OCS Report
BOEM 2024-022

Evaluating Connections: BOEM's Environmental Studies and Assessments

Volume 2: Findings and Recommendations

April 2024

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

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DISCLAIMER

Study concept, oversight, and funding were provided by the U.S. Department of the Interior (DOI), Bureau of Ocean Energy Management (BOEM), Washington, DC, under Contract Number GS-10F-0061N, Task Order 140M0119F0039. This report has been technically reviewed by BOEM, and it has been approved for publication. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

CITATION

Kaufman D, Flight M, Foley C, Arthur C, Bunting K, Fox E, Englehart G, Smalley P, Huang J (Industrial Economics, Inc. [IEc], Cambridge, MA). 2024. Evaluating connections: BOEM's environmental studies and assessments. Volume 2: findings and recommendations. Cambridge (MA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 135 p. Report No.: BOEM 2024-022.

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LIST OF ABBREVIATIONS AND ACRONYMS

BOEM	Bureau of Ocean Energy Management
CAA	Clean Air Act
COR	Contracting Officer's Representative
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DOI	Department of the Interior
EIS	environmental impact statement
ESA	Endangered Species Act
ESP	Environmental Studies Program
ESPIS	Environmental Studies Program Information System
ESP-PAT	Environmental Studies Program-Performance Assessment Tool
GOM	Gulf of Mexico
IEc	Industrial Economics, Inc.
MMP	Marine Minerals Program
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NSL	National Studies List
NTL	Notices to Lessees and Operators
OCS	Outer Continental Shelf
OCSLA	OCS Lands Act
OEP	Office of Environmental Programs
OREP	Office of Renewable Energy Programs
PO	Project Officer
SDP	Studies Development Plan
SME	subject matter expert
SNA	social network analysis
STR	Science and Technical Review

EXECUTIVE SUMMARY

The mission of the Bureau of Ocean Energy Management (BOEM) is to manage the development of U.S. Outer Continental Shelf (OCS) energy, mineral, and geological resources in an environmentally and economically responsible way. The OCS Lands Act (OCSLA) of 1953, as amended, granted the Secretary of the Interior the authority to oversee the exploration and development of mineral resources on the OCS and the Energy Policy Act of 2005 expanded the Secretary's authority to include management of renewable energy resources.

In fulfilling its mission, BOEM must comply with a range of environmental requirements. BOEM develops environmental assessments, including National Environmental Policy Act (NEPA) analyses, consultation documents, and other analyses that use the best available information to comply with relevant statutes and policies.[1] Environmental studies sponsored by BOEM's Environmental Studies Program (ESP) provide scientific information to inform BOEM's environmental assessments.

BOEM describes a "feedback loop" as the process by which environmental studies inform environmental assessments and environmental assessments in turn inform environmental studies. The goal of the feedback loop is that BOEM science informs BOEM decisions through assessments (i.e., science-to-policy), and vice versa. BOEM is pursuing an evaluation of the linkages between the scientific research it is funding and the information needs within its assessments to determine how well this feedback loop is functioning and to identify potential improvements in the science-to-policy process. The project's overarching objective is to evaluate the effectiveness of BOEM's feedback loop process. This project evaluates BOEM's internal feedback loop process and makes recommendations for improvements. The project covers the time period between 1999 and 2019.

To evaluate BOEM's internal feedback loop process, this report addresses three overarching evaluation questions (each question had multiple sub-questions, listed below in the Findings):

1. How well do BOEM environmental studies inform BOEM's environmental assessments?
2. How well do BOEM's environmental assessments inform new BOEM studies?
3. How well are information needs and study findings communicated across BOEM?

Underlying all three of these questions is the evaluation question: **If changes to the feedback process are needed, what would they be and who would be responsible for implementing the changes?** This recommendation question was addressed based on the answers to Questions 1–3.

Table ES-1 provides a high-level overview of key findings from the evaluation. The remainder of the Executive Summary describes the data sources and methods that Industrial Economics, Inc. (IEc) used to answer the evaluation questions, followed by IEc's more detailed findings for each evaluation question (and sub-question) and IEc's recommendations to strengthen the feedback loop.

[1] For purposes of this project, the term "environmental assessment" encompasses the full suite of analyses that BOEM undertakes related to compliance with environmental statutes, regulations, and executive orders, and is not restricted to environmental assessments conducted pursuant to NEPA.

TABLE ES-1. HIGH-LEVEL OVERVIEW OF KEY FINDINGS

Strengths of BOEM Feedback Loop Performance	Recommendations for Next Steps
Q1. How well do BOEM environmental studies inform BOEM environmental assessments?	
✓ Most BOEM assessments reference BOEM studies, and the proportion of assessments referencing studies has increased over time (averaging 85% over the past decade). This indicates the relevance of the studies to BOEM's assessments and increased focus on assessment information needs over time. ✓ BOEM assessments frequently reference many and varied BOEM studies, demonstrating that the assessments rely on BOEM studies extensively and across diverse topic areas. ✓ BOEM staff broadly agree that they rely on BOEM studies to support their assessment work and provide examples of studies fulfilling critical information needs.	• Commit to communication of study results through formal channels, including presentations and consistent use of the Environmental Studies Program Information System (ESPIS). • Increase transparency regarding the process for prioritizing studies to ensure study ideas and profiles target key information needs.
Q2. How well do BOEM assessments inform studies?	
✓ Interviewees overwhelmingly report that BOEM invests in studies that target assessment information needs, describing that assessments are the primary source for information needs. ✓ BOEM staff derive study ideas based on their experience working on assessments and in anticipation of forthcoming assessment information needs. ✓ BOEM's investments in studies (in terms of funding levels) target the information needs most frequently identified in assessments.	• Develop a systematic process and accompanying data systems for tracking assessment information needs as they arise so this information can be referenced when developing strategic science questions and by staff in proposing study ideas.
Q3. How does the feedback loop function?	
✓ BOEM interviewees provide multiple examples of studies influencing key policy decisions, including mitigation measures. ✓ BOEM's ESPIS database provides a searchable central repository of studies, tagged with important characteristics (e.g., topics and geography). ✓ BOEM disseminates information through a variety of formal and informal channels, including presentations, brown bag lunches, and information transfer meetings. ✓ BOEM staff maintain strong intra-agency networks, both within and outside of their own regions and offices to communicate assessment information needs and studies ideas. ✓ BOEM is committed to understanding and strengthening the influence of the Bureau's science on policy, as evidenced by the Office of Environmental Program initiating this feedback loop evaluation project.	To enable BOEM to assess feedback loop functioning in the future: • Leverage the ESPIS database to incorporate additional information that will facilitate identifying the assessment information needs targeted by studies. • Create a central location for storing and accessing BOEM assessments. • Strengthen ability to track citations of environmental studies, both in peer-reviewed publications and in BOEM assessments. • Use consistent "topic" categories to define information needs and study topics to facilitate tracing.

DATA SOURCES AND METHODS

IEc relied upon the data sources summarized in Table ES-2 to answer the evaluation questions. Studies and assessments informed analyses based on counts and trends, such as the number of studies that addressed a particular topic over time, and the number of times that studies were cited in assessments. The interviews and survey responses provided context and examples to interpret and expand on these analyses. The input collected through the interviews and surveys reflects the perspectives, experiences, and insights of BOEM personnel who work on studies and/or assessments or manage staff who do. The survey results were also used to generate a social network analysis (SNA) of the connections through which study and assessment information is shared throughout BOEM. The ESP-Performance Assessment Tool (ESP-PAT) provided self-reported information on the use of study results for a subset of the studies.

TABLE ES-2. OVERVIEW OF DATA SOURCES USED IN THE EVALUATION

Data Source	Count	Description and Caveats
Studies	876	• This evaluation only looked at studies that are in ESPIS. These studies were funded, in whole or in part, by the ESP. Studies were included in the analysis if they were active between 1999–2019. • This analysis did not count the following activities in ESPIS as studies: conferences, management, non-research efforts, and unverified studies.
Assessments	256	• For purposes of the current project, the term "environmental assessment" encompasses the types of analyses that BOEM's Environmental Assessment Program undertakes and is not restricted to NEPA environmental assessments. • Unlike studies, assessments are not compiled in a central inventory. To compile as complete an inventory of environmental assessments as possible, IEc employed an automated process known as web scraping. IEc conducted additional review of web pages that had web scraping hits—and through that review, found several additional assessments on the same web pages. • Additionally, IEc accessed archived BOEM web pages for review; identified BOEM documents that appeared to be no longer publicly available so that BOEM staff could provide these directly; reviewed the BOEM Data Center web page; and requested feedback from BOEM staff based on the summarized list of assessment documents.
Interviews	39	• Interviewees were selected by the Evaluation Project Team co-leads with input from IEc. First, IEc calculated a target number of interviewees for each region or program area based on the total number of environmental staff in each respective office. Next, individuals were selected based on their past and/or present position, historical knowledge, and experience working in one or more regions or programs. Finally, the list of interviewees was further narrowed and balanced to identify an adequate range of staff and managers, disciplines, and subject matter experts (SMEs) representing studies, assessment, or both. • Interviewees provided institutional knowledge, examples, and feedback, based on their perceptions and experiences.

Data Source	Count	Description and Caveats
Survey responses	126	• IEc conducted a web-based survey of all BOEM technical staff that work on environmental studies and/or environmental assessments or manage staff who do. Based on information from the BOEM Evaluation Team and the scoping interviews, the total number of relevant individuals is 146. IEc aimed for a complete census rather than attempting a representative sample. The survey response rate was 86 percent (126 total responses). The survey used skip logic to ensure that respondents only answered the questions that were relevant to them; as such, not every respondent answered every question. • Survey responses provide a current snapshot view based on the perceptions and experiences of the respondents. While some survey respondents have been with BOEM for many years, others joined the Bureau recently and may overlap with a relatively small portion of the time period covered by the project (1999–2019).
ESP-PAT (# of in-scope studies)	258	• ESP-PAT is an internal BOEM mechanism for capturing information on the effectiveness and use of ESP studies in fulfilling the Bureau's information needs. It relies on self-reported information from BOEM staff; 258 of the 876 studies in scope for this evaluation were in the ESP-PAT database.

IEc used the data sources in the table to conduct the following analyses:

- **Topic Trend Analysis.** Topic trend analysis focused on exploring the relationship between the topics that BOEM researches in its environmental studies and analyzes in environmental assessment documents over time.

- **Citation Analysis.** IEc searched assessments for references to ESP-funded study documents and associated publications to quantify how frequently studies inform assessments. IEc also reviewed a sample of the assessments to understand the context for the citation(s) or to explain a lack of citations. The citation analysis provided information on the connections between assessments and studies and identified examples to further explore and contextualize through interviews.

- **Information Needs Tracing.** IEc reviewed assessments, ESP-PAT, and the information needs section of study profiles to identify instances in which assessments are identifiable as the motivation for studies. IEc examined the frequency with which environmental assessments clearly identify information needs to inform further or future analyses of impacts of BOEM projects and planning activities. IEc also conducted an analysis of the information needs for the environmental studies for which study profiles exist that include an "information needs" section.

- **Survey Analysis.** IEc analyzed survey responses and summarized them based on the percentage of respondents answering each of the possible responses for the individual questions.

- **Interview Coding and Qualitative Analysis**. IEc analyzed responses to each interview question to identify themes and summarize responses. We analyzed the interview responses overall and by relevant BOEM office (e.g., national, regional, or cross-program). IEc summarized the frequency with which each theme was raised overall and by different BOEM offices and identified illustrative quotations that capture issues that interviewees frequently raised.

- **SNA.** IEc used survey responses to conduct an SNA focusing on information exchange and knowledge transfer of studies and assessments information throughout BOEM. SNA involves mapping and characterizing a network, which can be defined as relationships between people or organizations (including offices within an organization). As part of this network analysis, we looked at the ties (connections) between individuals (nodes) and quantified the number and characteristics of those relationships. We present network maps and metrics that illustrate the presence and strength of relationships in the BOEM network.

Process for Developing the Methodology and Implementing the Evaluation

This report is the culmination of two years of work between BOEM and IEc. Year 1 (September 2019–September 2020) focused on designing the internal evaluation methodology. This effort resulted in the Year 1 methodology report (Volume 1).

The BOEM Evaluation Project Team actively participated in the project throughout the development and implementation of the methodology. The two BOEM project co-leads engaged regularly with IEc throughout the process and helped inform the methodology. In addition, the BOEM Evaluation Project Team included representatives from BOEM's program and regional offices, who provided substantive input at key junctures throughout the process. The ESPIS team likewise provided valuable data and input for the project. IEc also conducted nine evaluation scoping interviews during Year 1 with Studies and Assessment managers in BOEM Headquarters and the Alaska, Pacific, and Gulf of Mexico Regions. BOEM approved the final evaluation methodology in September 2020.

