norton Sound/Yukon Delta Sociocultural Systems Baseline Analysis. Wolfe, R.J. Contract No. AA851-CT1-29 (A13/PB 83-176396).

Report No.	MMS No. [86]	Year	Title, Author
TR73		1982	Economic and Demographic Structural Change in Alaska. Huskey, L., W. Nebesky, B. Tuck, & G. Knapp, Institute of Social and Economic Research, University of Alaska. Contract No. AA851-CT1-30 (A13/PB 83-174789).
TR74		1983	Chukchi Sea Sociocultural Systems Baseline Analysis. Cultural Dynamics, Ltd. Prepared by N.Y. Davis (P.I.) and S. McNabb. Contract No. AA851-CTO-58 (A17/PB 85-172922).
TR75, Vol. 1		1982	North Aleutian Shelf Non-OCS Forecast Analysis Volume I. Impact Assessment, Inc. Prepared by J.S. Petterson, L.A. Palinkas and B.M. Harris. Contract No. AA851-CT1-31 (A12/PB 174797 and A13/PB174805).
TR75, Vol. 2		1982	North Aleutian Shelf Non-OCS Forecast Analysis Volume II. Impact Assessment, Inc. Prepared by J.S. Petterson, L.A. Palinkas and B.M. Harris. Contract No. AA851-CT1-31 (A12/PB 174797 and A13/PB174805).
TR76		1982	Forecasting Enclave Development Alternatives and Their Related Impacts on Alaskan Coastal Communities as a Result of OCS Development. Louis Berger & Associates, Inc. Contract No. AA851-CTO-61 (A13/PB 83-176370).
TR77, Vol. 1,2,3		1983	Social Indicators for OCS Impact Monitoring. Louis Berger & Associates, Inc. Contract No. AA851-CTI-50.
TR78		1983	Statewide and Census Division Demographic and Economic Systems, Navarin Basin (Sale 83) Impact Analysis. Knapp, G., E. Porter and B. Reeder, Institute of Social and Economic Research, University of Alaska. Contract No. AA851-CT1-30.
TR79		1982	Barrow Arch Planning Area (Chukchi Sea) Petroleum Technology Assessment OCS Lease Sale No. 85. Wilson, J.C., W.W. Wade, M.L. Feldman, and D.R. Younger of Dames & Moore. In association with SF/Braun, T.R. Marshall Jr., Brian Watt Associates, Inc., G.S. Harrison and Ogden Beeman and Associates. Contract No. AA851-CT1-37 (Job No. 08699-026-20) (A14/PB 85-172930).
TR80		1982	An Economic Analysis of Concurrent Development of Outer Continental Shelf Oil and Gas Leases in the Bering Sea. Feldman, M.L. and W.W. Wade of Dames & Moore and G.S. Harrison. Contract No. AA851-CT1-36 (A05/PB 83-176362).
TR81		1983	Hope Basin Planning Area Petroleum Technology Assessment. Wilson, J.C., D.R. Younger, M.L. Feldman, and W.W. Wade of Dames & Moore. In association with SF/Braun, T.R. Marshall, Jr., and Ogden Beeman and Associates. Contract No. AA851-CT1-37 (Job No. 08699-026-20) (A07/PB 85-154060).
TR82		1983	Navarin Basin Commercial Fishing Industry Impact Analysis. Centaur Associates, Inc. (Ingram, B.S., B.B. Weyhrauch) , Dames & Moore (M.I. Hutton, S.T. Grabacki) and LZH Associates (L.Z. Hale). Contract No. AA851-CT2-46/14-12-0001-29072 (A16/PB85-154904).