Year 2 (September 2020–September 2021) focused on implementing the approved methodology. The BOEM project co-leads helped inform the implementation of the methodology and the analysis of findings. The survey and interviews solicited input from managers and staff across BOEM to provide their input on the evaluation topics; the interviews also provided the opportunity to discuss initial findings from the citation analysis and topic trend analysis and BOEM management were given the opportunity to provide feedback on the evaluation report before it was finalized.

IEc and BOEM project co-leads carefully reviewed all comments received on the draft evaluation report and provided additional context or clarity where needed. The team made every effort to accurately reflect the input provided, including from interviewees and survey respondents. Although the interviews and surveys were BOEM-wide, not everyone who participated in an interview or survey had an opportunity to comment on the draft report. Furthermore, interviewees and survey respondents may not have had the full context of everyone on the Evaluation Project Team. The responses provided in the interviews and survey reflect the respondents' interpretations and opinions, and do not necessarily reflect the views of Evaluation Project Team members. If the interview and survey results differ from the understanding of Evaluation Project Team members, this may provide an opportunity for BOEM to address issues raised in the interviews and survey and/or to clarify perceptions.

Key findings for each evaluation question and sub-question are presented below.

FINDINGS FOR QUESTION 1: HOW WELL DO BOEM ENVIRONMENTAL STUDIES INFORM BOEM ENVIRONMENTAL ASSESSMENTS?

Overall, the information and analysis that underpins this evaluation provides strong evidence that BOEM environmental studies inform BOEM environmental assessments. The citation analysis found the percentage of BOEM assessments that cite at least one BOEM study product[2] varies year to year, but the average percent across the past 20 years is 75 percent. Survey results also highlight the importance and usefulness of studies in environmental assessments. Overall, 85 percent of survey respondents (BOEM personnel who work on environmental studies and/or assessments or manage staff who do) somewhat agreed or strongly agreed that ESP-funded studies are useful for their assessment work. Although not all studies are reported in ESP-PAT, 97 percent of submissions indicated there was a use for the results of the study, ranging from use in NEPA analyses to affecting new policies or Notices to Lessees (NTLs).[3] Consistent with the findings of other analyses, interviews highlighted the importance of studies for informing BOEM environmental assessments.

1. How are the study results used internally (consider both final and interim results)?

In addition to documenting the extensive use of studies in assessments, our results indicate that BOEM uses the study results to inform policy or planning decisions and to effect changes to or validate current conclusions. Multiple interviewees highlighted examples of studies informing BOEM policy or planning decisions. In several cases, the studies that informed policy were intended to replace outdated information or data that were either limited in scope or required updates to reflect current conditions and technology. In concurrence with findings from the interviews, ESP-PAT data also indicate study results are used to effect changes to or validate current conclusions regarding a protected resource. The citation analysis included an examination of the relationship between the office or region author[4] of the study and office or region author of the assessment; results indicate that National studies routinely support assessments in various offices and regions. Most survey respondents considered BOEM studies authored by other people to be somewhat or very important to them personally in developing environmental assessments within the last 12 months (83 percent of 88 environmental assessments staff who responded to the survey).

[2] Study products encompass BOEM published reports, data products (e.g., data sets), and related external publications, including peer-reviewed journal articles.

[3] ESP-PAT is an internal BOEM mechanism for capturing information on the effectiveness and use of ESP studies in fulfilling the Bureau's information needs. ESP-PAT relies on self-reported information submitted by the study Contracting Officer's Representative (COR) or Project Officer (PO). If CORs or POs indicate that "there is a clear use for the results of this study," they are prompted to choose from a list of options for how the study results will be used. Options range from "the outcome of the study will clearly be used for NEPA analyses" to "the results of the study support changes to current policies or to regulatory tools such as Notices to Lessees." In open-text data fields, respondents sometimes provide direct reference to a specific NEPA or other analysis or policy. Only a small portion of survey respondents reported using ESP-PAT (16 percent of 111); and only 258 of the 876 studies in scope for this evaluation are in the ESP-PAT database.

[4] In the context of this project, the term "author" refers to a BOEM environmental staff member who develops a study idea into a study profile and possibly into an ESP-funded study; it is also used in this project to refer to a BOEM environmental staff member who contributes to the development of an assessment document. In some offices, authors of studies are also authors of assessments, but that is not the case in all offices.

a. **Do study results inform mitigation measures, NEPA reviews, consultations, models, follow-on studies, etc.?**

Across all relevant data sources and analyses, findings indicate that study results inform mitigation measures, NEPA reviews, consultations, models, follow-on studies, changes to or validation of current conclusions, oil spill risk analysis, identification of new resources or issues, and changes to policies or NTLs. Study results consistently inform NEPA analyses; for example, of the 258 ESP-PAT in-scope submissions for this evaluation, 181 studies informed NEPA analyses, and all 41 NEPA environmental impact statements (EISs) in the assessment inventory cited at least one BOEM study product. ESP-PAT data and interviews both indicate that study results can also inform NTLs. However, thematic analysis of open-ended survey questions highlights respondents' suggestion for a formal process to update NTLs and mitigation measures based on new study findings, such as a schedule to regularly update guidance documents to represent the best data available and investments in studies that evaluate the efficacy of mitigation measures prescribed in NTLs.

2. **How are products other than the final study report (e.g., journal articles) used in assessments?**

The citation analysis indicates that in addition to the final study report, BOEM assessment documents consistently cited peer-reviewed journal publications that resulted from BOEM studies. However, these study-related publications were cited less frequently than final study reports. Among the survey respondents who reported working on environmental assessments, 90 percent somewhat or strongly agreed that external peer-reviewed journal articles inform assessment work (of 88 total respondents). These findings were echoed in the interviews where multiple interviewees stated that assessments staff preferred to reference peer-reviewed journal articles over BOEM study reports. Interviewees indicated that their preferred search process was to use Google Scholar and suggested this approach comprehensively captures their desired topical results, including the identification of relevant peer-reviewed journal articles stemming from BOEM studies, and/or other research. Considering findings from the citation analysis, which found that BOEM assessments cited BOEM study reports more often than peer-reviewed journal articles resulting from BOEM studies, there may be a disconnect between preference and practice.

FINDINGS FOR QUESTION 2: HOW WELL DO ASSESSMENTS INFORM STUDIES?

Analyses indicate that information needs identified in assessments do inform studies, as BOEM staff develop study ideas based on their experience conducting assessments and their perspective on what information will be needed in future assessments. However, assessment documents themselves do not comprehensively or systematically record information needs. This gap makes it difficult to track what information needs exist comprehensively or systematically, and the extent to which studies are adequately addressing information needs. IEc undertook an effort to systematically identify the information needs in assessment documents, but we were often unable to identify specific information needs.

There are other sources for study ideas (e.g., input from other federal and non-federal public agencies, or public comments) and several reasons for why a study idea may not be funded, even if it is developed into

a study profile.[5] Some of these reasons include that the studies were not a priority or were lower priority for BOEM relative to other studies, funding, and timing. Each fiscal year, there is a limited budget for funding studies to address BOEM's information needs. Additionally, external events or pressing stakeholder needs may dictate a short-term realignment of priorities and therefore which study profiles are funded each year. However, the frequency with which survey respondents described that proposed studies were not advanced because they were relatively low priority for BOEM signals a need for greater transparency around the study profile selection process. In interviews, BOEM staff discussed lack of management buy-in or misunderstanding of a study by the Science and Technical Review (STR) team. This perception of "lack of support" suggests that study authors or proponents may be confused or uninformed about Bureau, office, or program priorities. This view may be due to lack of information regarding those priorities or may reflect a need to work on better communicating the study's justification of how it is addressing these priorities. There may be a need for greater transparency in Bureau-wide priorities for study funding, wider distribution of rubric criteria for evaluating studies for selection, or formalizing the decision-making process.

1. **Are information needs identified through the assessment process being developed into studies?**

Interviewees overwhelmingly reported that BOEM develops studies based on information needs identified in assessments and provided several specific examples of this part of the feedback loop. The topic trend analysis results support this, suggesting a connection between assessments focused on wind energy development and oil and gas activities and subsequent studies focused on those topics. In addition, 55 percent of survey respondents indicate their own scientific work, including work on assessments, was a source of study ideas, which is intuitive given the number of BOEM staff who conduct both assessments and studies. Finally, in a question about how study ideas originate, some survey respondents specifically added "environmental assessments" as a write-in answer description in addition to the available response options, implying a connection between information needs identified in assessments and the study development process.

However, as noted above, the assessment documents do not identify information needs comprehensively or systematically. Although BOEM staff strongly report that information needs in assessments inform their study ideas, the assessment-to-study part of the feedback loop mostly relies on individuals interpreting their information needs and relies on individuals or groups to communicate why an information need should be addressed. This may reflect what is objectively most important for BOEM to address, or it may reflect who most effectively champions their study. The process also does not have a mechanism to identify persistent information needs that remain over time.

   a. **If yes, how do the results of the studies address the information needs identified in the study profiles? b. If not, why?**

Based on the survey and interview results, studies generally address the information needs that they seek to answer. Several interviewees across multiple offices and regions discussed research on marine mammals as an example of the strength of the BOEM studies program in addressing information needs.

[5] Appendix G provides the study profile template.

However, as reported by interviewees, in some cases the information needs section of the study profile does not include enough detail to sufficiently explain how BOEM will use the data from the study. Other times there may be a disconnect between the individual authoring the study profile and the individual authoring the statement of work, which may result in a study addressing an information need that is different than the original study profile. In both cases, interviewees recommended building in additional rigor and checks in the study development process to better ensure that the results of the studies address the information needs identified in the study profiles. Interviewees also indicated issues with timing, which may hinder the ability of studies to address identified information needs. As noted above, survey data also identified challenges (including proposed studies being lower priority for BOEM, funding, and timing) to BOEM pursuing an information need, even if developed into a study profile.

FINDINGS FOR QUESTION 3: HOW DOES THE FEEDBACK LOOP FUNCTION?

The feedback loop functions through formal communications (such as study reports, presentations, and ESPIS) but also relies heavily on informal word of mouth to communicate information on both studies and assessments. Presentations were among the top three modes of internal results dissemination identified by survey respondents. Importantly, most respondents also consider presentations useful for *receiving* information about BOEM studies. Despite BOEM's efforts at consolidating studies information in ESPIS, less than 60 percent of the survey respondents indicated that they disseminate information about study findings using ESPIS. Although BOEM's internal mechanisms, by default, require that the COR submit a study report to ESPIS (via the ESPIS data manager), interviewees and survey respondents do not view this step as sufficient for information dissemination.

1. How are the results of studies communicated internally (consider both final and interim results)?

Multiple analyses indicate that the results of studies are communicated internally, but there is room to improve internal communications. Survey results indicate that studies are communicated internally at BOEM predominantly through word of mouth, study reports, and presentations. Interviewees emphasized the importance of communication and collaboration as a vital piece of the feedback loop, but they acknowledged that communication of study results typically occurred through informal channels. This is consistent with the survey findings that "word of mouth" was a common communication method. Further, network analysis showed that BOEM consists of a well-connected network, defined mainly by close intraoffice connections and frequent interactions with staff at the Office of Environmental Programs (OEP), located at BOEM Headquarters.

a. Are the results presented internally?

Presentations were among the top three modes of internal results dissemination identified by survey respondents. Importantly, most respondents also consider presentations useful for receiving information about BOEM studies. Interview results provide additional context to internal presentation practices and indicated less consistent internal presentation practices compared to the survey results. Some interviewees indicated teams had discussions or presentations, while others acknowledged that most discussions were informal. Examples of existing practices for sharing study results include brown bag lunches, webinars, and "lunch and learn" events.

b. Are the results published in ESPIS?

Despite BOEM's efforts at consolidating studies information in ESPIS, less than 60 percent of the survey respondents indicated that they disseminate information to others about study findings using ESPIS. Interviews reflected similar findings, and further illuminated that low rates of using ESPIS for information dissemination may be driven, in part, by negative experiences with ESPIS for obtaining information on studies. BOEM notes that ESPIS was designed to be a repository of studies. The primary goal of ESPIS was not to be a searchable resource library but to make information available to the public.

c. Are the results shared using the ESP-PAT tool?

BOEM staff did not report using ESP-PAT as a dissemination mechanism, and further, people familiar with the tool explained this was not its intended purpose. Overall, the survey, interviews, and ESP-PAT data itself indicate that BOEM staff do not often use ESP-PAT.

2. How are assessment information needs identified? a. Who identifies information needs?

BOEM assessment documents identify information needs within the assessment documents themselves, although this practice is more common for recent assessments. Additionally, many staff found that their experience and knowledge of their program, office, or region provided insight into existing or future assessment information needs. Consistent with the findings of the information needs tracing analysis, some staff mentioned identifying information needs when creating the "Incomplete or Unavailable Information" section of NEPA documents. Information needs described in these sections are, however, focused on information relevant to evaluating reasonably foreseeable significant adverse effects on the human environment consistent with NEPA requirements (40 CFR §1502.21); accordingly, these sections do not necessarily reflect all information that may be useful or helpful.