Report No.	MMS No. [86]	Year	Title, Author
TR83		1982	Navarin Basin Petroleum Technology Assessment OCS Lease Sale No. 83. Wilson, J.C. W.W. Wade, M.L. Feldman and L.E. Fausak of Dames & Moore. In association with Santa Fe Engineering Services Co., T.R. Marshall, Jr., Brian Watt Associates, Inc. and G.S. Harrison. Contract No. AA851-CTO-3 (Job No. 08699-023-20) (A09/PB 85-154912).
TR84		1983	Navarin Basin (Sale 83) Transportation Systems Impact Analysis. Louis Berger & Associates, Inc. Contract No. AA851-CT2-34.
TR85		1983	A Description of the Socioeconomics of the North Slope Borough. Kruse, J.A., M. Baring-Gould, W. Schneider, J. Gross, G. Knapp, and G. Sherrod, Institute of Social and Economic Research, University of Alaska. Contract No. AA851-CTZ-37 (A19/PB 87-189338).
TR85A		1983	A Description of the Socioeconomics of the North Slope Borough, Appendix: Transcripts of Selected Iñupiat Interviews. Kruse, J.A., M. Baring-Gould, W. Schneider, J. Gross, G. Knapp, and G. Sherrod, Institute of Social and Economic Research, University of Alaska. Contract No. A12/PB 85-162055.
TR86		1983	Marketability of Bering Sea Natural Gas on the U.S. West Coast (1995 to 2000). Feldman, M.L., D.R. Younger and W.W. Wade of Dames & Moore and Fluor Engineers and Constructors, Inc. Contract No. 14-12-0001-029044 (A08/PB 85-155380).
TR87		1984	St. George Basin and North Aleutian Basin Economic and Demographic Systems Impacts Analysis. Knapp, G., J. Zimicki, T. Hull, W. Nebesky, and K.M. MarkAnthony, Institute of Social and Economic Research, University of Alaska. Contract No. A24/PB85-173383 (29058 and 29078).
TR88		1983	Diapir Field Statewide and Regional Economic and Demographic Systems Impact Analysis. Knapp, G., B. Reeder and Scott Goldsmith, Institute of Social and Economic Research, University of Alaska. Contract No. AA851-CT1-30.
TR89		1984	Effects of Renewable Resource Harvest Disruptions on Socioeconomic and Sociocultural Systems: St. Lawrence Island. Little, R.L. and L.A. Robbins, John Muir Institute. Contract No. AA851-CT1-59.
TR90		1984	Effects of Renewable Resource Harvest Disruptions on Socioeconomic and Sociocultural Systems Impact Analysis Unalakleet, Norton Sound. Jorgensen, J.G. (and J.A. Maxwell and V. Katchatag, Part I), John Muir Institute, Inc. Contract No. AA851-CT1-59 (14-12-0001-29024).
TR91		1985	Effects of Renewable Resource Harvest Disruptions on Socioeconomic and Sociocultural Systems: Wainwright, Alaska. Luton, H. H., John Muir Institute, Inc. Contract No. AA851-CT1-59.
TR92		1983	Unalaska: Ethnographic Study and Impact Analysis. Impact Assessment, Inc. Prepared by J.S. Petterson, L.A. Palinkas, B.M. Harris, M.A. Downs and B. Holmes. Contract No. AA852-CT2-35 (14-12-0001-29009) (A14/PB 85-154896).