3. Once identified, how are the information needs communicated internally? a. Who communicates information needs?

Overall, survey and interview data indicate that BOEM staff and managers communicate information needs primarily through informal conversations with study and assessment colleagues, and through internal meetings. The network analysis also supports this finding regarding internal informal communication within offices. Though a popular means of communication, the largely informal, person-to-person information sharing is not a consistent or rigorous mode of information needs tracking. Although many SMEs across offices and regions mentioned having their own list of ideas based on their work, these were informal and not necessarily communicated between staff. The lack of a central repository systematically storing information needs prevents BOEM from better understanding connections between information needs and proposed efforts to address those information needs.

RECOMMENDATIONS

Table ES-3 summarizes the key recommendations resulting from this evaluation. We provide more detail on these recommendations in Section 5.4. The summary table provides additional information on the relative level of effort we expect would be required to implement each recommendation and the potential influence on the effectiveness of the science-to-policy process. The level of effort is expressed in terms of low, moderate, and high. We note that, as the recommendations are not prescriptive with respect to how BOEM should specifically implement the recommendation, there are options that require varying levels of time commitment. Additionally, the level of effort pertains to the time required to establish the system or process recommended; most recommendations then would require some effort to continuously implement over time. The relative level of effort considers factors, including whether implementing the recommendation would require developing and implementing new processes at the program level (e.g., tracking information that has not previously been tracked); creating additional, ongoing responsibilities for staff; or undertaking a one-time effort to refine existing systems and processes (e.g., updating lists of key topics).

The recommendations also are ranked as slightly influential, moderately influential, or very influential with respect to the potential influence on the feedback loop. This column specifies whether the potential influence refers to 1) the expected "effectiveness" of the recommendation in improving feedback loop functioning (e.g., by better targeting investments in studies to fill critical information needs); or 2) the usefulness of the recommendation in streamlining BOEM's ability to continuously evaluate how well the feedback loop is functioning (i.e., "evaluation"). Ultimately, however, improving BOEM's ability to track how well the feedback loop is functioning should lead to improvements in effectiveness as BOEM adapts over time to the information gained from regular evaluation.

TABLE ES-3. RECOMMENDATIONS, ANTICIPATED LEVEL OF EFFORT, AND INFLUENCE ON FEEDBACK LOOP

Recommendations and Measurement Approaches	Level of Effort	Potential Influence on Feedback Loop
1. Organize and strengthen the process for tracking information needs across BOEM		
a. Require a formal process of documenting (and ideally prioritizing) information needs from assessments	Moderate–High	Very Influential • Effectiveness • Evaluation
b. Develop a central repository for documenting information needs	Low	Very Influential • Effectiveness • Evaluation
c. Build and assign responsibility for documenting information needs	Moderate	Moderately Influential • Effectiveness • Evaluation
d. Improve internal tracking to trace study ideas from study profiles, to funded studies (National Studies List), to ESPIS study information and products	Moderate	Moderately Influential • Evaluation

Recommendations and Measurement Approaches	Level of Effort	Potential Influence on Feedback Loop
e. Require that study profiles provide a clear description of the relevant information need the study is targeting, the origin of the information need, and co-developers	Low	Very Influential • Evaluation
2. Improve communication regarding the process for prioritizing studies to increase transparency	Moderate–High	Very Influential • Effectiveness
3. Expand the functionality and usability of ESPIS		
a. Create a streamlined process that allows CORs to easily update information in ESPIS	Moderate–High	Very Influential • Evaluation
b. Send CORs an annual prompt to update information for up to five years after completion of a study	Moderate	Moderately Influential • Evaluation
c. Subsume the type of data collected in ESP-PAT into ESPIS or other tracking system	Moderate–High	Very Influential • Evaluation
d. Use standard topic tags across assessments and studies	Low–Moderate	Very Influential • Evaluation
e. Improve the usability of ESPIS as a resource to obtain study information	Moderate	Moderately Influential • Effectiveness
4. Strengthen BOEM's ability to track citations of environmental studies, both in peer-reviewed publications and in BOEM assessments		
a. Consider specifying within contracts that requirements for referencing BOEM obligation numbers in study publications extends beyond the period of performance for the contract	Moderate	Moderately Influential • Evaluation
b. Require assessments to include a section specifically identifying the BOEM studies referenced in analyses	Low	Very Influential • Evaluation
5. Create a central location for storing and accessing all BOEM assessments	Moderate	Moderately Influential • Evaluation
6. Commit to regular communication of study results through formal channels	Moderate	Moderately Influential • Effectiveness
7. Monitor effects of COVID and working remotely on communication channels and the feedback loop	Low	Moderately Influential • Effectiveness

1 INTRODUCTION AND PURPOSE OF THE EVALUATION

BOEM's mission is to manage the development of U.S. OCS energy, mineral, and geological resources in an environmentally and economically responsible way. OCSLA of 1953 granted the Secretary of the Interior the authority to oversee the exploration and development of mineral resources on the OCS and the Energy Policy Act of 2005 expanded the Secretary's authority to include management of renewable energy resources.

Per Section 20 of the OCSLA, BOEM developed the ESP to conduct studies for information needed for the assessment and management of environmental impacts of oil and gas and other mineral development on the human, marine, and coastal environments. In fulfilling its mission, BOEM must comply with a range of environmental requirements. In so doing, BOEM develops environmental assessments, consultation documents, and other analyses that use the best available information. Much of that information flows from BOEM-sponsored research, particularly studies sponsored by the ESP.

BOEM has described this process as a "feedback loop" in which studies inform assessments and assessments inform studies. The goal of the feedback loop is that BOEM science informs BOEM decisions through assessments (i.e., science-to-policy), and vice versa. However, BOEM has not yet tested these linkages between assessments and studies or formally examined how well the information is supporting the Bureau's decisions.

BOEM initiated this evaluation to understand how ESP-funded research is used within and outside of BOEM. The evaluation defines "use" of BOEM studies based on whether the science informs analyses and assessments, or influences policy or planning decisions. Through this evaluation, BOEM aims to understand the extent to which study results are incorporated into assessments, information needs are identified through the assessment process, and studies and assessments are informing policy decisions. The project covers the time period between 1999 and 2019.

The evaluation is a three-year project. The first two years focused internally (within BOEM). Key topics of the internal evaluation include how well BOEM is communicating information needs and study results across the Bureau, and the extent to which results from studies are being incorporated into assessments and informing BOEM's policy decisions. Specifically, Year 1 (September 2019–September 2020) focused on designing the internal evaluation methodology, resulting in Volume 1 of this report. Year 2 (September 2020–September 2021) focused on implementing this methodology, collecting evaluation data, and developing evaluation findings, conclusions, and recommendations. Volume 2 of this report is the culmination of Year 2 activities. During Year 2, the team also began preparing for the external evaluation. Year 3 (September 2021–September 2022) will flesh out and implement the external evaluation design. The external evaluation will look outside of BOEM, including how well BOEM is communicating science to external users, how BOEM collaborates with other federal and state agencies, and whether/how federal and state agencies are using BOEM's assessments and consultation documents. Year 3 is detailed in Volume 3 of this report.

As shown in Figure 1, IEc's evaluation process for the internal evaluation (Years 1 and 2) followed nine primary steps: 1) develop the Evaluation Approach Outline; 2) compile and organize existing data

sources; 3) review and characterize information; 4) develop the evaluation methodology; 5) conduct topic trend and citation analyses; 6) trace information needs; 7) implement a survey; 8) conduct interviews; and 9) compile results and develop the final report. Section 4 (Evaluation Methodology) describes these steps in more detail.

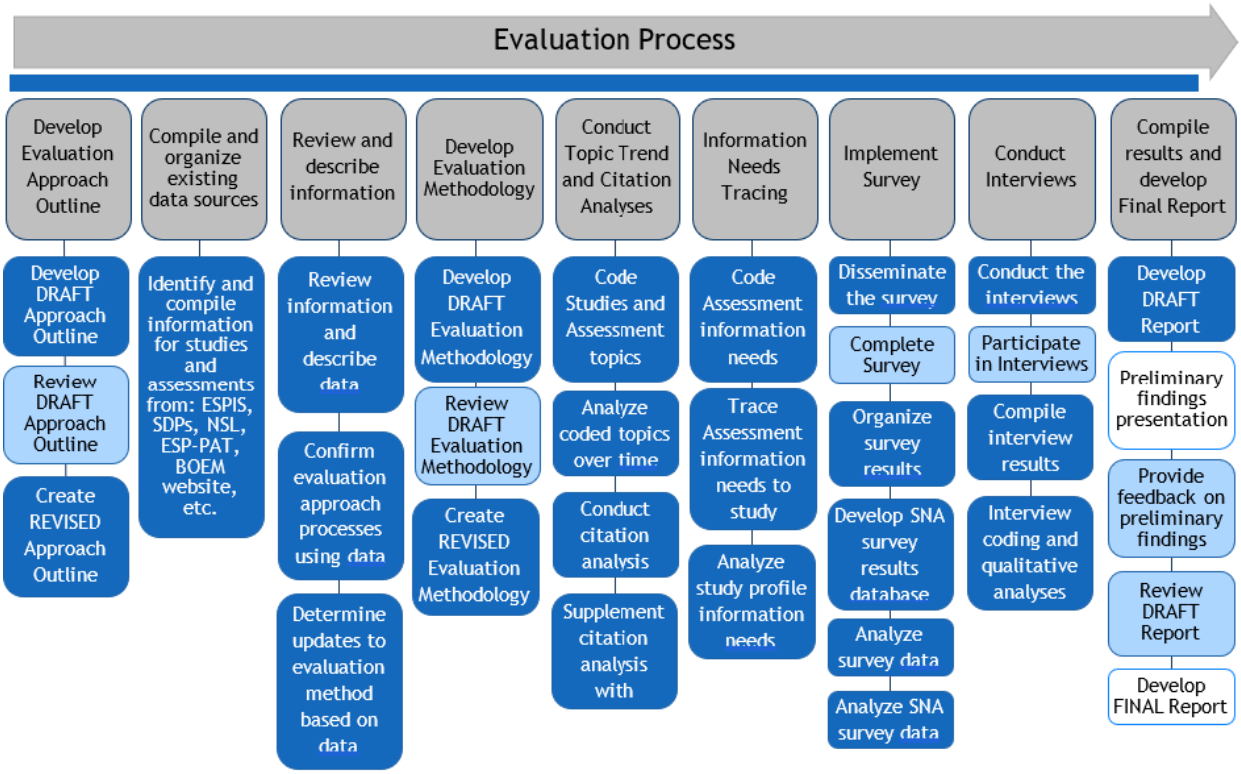

FIGURE 1. EVALUATION PROCESS FOR YEARS 1 AND 2
Light blue squares indicate BOEM role.

This report presents the results of the internal evaluation. This document is organized into six sections. Following this introduction, Section 2 provides a description of the ESP as well as BOEM's environmental assessment work. Section 3 presents the evaluation questions that guided this project. Section 4 presents a summary of the evaluation methodology. Section 5 presents the findings by evaluation question and identifies recommendations and measurement approaches based on the findings. Section 6 provides the appendices.

2 DESCRIPTION OF THE ESP AND BOEM'S ENVIRONMENTAL ASSESSMENT WORK

2.1 ESP

BOEM's ESP develops, funds, and manages scientific research to inform decision-making. The ESP studies provide information on the status and trends of the human, marine, and coastal environments, and the potential impacts on marine biota from chronic pollution, spills, and activities related to offshore development. The ESP prepares an annual Studies Development Plan (SDP), which documents proposed studies for the two upcoming fiscal years. Recent SDPs also provide context and articulate upcoming decisions that drive selected study topics for each office. The SDP includes a profile of each proposed study. This profile describes the study's relevance to BOEM's information needs and outlines study objectives, methods, research questions, and approximate cost. As described in the ESP Strategic Framework, ESP relies on seven criteria to evaluate potential study topics for inclusion in the SDP:

- Need for Information in BOEM Decision-making
- Contribution to Existing Knowledge
- Research Concept, Design & Methodology
- Cost-Effectiveness
- Leveraging Funds
- Partnerships
- Multi-Regional & Strategic Utility

The SDP serves as an internal planning document for BOEM, and typically not all proposed studies included in the SDP are conducted. Drawing from the SDP, BOEM develops the annual National Studies List (NSL), which narrows down the list of studies from the SDP to the list of new and continuing studies set to receive BOEM funding in the upcoming fiscal year. To inform the selection of studies for the NSL, BOEM's regional and program offices may priority rank studies in the SDP based on relevance to the ESP criteria. Program and regional offices may also prioritize studies based on their own set of criteria and information needs. To reach consensus on which studies receive funding in a given year, the NSL is discussed in a meeting with all BOEM Regional Directors and Program Managers before being passed on to the BOEM Director for final approval. After the NSL is finalized, BOEM procures the studies included in the NSL through competitive contracts, cooperative agreements with state institutions or universities, or interagency agreements with other federal agencies. Given the nature of the ESP as a multi-million dollar applied research program, the ESP process requires time to advance from an initial study idea to a funded study. Throughout the process, the ESP must balance needs across the Bureau while ensuring that information needs are met with scientific integrity and within procurement rules.

In keeping with the project design and decisions made at the evaluation project orientation meeting, the scope of this evaluation encompasses all ESP-funded research; it does not include research funded solely through other BOEM funding mechanisms (e.g., through a program office). While recognizing that other (non- ESP-funded) research also contributes to assessments and policy decisions, the evaluation scope

reflects the need to draw clear boundaries around the studies to be included. The criterion that studies must be funded in whole or in part by ESP provides clear parameters for inclusion and facilitates access to the studies because they should all be in ESPIS—in contrast to the assessments, which the evaluation team compiled from multiple sources, with substantial input from BOEM staff. Although this project excludes studies that received no ESP funding, we understand based on discussions with BOEM that this represents a small fraction of BOEM's scientific studies over the past 10 to 20 years. The findings and recommendations of this project apply to the ESP.

2.2 ENVIRONMENTAL ASSESSMENTS

A key part of BOEM's mission is ensuring environmental protection through compliance with environmental statutes, regulations, and executive orders. This typically requires detailed analysis of potential environmental impacts of exploration, development, and production activities in the OCS. For purposes of this project, the term "environmental assessment" encompasses the full suite of analyses that BOEM undertakes related to compliance with environmental statutes, regulations, and executive orders, and is not restricted to environmental assessments conducted pursuant to NEPA. Relevant statutes and regulations include the following:

- National Environmental Policy Act (NEPA)
- National Historic Preservation Act (NHPA)
- Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)
- Endangered Species Act (ESA)
- Air Quality Act (1967) or the Clean Air Act (CAA)
- Coastal Zone Management Act (CZMA)
- Marine Mammal Protection Act (MMPA)
- OCS Lands Act (OCSLA)
- Clean Water Act (CWA)

BOEM must comply with these and other statutes and regulations to carry out its mission of managing the development of OCS energy and mineral resources in an environmentally and economically responsible way. To do so, BOEM conducts environmental assessments of the impacts (including environmental, social, and economic) of its programs in conventional energy resources, renewable energy resources, and non-energy minerals (e.g., sand, gravel, and critical minerals). BOEM also provides oversight, policy guidance, and direction through consultations within the Bureau and with other agencies.

Environmental assessments are conducted to comply with regulations, inform BOEM's resource planning and management efforts, provide an understanding of a project's potential impacts for decisionmakers and the public, and avoid or minimize potential impacts. For example, BOEM prepares environmental assessments to satisfy the requirements of NEPA, ESA, MMPA, CZMA, and NHPA. In addition, Section 18 of the OCSLA requires consideration of the potential impacts to the marine and coastal environments that could result from leases issued under the National OCS Oil and Gas Leasing Program. These reports support consultation requirements and inform decisions regarding where activities on the OCS may occur.

For the purposes of this evaluation, the universe of assessments includes environmental assessment documents prepared pursuant to the statutes and regulations listed above. The following are types of assessment documents that the evaluation team considered for inclusion in this evaluation (i.e., types of documents considered in the universe of assessments):

- NEPA EISs
- NEPA environmental assessments
- NHPA documents (includes Section 106 Evaluations of effects on historic properties and Programmatic Agreements)
- Essential fish habitat assessments for MSFCMA consultations
- ESA Section 7 biological evaluations
- ESA Section 7 biological assessments
- Analyses and assessments prepared for CAA, CZMA, and MMPA
- Government-to-government (e.g., Tribal) consultations
- Analyses and assessments such as engineering analyses, regulatory impact analyses, resource evaluations (i.e., assessments identifying the presence of oil and gas resources in a given area), additional NEPA-related analyses, site assessments, and cost-benefit analyses, prepared for OCSLA and other regulatory requirements

In addition, to better understand whether certain BOEM documents prepared to characterize and describe Tribal, cultural, and archaeological resources fit the definition of "environmental assessment" used in this evaluation, IEc spoke with several Tribal liaisons during scoping interviews. Though many of those documents were outside the scope of the evaluation, the discussions provided useful information to enable the evaluation methodology to better capture the ways in which Tribal resources and issues are addressed in assessments and studies. For example, the information needs tracing analysis used several tags to code documents that addressed Tribal resources. The discussions also clearly articulated the extent to which BOEM staff interact with Tribes outside of the official feedback loop (as defined in this evaluation) to elicit feedback regarding potential effects of BOEM activities on Tribal resources and where investments in related studies would be most helpful. The liaisons identified multiple instances of BOEM partnering with Tribes to develop study plans focused on Tribal resources and issues (e.g., early input of Alaska Native communities to the stakeholder process to identify studies; implementation of the Maritime Cultural Resources Site Assessment in the Main Hawaiian Islands [BOEM OCS Study 2017-021]).

BOEM Headquarters offices (OEP, Office of Renewable Energy Programs [OREP], and the Marine Minerals Program [MMP]) as well as each of the three regional offices (Alaska, Pacific, and Gulf of Mexico [GOM]) have formal organizational divisions separately addressing environmental assessment and environmental study functions. However, although the formal structure distinguishes between these two functions, the scoping interviews conducted as part of this project indicated that in all the Headquarters and regional offices, environmental study and environmental assessment functions are shared across the divisions. In most cases, an SME works on both environmental assessments and environmental studies, regardless of the office they formally reside in.

3 EVALUATION QUESTIONS

This evaluation seeks to address three types of questions: 1) **process** questions, related to the implementation of the environmental studies and environmental assessment feedback loop; 2) **outcome** questions, related to the results of the feedback loop; and 3) **measurement** questions, related to the means by which to assess the performance of the feedback loop going forward.

IEc identifies process questions in evaluations to help determine if program activities are being implemented as planned or assumed. Overall, these answer the question: What is BOEM doing to implement the feedback loop? Outcome questions help determine if program activities are causing the desired results. They answer the question: What results does BOEM see from their activities? Combined, these two categories of questions help identify if a program is working well and potential reasons why it may or may not be working well.

As specified in the project design, the internal evaluation addresses three overarching evaluation questions:

1. How well do BOEM environmental studies inform BOEM's environmental assessments?
2. How well do BOEM's environmental assessments inform new BOEM studies?
3. How well are information needs and study findings communicated across BOEM?[6]

Underlying all three of these questions is the evaluation question: **If changes to the feedback process are needed, what would they be and who would be responsible for implementing the changes?** This recommendation question is addressed based on the answers to Questions 1–3.

Table 1 provides the three overarching evaluation questions and associated sub-questions that help answer the three overarching questions, and the associated question type (process, outcome, or measurement). While the three overarching questions above are taken directly from the contract language, IEc made minor updates to the sub-questions shown in Table 1 for the purpose of organizing the evaluation approach.

[6] The contract language includes a fourth overarching evaluation question: What is the impact on the external environmental community? Question 4 will be addressed in Year 3 of the project (external evaluation).

TABLE 1. EVALUATION QUESTIONS AND QUESTION TYPE

Evaluation Question	Evaluation Question Type
Q1. How well do BOEM environmental studies inform BOEM environmental assessments?	
1. How are the study results used internally (consider both final and interim results)?	Outcome
a. Do study results inform mitigation measures, NEPA reviews, consultations, models, follow-on studies, etc.?[7]	Outcome
b. How can BOEM identify, document, and measure the internal use of the studies?	Measurement
2. How are products other than the final study report (e.g., journal articles) used in assessments?	Outcome
Q2. How well do assessments inform studies?	
1. Are information needs identified through the assessment process being developed into studies?	Outcome
a. If yes, how do the results of the studies address the information needs identified in the study profiles?	Outcome
b. If not, why?	Outcome
c. How can BOEM identify, document, and measure the assessment information needs to inform studies?	Measurement
Q3. How does the feedback loop function?	
1. How are the results of studies communicated internally (consider both final and interim results)?	Process
a. Are the results presented internally?	Process
b. Are the results published in ESPIS?	Process
c. Are the results shared using the ESP-PAT tool?	Process
d. How can BOEM identify, document, and measure the internal communication of their studies?	Measurement
2. How are assessment information needs identified?	Process
a. Who identifies information needs?	Process
3. Once identified, how are the information needs communicated internally?	Process
a. Who communicates information needs?	Process
b. How can BOEM identify, document, and measure the internal communication of their information needs?	Measurement
4. If changes to the feedback process are needed, what would they be and who would be responsible for implementing the changes?	Process

[7] The original evaluation question included Notices to Lessees and Operators (NTLs) in this question. However, this evaluation considers NTLs to be policy documents, not assessments, and evaluates NTLs in this context.

4 EVALUATION METHODOLOGY

4.1 DATA SOURCES

Environmental studies, environmental assessments, a web-based survey, interviews, and ESP-PAT were the main data sources for addressing most of the evaluation questions. Other program documents primarily served to contextualize and interpret evaluation findings. Table 2 summarizes which data sources were used to answer each evaluation question. Each data source is described in-depth in the Year 1 methodology report (Volume 1).

Environmental Studies. IEc used three main sources of information related to environmental studies: BOEM's ESPIS, a database with ESP-funded studies and associated BOEM reports and external publications; the NSL; and the SDPs (contains the proposed study profiles). Each of these sources is maintained separately and provides different information about BOEM environmental studies; combined, they provide a robust set of data for understanding BOEM topics and information needs that were pursued over time. For purposes of this evaluation, IEc will refer to the combination of the data contained in these sources generally as "environmental studies." Once consolidated, IEc established criteria, in consultation with BOEM, to determine in-scope studies and relevant for the evaluation. Figure 2 presents the number of studies in scope for the evaluation over time. Criteria for removal included the following:

- **Conference.** The study reflects BOEM support for a conference, meeting, symposium, forum, working group, or other type of general meeting support. BOEM and IEc acknowledge these are important mechanisms for sharing information about BOEM studies. However, for the purposes of this evaluation, this "study type" does not reflect BOEM-supported research.
- **Management.** The study is general management, administrative, or logistical support. Studies falling into this category may include Coastal Marine Institute management support.
- **Non-research effort.** The study is otherwise a non-research effort. Studies in this category include BOEM's support for a children's activity book.
- **Unverified study.** Several studies that IEc initially included in scope only had accompanying NSL and study title information. Unfortunately, IEc was unable to match these studies with additional sources using the available information. IEc sent this list to BOEM for review where a determination was made to exclude these items since they could not be traced to actual studies.

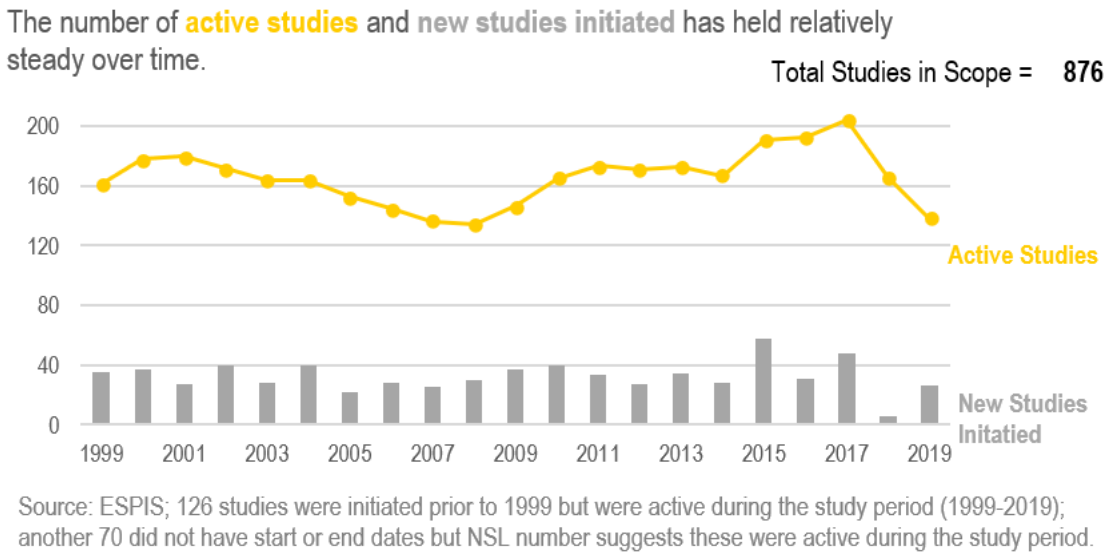

FIGURE 2. NUMBER OF ACTIVE STUDIES AND NEW STUDIES INITIATED EACH YEAR OVER TIME
Total studies in scope = 867. The number of active studies and new studies initiated has held relatively steady over time.