Report No.	MMS No. [86]	Year	Title, Author
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TR127	MMS 86-0124	1987	Institutional Change in Nome: 1980-1986. Impact Assessment, Inc. Prepared by J.S. Petterson, L.A. Palinkas, M.A. Downs and M. MacFadyen. Contract No. A09/PB 87-204608.
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Report No.	MMS No. [86]	Year	Title, Author
TR160, Vol. 5	MMS 95-0014	1995	An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska, V. Alaska Peninsula and Arctic. J.A. Fall and C.J. Utermohle (Editors). Contributors: J. Barnhart, L. Brown, J. Evak, J.A. Fall, S. Georgette, L. Hutchinson-Scarbrough, G. Jennings, J. Magdanz, R. Mason, R. Miraglia, C. Mishler, S. Pedersen, J. Seitz, S. Skaggs, R.T. Stanek, L. Tomrdle, C.J. Utermohle and V. Vanek, Alaska Department of Fish and Game, Division of Subsistence. Contract No. 14-35-0001-30622.
TR160, Vol. 6	MMS 95-0015	1995	An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development, VI. Discussion and Conclusions. J.A. Fall and C.J. Utermohle (Editors). Contributors: J. Barnhart, L. Brown, J. Evak, J.A. Fall, S. Georgette, L. Hutchinson-Scarbrough, G. Jennings, J. Magdanz, R. Mason, R. Miraglia, C. Mishler, S. Pedersen, J. Seitz, S. Skaggs, R.T. Stanek, L. Tomrdle, C.J. Utermohle and V. Vanek, Alaska Department of Fish and Game, Division of Subsistence. Contract No. 14-35-0001-30622.
	MMS 96-0053	1996	Social Indicators Monitoring Study Peer Review Workshop. June 18 and 19, 1996. MBC Applied Environmental Sciences (PB97-123400). Contract No. 14-35-0001-30570.
TR161	MMS 01-0058	2001	*Exxon Valdez* Oil Spill, Cleanup and Litigation: A Collection of Social-Impacts Information and Analysis, Final Report. Impact Assessment, Inc. Prepared by Russell, J.C., M.A. Downs, B.R. Strick, M.S. Galginaitis.
TR162, Vol. 1,2	MMS 99-0041	1999	Economic and Social Effects of the Oil Industry in Alaska 1975 to 1995. McDowell Group, Inc. with M. Barker. Contract No. 14-35-01-97-CT-30844.
TR163	MMS 01-0032	2001	Long-Term Consequences of the *Exxon Valdez* Oil Spill for Coastal Communities of Southcentral Alaska. Fall, J. A., R, Miraglia, W. Simeone, C.J. Utermohle and R.J. Wolfe, Alaska Department of Fish and Game, Division of Subsistence. Contract No. 14-35-0001-30788.
	MMS 00-0061	2001	An Economic Assessment of the Sport Fisheries for Halibut, and Chinook and Coho Salmon in Lower and Central Cook Inlet. Hermann, M., S.T. Lee, C. Hamel, K.R. Criddle, H.T. Geier, J.A. Greenberg, C.E. Lewis.
TR164	MMS 02-0066	2004	Arctic Economic Impact Model for Petroleum Activities in Alaska (Arctic IMPAK) [on CD: economic model in MS Excel; final report TR-164; documentation for Arctic IMPAK; journal article. On same CD as TR-165 and associate products]. Jack Faucett Associates. Contract No. 01-98-CT-30907, 01-02 PO 85307).
TR165	MMS 02-0060	2004	Sub-Arctic Economic Impact Model for Petroleum Activities in Alaska (Sub-Arctic IMPAK) [on CD: economic model in MS Excel; final report TR-165; documentation for Sub-Arctic IMPAK]. Jack Faucett Associates. Contract No. 01-00-PO-17115, 01-02 PO 85307).
TR167	MMS 04-0038	2004	A Study of the Drift Gillnet Fishery and Oil/Gas Industry Interactions and Mitigation Possibilities in Cook Inlet [on CD: maps in ArcView shape files; final report TR-167]. Impact Assessment, Inc. Contract No. 1435-01-03-CT-71847.

Report No.	MMS No. [86]	Year	Title, Author
TR167A	MMS 04-0038	2004	A Study of the Drift Gillnet Fishery and Oil/Gas Industry Interactions and Mitigation Possibilities in Cook Inlet Executive Summary [on CD: maps in ArcView shape files; final report TR-167]. Impact Assessment, Inc. Contract No. 1435-01-03-CT-71847.

Appendix B: Institutional Context

Dee M. Williams, Ph.D.

Agency Jurisdiction: The public may not fully realize that the MMS has no jurisdiction over oil and gas development in the interior lands of Alaska or in state waters of the Alaska coastline. Nor does the MMS have primary jurisdiction over ocean vessel traffic or wildlife management, except to ensure that proposed actions do not impact threatened or endangered species. Those responsibilities belong to other government agencies that operate under different legislative authority, different mission statements, and different research budgets. Following provisions of the OCSLA, the MMS ESP has lead responsibility to research anticipated effects related to resource development on the Federal waters of the OCS and near-shore areas.

This focused responsibility puts the agency in the awkward position of drawing sharp distinctions between *onshore* and *offshore* environmental impacts that might derive from oil and gas development. Yet such distinctions are not generally recognized by the public. Many Alaska residents tend to regard oil development impacts in association with major historical events and their ongoing ramifications, such as the achievement of statehood, the passage of ANCSA and ANILCA legislation[87] and subsequent Native regional and village incorporation, the construction of the Trans-Alaska oil pipeline, the development of Prudhoe Bay and surrounding oil fields, the creation of the Permanent Fund Account, the availability of enormous royalty revenue to the State legislature, the formation of the North Slope Borough (with rights to levy property taxes on oilfield infrastructure), and the turmoil of the *Exxon Valdez* Oil Spill (EVOS) and litigation process. Thus, MMS institutional nuances about "potential effects" from "OCS" oil development scenarios do not resonate very well with the perceptions of ubiquitous impacts from oil development routinely expressed in public discourse.

In essence, the bulk of ESP social research has been attempting to predict and measure the small increments of *additional* and *direct* impact to society that *might* result from a *hypothetical* offshore development scenario in analytic isolation from the widespread impacts that continue to reverberate throughout the state from continual onshore oil-related activities. To say the least, that challenging task

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[87] See Chapter Two regarding the Alaska Native Claims Settlement Act and the Alaska National Interest Lands Conservation Act.

does not favor prospects for definitive scientific results, clear communication, or smooth interaction with the public. In combination with the familiar limitations of social research methods and inference, the meaningful institutional nuances and boundary lines of jurisdiction identified above also tend to influence prospects for comprehensive scientific estimation of long-term and cumulative impacts in specific communities.

Scale of Effort: Another noteworthy observation is the manifest labor intensity of social research initiated by the agency in relation to the actual volume of oil and gas resources that have been extracted on the OCS in Alaska. Through 2004, the agency has directed $24.5 million into social research efforts while regulating the extraction of only about 12 million barrels of oil. Despite all the anticipation of industrial development that motivated federal lease sales and geological exploration over the years, the first and only existing oil production platform to extract hydrocarbon resources from the OCS went into operation in 2001 at the Northstar facility, located offshore and northwest of Prudhoe Bay along the interface between state and federal waters. This surprising situation means that the Alaska region ESP has achieved a dramatically high ratio of social research investment dollar per unit of oil production of approximately 2:1 ($204 dollars per every 100 barrels produced).

Of course, there are many reasons why such a ratio does not constitute an appropriate evaluation measure of any regional research program, especially given all the inherent speculative aspects of hydrocarbon extraction. The calculation does serve at least to underscore the magnitude of social research effort the agency has expended in Alaska in proportion to realized offshore development and energy production. In retrospect, it seems reasonable to acknowledge that the long-term anticipation, by virtually all stakeholders, of impending OCS development activities has thus far been markedly overstated, and the majority of research efforts thus far have been focused on *potential* effects from development scenarios that never actually materialized.[88] Indeed, given the long-term discrepancy between anticipated and actual offshore development activity, social scientists will ultimately want to consider also whether specific unintended consequences (for community relations, agency policies, and the disciplines of social science)

[88] For that reason, the phrase "potential effects" has served as a rather ubiquitous and significant qualifier of analysis throughout all of the ESP research literature. At Northstar, where development has occurred, the ESP has initiated an intensive monitoring research program since 1999 entitled Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA) that includes an ethnographic component—see Chapter Seven for further discussion.

may perhaps derive from substantial research money going through a single research program in pursuit of a single research paradigm (i.e. the conventional "social impact assessment" model ─ see related discussion in the essays by Petterson and Worl in Chapter Ten).

Contract Management: With few exceptions, virtually all studies conducted under ESP funding are implemented by external contractors or through cooperative agreements that involve personnel at other institutions. The studies are initially planned, designed, and administered by a team of disciplinary scientists and specialists within the ESP, one of whom will serve as the Contracting Officer's Technical Representative (COTR) for each study contract. The ESP scientists identify significant research questions and specify research objectives and tasks through a technical Statement of Work. The MMS thus provides initial design and management of the regional studies program, but generally procures the implementation of new studies and all resulting technical reports from private sector contractors, other government agencies, or universities.

Social research funding for new studies has varied over the years from a high of about $2.5 million in 1979 to a low of $45 thousand in 1993 and back up to $350 thousand in 2004. The Alaska region once received a large share of funding to provide needed baseline information, but program emphasis has shifted more recently to support studies in the Gulf of Mexico where oil industry interest is currently much stronger. The temporal adjustment of budgets had implications for consolidation of Alaska region staff and administrative functions, with resulting changes in ESP organization and study priorities. In 1993, for example, the social and economic studies component was reduced in personnel and more fully integrated with a newly reconstituted ESP that placed greater emphasis on multi-disciplinary collaboration and on formulation of more specific research questions.

Stakeholders sometimes wonder aloud about the ultimate role of contracted studies in agency lease sale decisions. Some critics even assert that unless the Department of Interior actually terminates a lease sale on the Alaska OCS then studies merely provide "cover" to meet the letter of the law without ever influencing a presumed inevitable outcome. What such individuals fail to realize is that identification of potential social impacts leads the agency to explore deferral options for critical resource areas and specific mitigation measures, rather than outright termination of a lease sale. The mandate to balance national energy development needs with environmental considerations compels the agency to control adverse impacts primarily through careful design, leasing stipulations, and safe regulation of a prospective development project (see 43 USC 1346.a.3.d). The appropriate measure of success for the ESP lies not in preventing a lease sale, but in the timely delivery of useful and quality research. Indeed, the best measure of social research influence on agency decisions could lie in the specificity of deferral areas and the character of lease sale stipulations and mitigation measures that emerge over time.