Environmental Assessments. To compile as complete an inventory of environmental assessments as possible, IEc employed an automated process known as web scraping. The web scraping process used an RStudio-based code and 24 search terms. We identified the search terms based on initial research of the types of assessment documents that BOEM prepares, a review of the BOEM website, discussions during the October 2019 project orientation meeting, and feedback received as part of the Interim Progress Meeting in February 2020. Briefly, the web scraping process involved first developing a code specifying search terms for the search engines to reference when searching BOEM's website. When executed in RStudio, the code identified web pages with downloadable files associated with each search term, downloaded the files, and organized them into folders. The code then produced an Excel spreadsheet containing web addresses (URLs) and file names for the files that were downloaded. IEc conducted additional review of web pages that had web scraping hits and, through that review, found several additional assessments on the same web pages. Based on discussions with BOEM staff as to the completeness of the inventory, in Spring 2020, we revised our initial inventory of assessments. Additionally, IEc accessed archived BOEM web pages for review; identified BOEM documents that appeared to be no longer publicly available so that BOEM staff could provide these directly; reviewed the BOEM Data Center web page; and requested feedback from BOEM staff based on the summarized list of assessment documents to ensure as complete as possible an accounting of relevant documents.

Based on additional conversations with BOEM staff and review of a selection of post-lease assessments, IEc determined that expanding the inventory to include post-lease assessments would significantly increase the scope of review without necessarily providing new information related to the effectiveness of the feedback loop. Therefore, post-lease assessments were not included. Any environmental document prepared by another lead agency and ultimately adopted by BOEM as a cooperating agency was not considered in the inventory; the decision to exclude those documents reduced the number of environmental documents related to the MMP. However, assessments prepared by other lead agencies and adopted by BOEM will be included in a future phase of the feedback loop evaluation (Year 3). During a

final review of the inventory of BOEM environmental assessments, IEc met with BOEM Tribal liaisons and received several documents that characterize Tribal cultural resources but did not quite fit the definition of environmental assessment or environmental study. These documents were from studies funded outside of the ESP, including multiple studies focused on cultural resources. Because they were not funded through the ESP, these studies were excluded from the list of studies in this evaluation, and IEc instead considered the documents for inclusion as environmental assessments. Examples include an inventory of terrestrial properties to assess marine viewsheds in the Hawaiian Islands and an inventory of submerged cultural resources. Given their focus on providing new information through primary data collection, and a lack of analysis for compliance with the previously listed statutes and regulations, these documents did not fit the definition of environmental assessments. Therefore, these documents were not included as either studies or assessments in this evaluation.

Survey. IEc conducted a web-based survey of all BOEM technical staff that work on environmental studies and/or environmental assessments. Prior to conducting the survey and interviews (interviews are discussed in the next bullet point), IEc worked with BOEM to complete a Privacy Impact Assessment and to develop a Privacy Notice, which was shared with the target respondents for the survey and interviews prior to collecting information from them. Based on information from the BOEM Evaluation Team and the scoping interviews, the total number of individuals that work on environmental studies and/or environmental assessments or manage staff who do is 146. The survey used skip logic to ensure that respondents only answered the questions that were relevant to them; as such, not every respondent answered every question.

Due to the small number of individuals that fall within the defined universe, IEc aimed for a complete census rather than attempting a representative sample. IEc programmed the survey and sent a survey URL to respondents with an invitation letter explaining the goals of the project and the estimated time commitment. The survey response rate was 86 percent (126 total responses), which accounts for completes and partials (both used in the analysis). The survey response rate was calculated using the following American Association for Public Opinion Research standard web survey method:

(complete+partial)/(complete+partial+refusal)

IEc defined "complete responses" (108 total) as those that offer at least one external contact (as part of the Network Analysis information request) and "partial responses" as those for which participants responded to more than two questions but did not complete all the questions regarding external contacts (18 respondents). Non-responses and surveys for which participants answered only the first two questions are considered "refusals" (20 total). The calculation of the response rate assumes each response is a unique responder although it is possible that individual participants engaged in multiple attempts to complete the survey. As survey responses were anonymous, it was not possible to track whether or how frequently this occurred. Consequently, the response rate calculation described above may be overestimated.

TABLE 2. DATA SOURCES TO ADDRESS EACH EVALUATION QUESTION

Evaluation Question[8,9]	Studies	Assessments	Interviews	Survey	ESP-PAT
Q1. How well do BOEM environmental studies inform BOEM environmental assessments?	✓	✓	✓	✓	✓
1. How are the study results used internally (consider both final and interim results)?	✓	✓	✓	✓	✓
a. Do study results inform mitigation measures, NEPA reviews, consultations, models, follow-on studies, etc.?	✓	✓	✓	✓	✓
b. How can BOEM identify, document, and measure the internal use of the studies?*	-	-	-	-	-
2. How are products other than the final study report (e.g., journal articles) used in assessments?	✓	✓	✓	✓	✓
Q2. How well do assessments inform studies?	✓	✓	✓	✓	-
1. Are information needs identified through the assessment process being developed into studies?	✓	✓	✓	✓	-
a. If yes, how do the results of the studies address the information needs identified in the study profiles? b. If not, why?	-	-	✓	✓	-
b. How can BOEM identify, document, and measure the assessment information needs to inform studies?*	-	-	-	-	-
Q3. How does the feedback loop function?	-	-	✓	✓	-
1. How are the results of studies communicated internally (consider both final and interim results)?	-	-	✓	✓	-
a. Are the results presented internally?	-	-	✓	✓	-
b. Are the results published in ESPIS?	-	-	✓	✓	-
c. Are the results shared using the ESP-PAT tool?	-	-	✓	✓	✓
d. How can BOEM identify, document, and measure the internal communication of their studies?*	-	-	-	-	-

[8] Data sources contributing to the available information on environmental studies include ESPIS, a database with ESP-funded studies, BOEM reports, and associated publications; the NSL; and SDPs.

[9] Gray cells indicate proposed metrics for ongoing measurement and/or recommendations for the feedback process.

Evaluation Question[8,9]	Studies	Assessments	Interviews	Survey	ESP-PAT
2. How are assessment information needs identified?	-	✓	✓	✓	-
a. Who identifies information needs?	-	-	✓	✓	-
3. Once identified, how are the information needs communicated internally?	-	-	✓	✓	-
a. Who communicates information needs?	-	-	✓	✓	-
b. How can BOEM identify, document, and measure the internal communication of their information needs?*	-	-	-	-	-
4. If changes to the feedback process are needed, what would they be and who would be responsible for implementing the changes?^	-	-	-	-	-

* Proposed metrics for ongoing measurement determined through implementation of the evaluation.

^ Recommendations for the feedback process developed based on findings to the previous evaluation questions.

Interviews. The goal of conducting interviews was to collect in-depth qualitative information about the environmental studies and assessments feedback loop. IEc conducted semi-structured Microsoft Teams interviews with select BOEM employees involved in environmental studies and/or assessments. Interviews were selected as a purposive sample to ensure adequate representation across key offices and staff roles. The sample of interviews are not statistically representative, and IEc does not attempt to make quantitative inferences about implementation of environmental studies, assessments, or the feedback loop based on the results of the interviews. The interviews provided detailed information on how the feedback loop is implemented across the agency and help explain how or why the feedback loop works. IEc conducted a total of 39 interview sessions as part of the implementation phase of the evaluation. Forty BOEM employees were identified to participate in the interview portion of the project. The individuals were selected by the Evaluation Project Team co-leads with input from IEc. First, IEc calculated a target number of interviewees for each region or program based on the total number of environmental staff in each respective office. Next, individuals were selected based on their past and/or present position, historical knowledge, and experience working in one or more regions or programs. Finally, the list of interviewees was further narrowed and balanced to identify an adequate range of staff and managers, disciplines, and SMEs representing studies, assessment, or both. The draft interview guides are available in Appendix A of this document. Prior to each interview, the BOEM Evaluation Team or IEc provided the interviewee with background information about the evaluation and the relevant interview guide.

ESP-PAT. The ESP-PAT is an internal BOEM mechanism for capturing information on the effectiveness and use of ESP studies in fulfilling the Bureau's information needs. It relies on self-reported information from BOEM staff. Question 7 on the form asks staff to respond to the prompt, "there is a clear use for the results of this study." Staff can select from one of three options: (1) there is a clear use for the results of this study; (2) a clear use for the information cannot be identified, but it is anticipated that it will be valuable to the Bureau in the future; (3) no clear use of the information can be identified; or report NOT received. If selecting "there is a clear use for the results of this study," staff are further prompted to select from the following options: study supports changes to (or validates) current conclusions regarding a

protected resource; the outcome of the study will clearly be used for NEPA analyses; the outcome of the study clearly pertains, and will be used, in BOEM's fulfillment of its requirements of CWA, ESA, MMPA, OCSLA, etc.; the outcome of the study will clearly be used for oil spill risk analyses; the results of the study support the development of new policies or the development of new regulatory tools such as NTLs; the results of the study support changes to current policies or to regulatory tools such as NTLs; the study identifies new resources, or issues, which were forwarded to management for consideration; and other. Respondents can select all that apply and are prompted to provide explanatory text for each of their selections. In the open-text data fields, respondents sometimes provide direct reference to a specific NEPA or other analysis or policy.

Only a small portion of survey respondents reported using ESP-PAT (16 percent of 111);[10] and only 258 of the 876 studies in scope for this evaluation are in the ESP-PAT database. The COR or PO is responsible for completing the submission for all studies receiving final reports or proceedings (this does not include conference support, book, publication, membership fees, audits, data purchases, etc.).[11] Although the information provided in ESP-PAT does not cover the entire study list, the information for the available studies is directly relevant to the evaluation questions. As discussed above, data derived from Question 7 of the ESP-PAT submission form provided self-reported documented information regarding the Bureau's use of the study and publications emerging from the study.

Other Program Documents. BOEM program documents provide important information for understanding current processes, supplementing other sources of information, and for providing context when interpreting findings. IEc uses the general term "other program documents" to refer to multiple data sources including (but not limited to) the following:

- Information on BOEM's website
- Strategic guidance documents (e.g., ESP Strategic Framework; Division of Environmental Assessment Strategic Framework)
- Internal documents provided by programs, offices, and regions
- Other potential process documents that may emerge during interviews (e.g., tracking spreadsheets for study ideas)

4.2 ANALYTICAL APPROACHES

The analytical approaches include topic trend analysis, citation analysis, information needs tracing, survey analysis, interview coding and qualitative analysis, and SNA. Each analytical approach is described in-depth in the Year 1 methodology report (Volume 1).

Topic Trend Analysis. Topic trend analysis is focused on exploring the relationship between the topics addressed by environmental studies and information topics used in environmental assessment documents. As a starting point for identifying relevant topics, IEc utilized the topic list, organized by activity and resource, from the BOEM document, *National Environmental Policy Act Documentation for Impact-*

[10] Responses to this survey question were not limited to CORs.

[11] IEc was provided a copy of the ESP-PAT database from May 5, 2020.

Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf.[12] During the Year 1 scoping interviews, IEc asked for feedback on the comprehensiveness and meaningfulness of this list to characterize study topics over time. Based on the feedback, we added topics to characterize the resources and activities of interest more completely. Figure 3 displays the topic list used in this analysis.

ACTIVITIES

DIRECT BOEM ACTIVITIES

- Dredged Material Ocean Disposal
- Geosequestration
- Liquified Natural Gas (LNG) Facilities
- Marine Minerals Extraction
- Oil and Gas Surveys and Extraction
- Oil Spill*
- Renewable Energy Development (Tidal)
- Renewable Energy Development (Wind)
- Submarine Transmission Lines, Pipelines, Cables, and Infrastructure

CONSIDERATION WHEN IMPLEMENTING ACTIVITIES

- Climate Change
- Fisheries Use and Management
- Land Use and Coastal Infrastructure
- Marine Transportation, Navigation, and Traffic
- Military Range and Civilian Space Program Uses

[*] Added as a result of information obtained from scoping interviews

RESOURCES

PHYSICAL RESOURCE

- Acoustic Environment
- Air Quality
- Ice Dynamics*
- Mineral Resources
- Physical Oceanography*
- Sediment Transport
- Water Quality

BIOLOGICAL RESOURCE

- Areas of Special Concern
- Benthic Communities
- Birds and Bats
- Chemosynthetic communities / Deep-water coral communities*
- Coastal and Estuarine Habitat
- Fish, Essential Fish Habitat, and Threatened and Endangered Fish
- Marine Mammals
- Pelagic Communities*
- Sea Turtles

SOCIOECONOMIC / CULTURAL RESOURCE

- Archaeological and Historic Resources
- Commercial and Recreational Fisheries
- Cultural and Vulnerable Coast Communities (non-tribal)*
- Demographics, Employment, Economic Resources, and Environmental Justice
- Energy Production and Distribution
- Subsistence Use*
- Tourism and Recreation
- Tribal Resources*
- Visual Resources

FIGURE 3. LIST OF TOPICS INCLUDING BOTH ACTIVITIES AND RESOURCES

Citation Analysis. IEc searched assessments for references to ESP-funded study documents and associated publications to quantify how frequently studies inform assessments. IEc conducted the citation analysis in RStudio using an automated query that searched each BOEM assessment's reference list for specific BOEM study products (i.e., BOEM published report(s), datasets, and external publication titles). The output was a list of all assessment reference files that included the document title as well as the specific page, line, and surrounding text for each positive query result. To identify unique BOEM reports and publications, we matched these results to unique identifiers and summarized the results by year and

[12] Document number BOEM 2019-036.

other identifying information (e.g., topic, office or region). In responding to a comment received from BOEM staff during the review process, IEc recognized that the identifier we used for the study products was not unique for a subset of records. Specifically, certain unrelated study products had the same report number, which we were using as a proxy for a unique identifier. IEc manually reviewed each study product that did not have a unique report number, re-ran the analysis on these reports using the report title as an identifier, and updated the analysis accordingly. In addition to this analysis, IEc reviewed a sample of the assessments to understand the context for the citation(s) or to explain a lack of citations. This step was particularly important to understand assessments that did not cite any BOEM studies and to confirm and validate the RStudio queries.[13] Together, these citation analysis methods provided information on the connections between assessments and studies and how the assessments staff tend to utilize BOEM science when evaluating environments and resources that could be affected by BOEM policies. In addition, the citation analysis identified examples to further explore in interviews, and we used the interviews to gather information on the context and importance of certain studies that were highly cited.