For example, the MMS has worked with the North Slope Borough, the Alaska Eskimo Whaling Commission, and other local organizations to reduce or eliminate adverse effects to bowhead whales and subsistence whalers from prospective oil activities through six distinct leasing stipulations in the Beaufort Sea planning area. In the Cook Inlet planning area, MMS has responded to community stakeholders to develop leasing deferral areas and a package of standard stipulations specifically intended to protect fisheries and fishing activities, to protect biological resources and habitats, to increase the sensitivity of oil industry personnel to community values and lifestyles, and to enhance safe transportation of hydrocarbons.

Study Planning and Procurement: Another notable point of discussion relates to the inclusive and deliberate nature of the ESP study procurement process. The agency assesses its information needs and develops new study proposals on an annual basis. It has a well established process that follows the guidance received from various national advisory committees of the General Accounting Office, the Office of Management and Budget, and the National Academies of Science. New study proposals appear in a public Annual Studies Plan a year in advance of commission, and no aspect of the study design or procurement process is undertaken lightly or without scrutiny from multiple parties and perspectives. Ultimately, studies develop through parallel processes of stakeholder input and scientific peer review.

Some of the key parties typically involved in the studies planning process include: disciplinary specialists among the ESP personnel and other MMS Environmental Impact Statement (EIS) analysts, who continually propose and refine new research topics, objectives, and methods; the OCS Scientific Committee, which advises on the quality and appropriateness of the ESP to the MMS mission; more than 200 external organizations from which MMS requests input about new study proposals; independent scientists and citizens who attend MMS-sponsored Information Transfer Meetings and special workshops to enhance peer review of study results and the direction of ESP research; and any interested member of the public who submits a study proposal or provides feedback about the studies plan. The MMS also solicits wider public input about research needs on a regular basis as it follows NEPA guidelines for collecting comments through scoping and hearings in the preparation of every EIS. Study products and technical reports undergo scientific peer review from credentialed professionals both internal and external to the agency. When appropriate, project-specific Scientific Review Boards are established to review study goals, methods, and products. Finally, periodic programmatic recommendations from external review boards, such as the National Research Council, have greatly assisted MMS in its planning and review process.

Since the total cost for nominated studies usually exceeds the annual budget for each regional program, MMS must prioritize agency needs. Studies are ranked according to the following considerations: importance of the information to decision-makers; timeliness of the research schedule; applicability of prospective results; and the status of current information on the subject. Many worthwhile research questions do not receive funding, or get postponed for reconsideration in later years.[89] Not every valid social impact issue achieves sufficient agency priority to mature into a separate research project. Conversely, the substantial role played by public input also means that some sensitive study topics approved for funding by the agency may not be completed without sufficient endorsement by influential stakeholders. Thus, the ESP is subject to criticism in public for not completing social research on topics that local residents in private will not support. Such real-world interactions make it difficult for outsiders to render accurate or informed judgments about the studies planning process from a detached perspective.

Programmatic Highlights: A final basic observation relates to the fluid and evolutionary nature of the ESP. The research program has changed dramatically over the years, and the changes are not necessarily always driven by single causes that can be identified in a straightforward manner. Instead, programmatic changes tend to be shaped by a combination of influences that derive from shifting agency priorities, external stakeholder pressures, creative individual initiatives from within and outside the agency, and ongoing institutional assessments about what works well and what does not. These factors do not interact in a formulaic manner, and so attempts to explain programmatic changes retroactively by analyzing study topics can only be partial at best. Nevertheless, a few significant turning points along the way deserve some brief commentary.

The first OCS lease sale in Alaska concerned the Gulf of Alaska, Lease Sale 39, in 1976. With regard to social analysis, that historic EIS was independently evaluated by a social scientist who provided an affidavit that asserted the following deficiencies in much of the social data: it was outdated, taken out of context, irrelevant to the Gulf of Alaska, exhibited internal inconsistencies, and was too incomplete to facilitate an accurate and specific projection of impacts. The affidavit also stated that the deficiencies "are

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[89] In particular, judicial interpretation through case law has determined that psychological impacts of proposed actions are not obliged under NEPA (see Metropolitan Edison v. People Against Nuclear Energy 1983).

in part inherent in the current state of social science relating to impact assessment." Alaska Governor Jay Hammond elevated the pertinent question whether accumulated scientific data was adequate for a responsible environmental assessment. In a letter to the Secretary of Interior dated December 4, 1975, he warned that the costs of short-term inflexibility would include not only litigation, but also "a far higher, perhaps permanent level of distrust and opposition on the part of the states, localities and individuals in place of the overall cooperation which should mark our national energy program." It is thus noteworthy that such early negative encounters fostered public anxieties over offshore development that subsequent extensive research cannot completely dispel.[90]

Subsequent to the first lease sale, the ESP funded primarily baseline and monitoring studies based on information developed through literature syntheses. In a 1977 review of the baseline approach to studies, the U.S. General Accounting Office (GAO) concluded that the program was not providing timely and appropriate information for leasing decisions and that the marine environment was too variable for a statistically valid baseline to be determined in a reasonable length of time. The National Research Council was then contracted to study the existing program and to recommend changes. Subsequent to the National Research Council review, a program management document was issued in 1978 that restructured the ESP and required a clear relation between a study and OCS issues and decisions. That approach has been used ever since.

In 1988, GAO again conducted a national audit of the ESP in response to concerns raised by some states, public interest groups, and a federal agency about the usefulness and quality of the studies being produced. The investigation found, in general, that both MMS and non-MMS users of program studies were satisfied with the usefulness, timeliness, and quality of the program studies. The audit indicated that in fact there was "little or no effect" in the specific cases where contractors did deliver their research products behind schedule.

In 1991, the U.S. House of Representatives requested in its appropriations report that the MMS seek advice from the National Research Council about the adequacy of its scientific and technical information for upcoming lease sales in Alaska. The National Research Council report was issued in 1994 and

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[90] It is plausible that subsequent agency efforts to comply with a host of legal requirements by analyzing the potential effects of worst-case scenarios plays a major role in perpetuating public anxieties. On the other hand, it is also plausible that public anxieties persist simply because of ongoing development prospects.

determined that the Alaska ESP in general was "extensive, substantive, and high quality." With regard to socio-economic effects, the report identified some "major information gaps," citing a particular need for more attention to the gradual or long-term changes that can be expected to take place even in the absence of an oil spill. It also raised questions about practical steps that could be taken to avoid or lessen social effects from OCS development. Finally, the report expressed concern about recent reductions in the budget and staff of the ESP program. The MMS responded in multiple ways, including many new study contracts and cooperative agreements with other government agencies, addition of new personnel, the creation of a new OCS Advisory Committee, newly energized government-to-government consultation meetings with tribal groups, new environmental justice consultations and analysis, Information Transfer Meetings and other workshops conducted in local communities, new mitigation and conflict avoidance agreements negotiated with local stakeholders, and broad exploration of other collaborative efforts.

In 2003, a new National Research Council report attempted to review information about all oil and gas activities on the North Slope and to assess their cumulative impacts on the physical, biotic, and human environments of the region. The report did not explicitly review the social science reports of the MMS ESP, but it did assert that "offshore exploration and development and the announcement of offshore sales have resulted in perceived risks to Inupiaq culture that are widespread and intense and are accumulating effects." One of the major findings was the recommendation for additional comprehensive planning of research across many agencies. With regard to social research, the report suggested still more cooperation with local communities and more documentation of the perceived threats that residents feel. In point of fact, the ESP had been already heavily involved in research and collaborative efforts on these fronts, so the report basically affirmed the program's fundamental direction. Nevertheless, the agency has further responded in multiple ways, including: an expansion of its involvement with the North Slope Science Initiative and the Interagency Arctic Research Policy Committee, the field implementation of social survey instruments on the North Slope to document local perceptions of impacts from oil development on bowhead whale hunting activities, the convening of a workshop and funding of a new study on Arctic cisco variability in the Colville River that explicitly provides a role for local traditional knowledge, and the procurement of several other new studies that will address specific concerns raised within the report.

That quick review serves to illustrate how the ESP endeavors to adjust its research program to the concerns of the historical moment.

Appendix C: .Pdf Files of Social and Economic Studies Technical and Special Reports Minerals Management Service, Alaska OCS Region

(on accompanying DVD)