Information Needs Tracing. Information needs tracing is an analysis to help understand how well assessments inform studies. IEc reviewed assessments, ESP-PAT, and the information needs section of the study profiles to identify instances in which assessments are identifiable as the motivation for studies. For assessments, NVivo queried, read, and thematically coded text indicating ongoing assessment information needs. IEc examined the frequency with which environmental assessments clearly identify information needs to inform further or future analyses of impacts of BOEM projects and planning activities. IEc also conducted an analysis of the information needs for the environmental studies for which study profiles exist that include an "information needs" section. ESP-PAT also provides a source of information for documented instances when a study was developed to meet an assessment information need.

Survey Analysis. IEc analyzed survey responses and summarized them based on the percentage of respondents selecting each of the possible responses for discrete-choice questions. IEc also conducted a thematic analysis of responses to open-ended survey questions.

Interview Coding and Qualitative Analysis. IEc analyzed responses to each interview question to identify themes and summarize responses. Responses were sometimes applicable to more than one evaluation question. IEc used NVivo for qualitative analysis to code each open-ended response. We analyzed the interview responses overall and by relevant BOEM office (e.g., national, regional, or cross-program). IEc summarized the frequency with which each theme was raised overall and by different BOEM offices and identified illustrative quotations that capture issues that interviewees frequently raised. We present interview findings with charts, graphs, and tables as appropriate. Because interviewees may reveal sensitive information in their responses, IEc does not attribute quotations or associate individual respondents with their responses.

SNA. IEc used survey responses to conduct an SNA focusing on information exchange and knowledge transfer of studies and assessments throughout BOEM. SNA involves mapping and characterizing a network, which can be defined as relationships between people or organizations (including offices within

[13] Guidance for utilizing citations in assessments has shifted over time (e.g., the recent NEPA streamlining process reduced the number of citations) and may provide a partial explanation for the variation in citation counts.

an organization). SNA identifies pathways for transmitting ideas, knowledge, information, and/or resources. As part of this network analysis, we looked at the ties (connections) between individuals (nodes) and quantified the number and characteristics of those relationships. Relationships are the unit of analysis, although data is collected at the individual level. We present network maps and metrics that illustrate the presence and strength of relationships in the BOEM network. We use this to understand the network structure, possible network influence on outcomes, and people or organizations that could be targeted or connected to achieve better expected outcomes.

4.3 EVALUATION CHALLENGES AND LIMITATIONS

IEc acknowledges several limitations associated with this project which we document below:

- **Difficulty in identifying information needs within assessments.** IEc's information needs tracing work was complicated by the fact that assessment documents generally do not systematically account for information limitations or recommended directions for future research. Effort was required to search throughout the text of the assessment inventory for key words and phrases indicative of information needs, and in many cases the results were too general to trace the information need to future studies. A more intentional subsection of assessments, or some alternative tracking approach outside of assessment documents, that articulated the information needs that would improve upon future analyses and assessments would better enable tracing between assessments and studies.
- **Subjectivity in coding by keyword topics.** We implemented a thorough process for tagging each study and assessment with a set of standardized topics to better understand trends in how studies and assessments influence one another. However, in some cases, it was necessary to use professional judgement to determine if a topic was highly relevant. In addition, the information needs described in assessments were often not specific enough for the topical tagging and information needs analysis to yield informative results.
- **Large volume of diverse environmental assessments in different locations.** Although IEc implemented an extensive process for identifying and compiling all relevant assessments for this evaluation, it is possible that not all relevant assessments were located and included.
- **Identifying citations of ESP-funded research and related publications in assessments.** IEc linked BOEM reports or external publications back to the original study in ESPIS, if the report or publication are recorded in ESPIS. While the ESPIS team has done (and continues to do) significant work, which the current evaluation utilized, conversations with ESPIS database managers and the scoping interviews indicated that the related publications in ESPIS, though extensive, are incomplete. As part of this evaluation IEc utilized additional data sources to further build out the list of related publications (e.g., ESP-PAT and Alaska Publications list), but this may not include all related publications, limiting the results of the citation analysis.
- **Potential bias associated with survey non-response.** IEc used a web-based survey to conduct a census of BOEM technical staff who were involved in the study and/or assessment process. IEc worked with the BOEM Evaluation Team to maximize survey responses; however, we did not

obtain a complete census (76 percent of the target for the SNA portion of survey[14]). These non-responses result in SNA metrics and maps that do not fully reflect the overall connections across the network. However, these persons are still included as nodes in the network map and connections from respondents to these non-respondents are presented.[15]

[14] The SNA used 111 survey responses, including the 108 complete responses plus 3 additional responses that provided partial information for the SNA. The 76 percent is calculated as 111 over 146.

[15] When analyzing the total number of connections between BOEM staff, IEc intentionally disregarded directionality; only one respondent had to report a connection for it to be included in our analysis. This approach aimed to increase likelihood of capturing the overall network of connections. Additional details on the methodology for characterizing unreported connections are included in Appendix F in the Social Network Analysis section.

5 FINDINGS BY EVALUATION QUESTION

The following sections present the findings by evaluation question using the collective information gathered from the various analyses. Each section is preceded with a summary paragraph in a call-out box, capturing overall findings across analyses.

5.1 Q1. HOW WELL DO BOEM ENVIRONMENTAL STUDIES INFORM BOEM ENVIRONMENTAL ASSESSMENTS?

Overall, the information and analysis that underpins this evaluation provides strong evidence that BOEM environmental studies inform BOEM environmental assessments. The citation analysis found the percentage of BOEM assessments that cite at least one BOEM study product[16] varies year to year, but the average percent across 20 years is 75 percent. Survey results also highlight the importance and usefulness of studies in environmental assessments. Overall, 85 percent of respondents somewhat agreed or strongly agreed that ESP-funded studies are useful for their assessment work. Although not all studies are reported in ESP-PAT and the information in ESP-PAT is self-reported, 97 percent of submissions indicated there was a use for the results of the study, ranging from use in NEPA analyses to affecting new policies or NTLs. Consistent with the findings of other analyses, interviews highlighted the importance of studies for informing BOEM environmental assessments.

1. HOW ARE THE STUDY RESULTS USED INTERNALLY (CONSIDER BOTH FINAL AND INTERIM RESULTS)?

In addition to documenting the extensive use of studies in assessments, our results indicate that BOEM uses the study results to inform policy or planning decisions and to effect changes to or validate current conclusions. Multiple interviewees highlighted examples of studies informing BOEM policy or planning decisions. In several cases, the studies that informed policy were intended to replace outdated information or data that was either limited in scope or required updates to reflect current conditions and technology. In concurrence with findings from the interviews, ESP-PAT data also indicate study results are used to effect changes to or validate current conclusions regarding a protected resource. The citation analysis included an examination of the relationship between the office or region author[17] of the study and office or region author of the assessment; results indicate that National studies routinely

[16] Study products encompasses BOEM published reports, data products (e.g., data sets), and related external publications including peer-reviewed journal articles.

[17] In the context of this project, the term "author" refers to a BOEM environmental staff member who develops a study idea into a study profile and possibly into an ESP-funded study; it is also used in this project to refer to a BOEM environmental staff member who contributes to the development of an assessment document. In some offices, authors of studies are also authors of assessments, but that is not the case in all offices.

support assessments in various offices and regions. Most survey respondents considered BOEM studies authored by other people to be (somewhat or very) important to them personally in developing environmental assessments within the last 12 months (83 percent of 88 environmental assessments staff who responded to the survey).

Interviewees discussed instances where studies directly inform BOEM decision-making processes. . .

In the Nantucket shoal area, a study found a high density of birds in the middle of a proposed wind energy area. BOEM changed the shape of the wind energy area to avoid this area.

In the Gulf of Mexico, studies expanded knowledge of potential archaeological features. BOEM updated assumptions and considerations in assessments.

BOEM research on undersea canyons helped inform executive action to create a national marine monument.

Interview Coding and Qualitative Analysis. Consistent with the findings of other analyses, interviews highlighted the importance of studies for internal BOEM uses, especially assessments. Interviewees mentioned the use of studies in assessments as well as supporting data products (e.g., data sets) that inform assessments and other internal work. Interviewees consistently mentioned studies that BOEM developed for use in future assessments based on anticipated assessment information needs. However, some interviewees expressed concerns with the feedback loop and the ability to integrate studies into assessments in a timely manner, further explained below.

Interviewees rarely distinguished between interim and final study results, but they did state a preference for using peer-reviewed journal articles over BOEM reports in developing assessments. Multiple interviewees highlighted examples of studies informing BOEM policy or significant decision-making processes. In several cases the studies that informed policy were intended to replace outdated information or data that was either limited in scope or required updates to reflect current conditions and technology.

Survey Analysis. Survey results highlight the importance and usefulness of studies to BOEM environmental assessments staff. Overall, 85 percent of respondents somewhat agreed or strongly agreed that ESP-funded studies are useful for their assessment work (of 88 total respondents), as shown in Figure 4.[18] The survey also asked respondents specifically about the importance of studies authored by other people and studies they authored themselves. Most respondents considered BOEM studies authored by other people to be somewhat or very important to them personally when developing environmental assessments within the last 12 months (83 percent of 88 total), as shown in Figure 5.

[18] Respondent proportions are calculated based on the number of respondents for each individual question. The total number of respondents for the survey was 126, but only 88 respondents answered the question about ESP-funded studies because it was directed to BOEM environmental assessments staff.

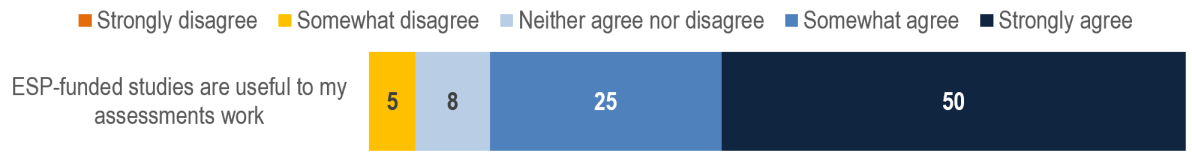

FIGURE 4. REPORTED USEFULNESS OF ESP-FUNDED STUDIES FOR BOEM IN DEVELOPING ENVIRONMENTAL ASSESSMENTS, N=88

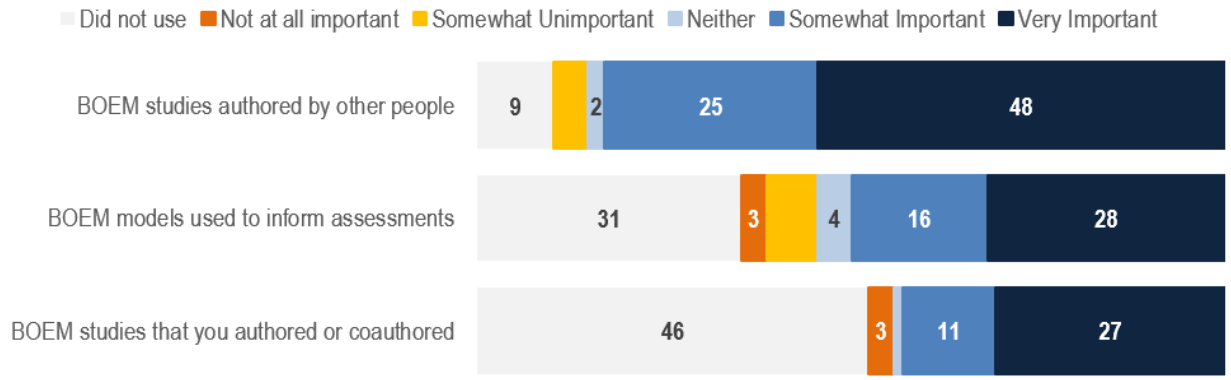

FIGURE 5. REPORTED IMPORTANCE OF BOEM STUDY RESULTS, INCLUDING BOEM MODELS, IN DEVELOPING ENVIRONMENTAL ASSESSMENTS, N=88[19]

Citation Analysis. Most BOEM assessments cite BOEM study products. The percentage of BOEM assessments that cite at least one BOEM study product varies year to year, but the average percent across all years is 75 percent (Figure 6). The average BOEM assessment cited 12 BOEM studies. Sixty-six assessments (29 percent) cited between one and five studies, while some assessments cited well over 50 (Figure 7; Table 3). Generally, studies that were initiated before 2010 were cited in assessments more often than studies that were initiated after 2010 (Table 4). Assessments that began after 2010 cited more BOEM study products, and 84 percent (103 out of 122 assessment documents) of assessments that began after 2010 cited at least one BOEM study product. This suggests that internally, earlier studies are referenced repeatedly across later assessments. These findings make intuitive sense. Earlier in the evaluation period (1999–2019), we anticipate a smaller number of assessments will cite at least one BOEM study product, given that assessments may be citing studies that were published before 1999. Later in the evaluation period, older studies have more opportunities to be cited than newer studies and more recent assessments have access to a larger body of studies. See Appendix F for more information on the citation analysis.

[19] As indicated in Figure 5, over half of respondents indicated that they did not use a study they authored or co-authored for developing assessments (52 percent of 88 total). However, we believe that this finding results from the fact that a fraction of the respondents do not author both studies and assessments. Additionally, respondents may have interpreted the term "author" narrowly, for example not including studies for which they contributed to the study profile, served as the COR, or were otherwise not a Principal Investigator. Given this, we do not draw conclusions from this finding regarding the broader evaluation question of whether BOEM studies inform BOEM assessments.

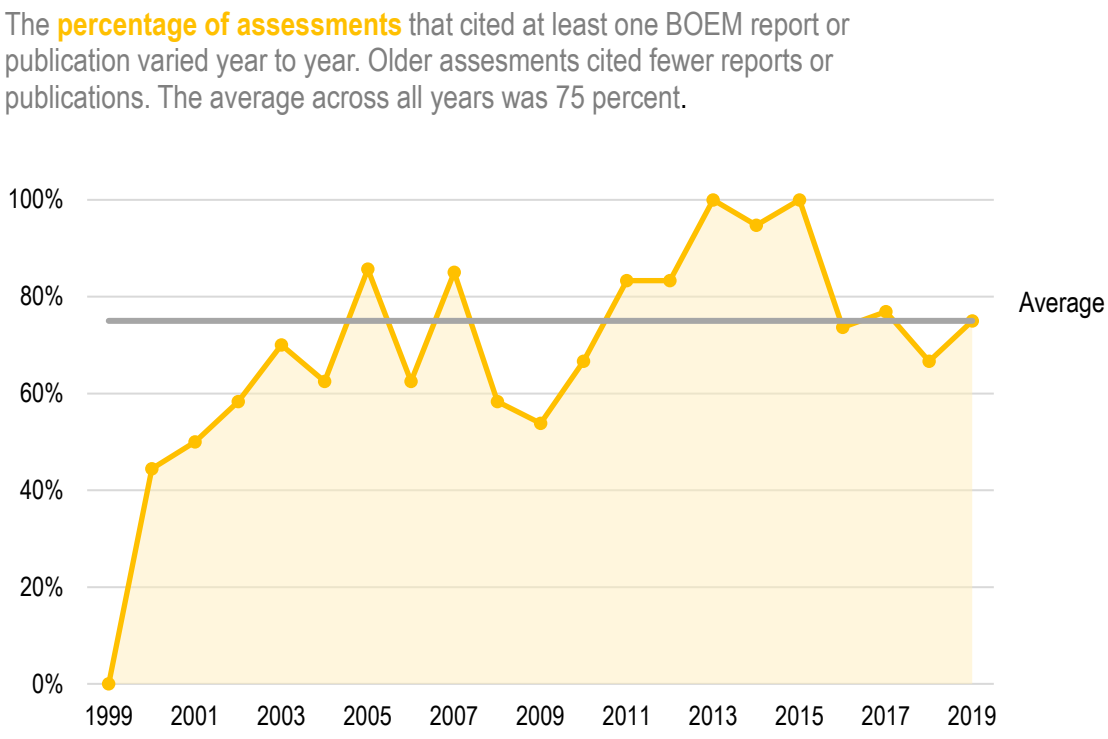

FIGURE 6. RATIO OF BOEM ASSESSMENTS THAT CITE AT LEAST ONE BOEM STUDY PRODUCT OVER TIME

The percentage of assessments that cited at least one BOEM report or publication varied year to year. Older assessments cited fewer reports or publications. The average across all years was 75 percent.

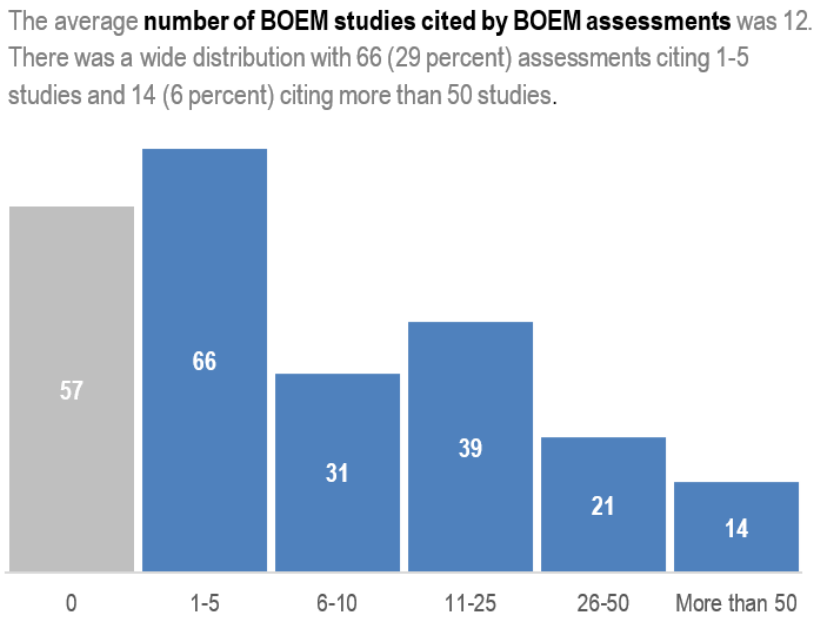

FIGURE 7. NUMBER OF STUDY CITATIONS PER BOEM ASSESSMENT

TABLE 3. TOP THREE BOEM ASSESSMENTS BY TOTAL BOEM STUDY CITATIONS, BY OFFICE AND REGION

Region/Office	Assessment Title	Total Number of BOEM Studies Referenced
Alaska	Liberty Development Project Development and Production Plan in the Beaufort Sea, Alaska	95
	Chukchi Sea Planning Area Oil and Gas Lease Sale 193	66
	Beaufort Sea and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, 221	53
Atlantic	Vineyard Wind Offshore Energy Project DEIS	20
	Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York	18
	Proposed Geophysical and Geological Activities in the Atlantic OCS to Identify Sand Resources and Borrow Areas North Atlantic, Mid-Atlantic, and South Atlantic Straits of Florida Planning Areas	17
Gulf of Mexico	Gulf of Mexico Outer Continental Shelf (OCS) Oil and Gas Lease Sales: 2012–2017 Western Planning Area Lease Sales 229, 233, 238, 246, and 248: Central Planning Area Lease Sales 227, 231, 235, 241, and 247, TX and LA	89
	Gulf of Mexico Oil and Gas Lease Sales 2017–2022 Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261	82
	Gulf of Mexico OCS Oil and Gas Lease Sale: 2012 Central Planning Area Lease Sale 216/222 Final Supplemental Environmental Impact Statement	68
National	Programmatic EIS – Outer Continental Shelf Oil and Gas Leasing Program - 2012–2017 in Six Planning Area Western Central and Eastern Gulf of Mexico, Cook Inlet, the Beaufort Sea, and the Chukchi Sea	96
	OCS Oil and Gas Leasing Program: 2017–2022	69
	Outer Continental Shelf Oil & Gas Leasing Program: 2007–2012 Final Environmental Impact Statement	68
Pacific	Environmental Setting of the Southern California OCS Planning Area	22
	Revisions to the Platform Hidalgo Development and Production Plan to Include Development of the Western Half of the Northwest Quarter of Lease OCS-P 0450	8
	Programmatic Environmental Assessment of the Use of Well Stimulation Treatments on the Pacific Outer Continental Shelf (final)	6

TABLE 4. TOP THREE BOEM STUDIES (SUM OF STUDY PRODUCTS) BY TOTAL CITATIONS IN BOEM ASSESSMENTS, BY OFFICE AND REGION

Region/Office	Study Title	Number of Assessments Referencing BOEM Study
Alaska	Monitoring Beaufort Sea Waterfowl and Marine Birds	36
	Importance of the Alaskan Beaufort Sea to King Eiders (*Somateria spectabilis*)	25
	Use of Sea Ice Habitat by Polar Bears in the Southern Beaufort Sea	24
Atlantic	Potential for Interactions between Endangered and Candidate Bird Species and Wind Facility Operations on the Atlantic Outer Continental Shelf	19
	Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf	18
	Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States	11
Gulf of Mexico	Coastal and Marine Ecosystem Program: Distribution and Abundance of Marine Mammals in the Gulf of Mexico (GulfCet II)	46
	Economic Impact of Fishing and Diving Associated with Offshore O&G Structures	32
	A Literature Review of Environmental Impacts of Synthetic Based Drilling Fluids	32
National	Identify Information Needs and Data Gaps on the Effects to Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Sound-Generating Activities by the Energy Industry	20
	Extension of the Coastal Ocean Model Calculations	14
	Effects of Pile Driving Sounds on Non-Auditory Tissues of Fish	12
Pacific	Continuation of Fish Assemblages Associated with Platforms Concentrating in Areas where Data are Limited	21
	Bayesian Analysis for Spatial Sting (BASS) Project	18
	The Ecological Role of Natural Reefs and Oil and Gas Production Platforms on Rocky Reef Fishes in Southern California	14

IEc also examined references to studies in assessments based on which BOEM office or region conducted the study. Figure 8 represents the relationship between the office or /region author for studies (left-hand side of the graphic) and the office or region author of the assessment that cited the study (right-hand side). As represented in the figure, GOM and Alaska studies largely inform assessments for their respective offices and regions (see Figure 8 inserts 1 and 2).[20] For the GOM and Alaska, 88 percent and 90 percent of identified study citations occur in assessments authored by their own office or region, respectively. As shown in Table 5, assessments from these offices and regions make up over half of the total assessment inventory. The analysis also indicates that National studies support assessments in various offices and regions, and National assessments reference National studies less often than regional studies (see Figure 8 insert 3). National assessments may include pilot studies and programmatic oil and gas assessments, which typically focus on leasing in the GOM and Alaska, two regions with regionally specific studies that these National assessments more often cite.

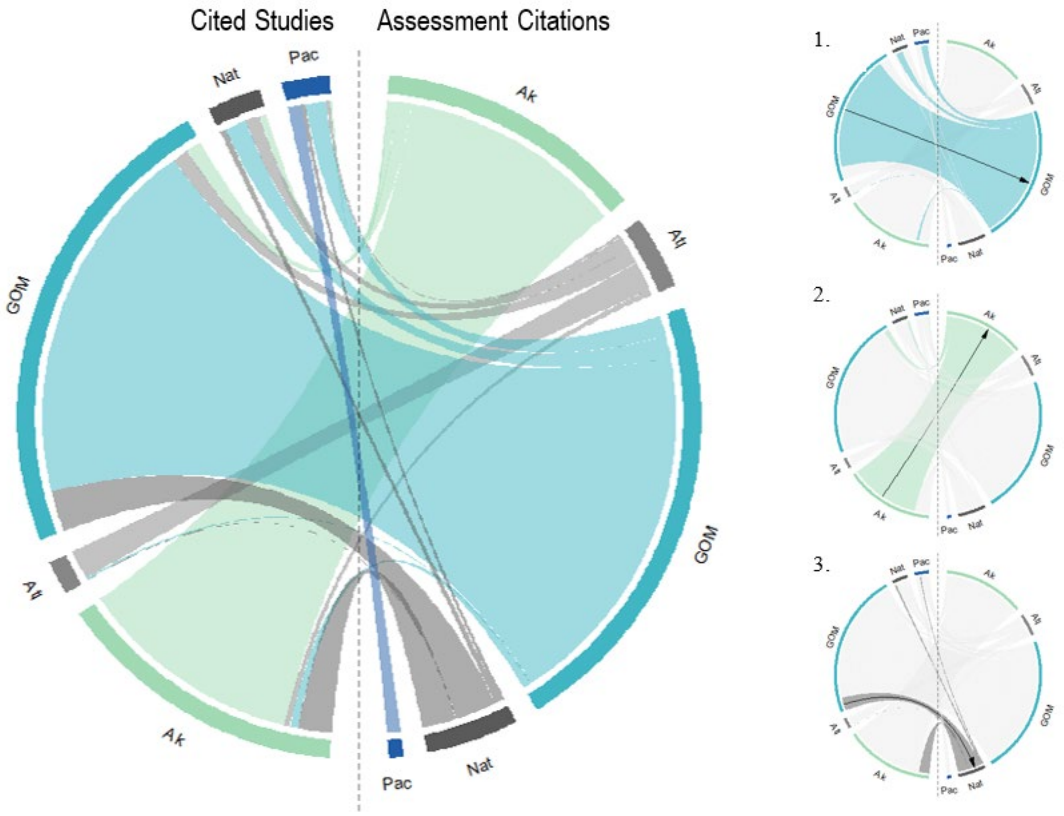

FIGURE 8. CITATIONS OF BOEM STUDIES BY OFFICE OR REGION BASED ON OFFICE OR REGION THAT AUTHORED THE STUDY, INCLUDING NATIONAL (NAT), PACIFIC (PAC), ALASKA (AK), ATLANTIC (ATL), GULF OF MEXICO (GOM)

[20] MMP was grouped with National for this analysis.

TABLE 5. NUMBER OF ASSESSMENTS BY OFFICE OR REGION

Region or Office[21]	Total Number of Assessments	Percent of Assessments
Alaska	57	25%
Atlantic	54	24%
GOM	90	39%
National	14	6%
Pacific	13	6%

Information Needs Tracing. The ESP-PAT database provides evidence that the results of the studies are being used to support BOEM internal activities. In IEc's review of ESP-PAT data, for the in-scope studies (258 total), 97 percent of submissions (which are provided on a per study basis) indicated the information gained from the study was already or would be used.[22,23] Figure 9 shows the number of ESP-PAT submissions over time and the percent of ESP-PAT submissions that indicate a clear use for the study. Additionally, in some instances, users provided information citing specific assessments; this indicates a direct tie between study results and use in BOEM assessments. The COR or PO is responsible for completing the submission for all studies receiving final reports or proceedings (this does not include conference support, books, publications, membership fees, audits, data purchases, etc.). Unfortunately, due to BOEM staff's moderate usage of this database, this may not reflect the overall status of studies use; additionally, it does not comprehensively track the internal use of study results.

[21] For the purposes of this analysis, OREP was grouped with the Atlantic Region, and MMP was grouped with OEP.

[22] The exact ESP-PAT question prompt states, "There is a clear use for the results of this study. For studies with a clear use, select as many options as are appropriate, for each selection, document specific examples. For studies with anticipated future uses, give an example of how the information might be used. For studies with no clear use, explain why one does not exist."

[23] ESP-PAT data are available from 2005 onward. ESP-PAT submissions were not made for all studies conducted within this timeframe.

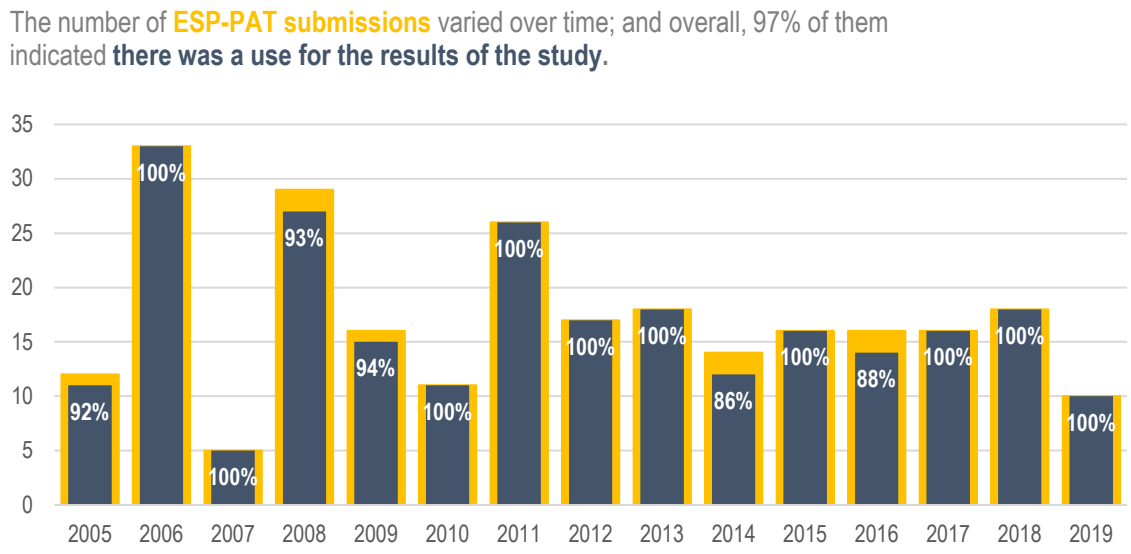

FIGURE 9. TOTAL NUMBER OF ESP-PAT SUBMISSIONS OVER TIME AND PERCENT INDICATING A USE FOR THE RESULTS OF THE STUDY

BOEM also uses study profiles to clearly articulate the need for a study to support BOEM goals. The development of study profiles for inclusion in the Study Development Plans has become more formalized and standard over time; currently all study profiles include a section titled "BOEM Information Need(s)." In this way, BOEM has designed the studies process to help ensure the usability of the results. In IEc's sampling of 55 study profiles from the 246 study profiles that could be matched to studies within the scope of this evaluation,[24] IEc coded the majority of BOEM information needs as pertaining to a general upcoming assessment need; five referenced specific upcoming assessment needs; and eight indicated the study would support development of a model.[25] By design, these study profiles indicate a use for the studies in models and assessments and are an effective way of documenting the intended connection between studies and assessments.

[24] As explained in the Year 1 methodology report (Volume 1), study profiles were only available for FY 2006 and later. Other reasons why ESPIS studies may not match a study profile include: study titles differ between ESPIS and the study profile to such an extent that they could not be matched; or multiple study profiles were merged to create a new study that does not exclusively reflect the original study profiles. To identify the ESP-PAT entries, IEc crosswalked the list of in-scope studies with ESP-PAT.

[25] IEc's original plan was to complete this for all 246 study profiles, but after initial work, it became apparent that these data would not provide a strong line of evidence indicating how study results were actually used. The 55 study profiles may not be representative of the full 246 profiles.

A. DO STUDY RESULTS INFORM MITIGATION MEASURES, NEPA REVIEWS, CONSULTATIONS, MODELS, FOLLOW-ON STUDIES, ETC.?

Across all relevant data sources and analyses, findings indicate that study results inform mitigation measures, NEPA reviews, consultations, models, follow-on studies, changes to or validation of current conclusions, oil spill risk analysis, identification of new resources or issues, and changes to policies or NTLs. Study results consistently inform NEPA analyses; for example, of the 258 ESP-PAT in-scope submissions for this evaluation, 181 studies informed NEPA analyses, and all 41 NEPA EISs in the assessment inventory cited at least one BOEM study product. ESP-PAT data and interviews both indicate that study results can also inform NTLs. However, thematic analysis of open-ended survey questions highlights respondents' suggestion for a formal process to update NTLs and mitigation measures based on new study findings, such as a schedule to regularly update guidance documents to represent the best data available and investments in studies that evaluate the efficacy of mitigation measures prescribed in NTLs. Additional detail on the results of individual analyses is presented below.

Interview Coding and Qualitative Analysis. Interviews found that studies helped inform mitigation measures, NTLs, follow-on studies, and BOEM models. Interviewees often identified ways that studies indirectly informed these measures, though some identified direct instances of study results informing mitigation measures. Several interviewees provided the example of marine mammal tracking and acoustic monitoring as directly contributing to avoidance and mitigation measures. One interviewee also reported an indirect feedback loop example: results from studies can inform mapping and data projects that generate results that BOEM and others then eventually use in mitigation planning. Compared to examples of studies informing assessments, interviewees typically had fewer examples of studies specifically informing mitigation measures. This is possibly because not all interviewees work on mitigation or NTLs or the pathway from study to mitigation measure may be more indirect, whereas there is a direct pathway from studies to assessment documents. In addition, there were differences across offices and regions with staff in the GOM, OEP, and MMP identifying more examples of studies aiding in developing measures or guidance. This trend is likely a product of the ongoing and long history of past activities in these regions/programs.

Survey Analysis. As discussed above (Section 5.1.1), most survey respondents somewhat agree or strongly agree that ESP-funded studies are useful for assessments (85 percent of 88 total). Use of studies to inform mitigation measures and consultations was not covered explicitly in the survey, but results do suggest that BOEM studies are used internally as a source of ideas for other BOEM studies. A total of 55 percent of respondents indicated that ideas for their current studies originated from their own research, while 7 percent of respondents used the "other" category response to indicate that their ideas originated from other BOEM studies (of 115 total). Thematic analysis of open-ended survey questions highlights respondents' suggestion for a formal process to update NTLs and mitigation measures based on new study findings. Recommendations include establishing a schedule to regularly update NTLs and guidance documents to represent the best data available (three respondents) and investing in studies to evaluate the efficacy of the mitigation measures incorporated in NTLs.

Citation Analysis. The citation analysis suggests that study results often inform NEPA reviews and ESA Section 7 biological assessments. Within the assessment inventory, over 90 percent of the total NEPA EISs, NEPA environmental assessments, and ESA Section 7 biological assessments cite at least one BOEM study product. All 41 NEPA EISs in the inventory cited at least one BOEM study product; it is not uncommon for these documents to include citations to more than 100 references. Resource Assessment Reports identifying the presence of oil and gas resources in a given area and NHPA Section 106 Evaluations cited at least one BOEM study less frequently compared to other types of assessments (respectively, 34 percent and 42 percent of these assessments cite to BOEM documents; see Figure 10). The analysis did not examine the exact location of citations within NEPA documents; therefore, whether the assessments cite study results related to mitigation measures, understanding the baseline conditions in the affected environment, or other sections of the assessment is uncertain.

The percentage of assessments that cited at least one BOEM study varied by the type of BOEM assessment. The assessment types with the highest number of documents, NEPA EAs and EISs, consistently cited at least one study (90% and 100%).

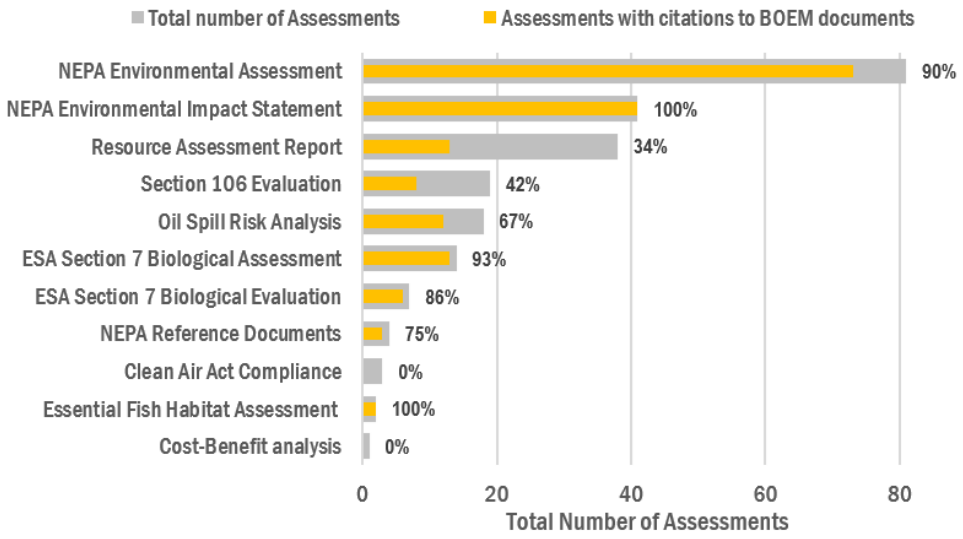

FIGURE 10. NUMBER OF BOEM ASSESSMENTS AND RATIO OF BOEM ASSESSMENTS WITH AT LEAST ONE BOEM STUDY CITATION, BY TYPE OF ASSESSMENT

Information Needs Tracing. BOEM's ESP-PAT data indicate that the results from at least 97 percent of the studies within the scope of this evaluation were used to inform environmental assessments or were anticipated to have a future use for BOEM. Of the 258 ESP-PAT in-scope submissions for this evaluation, 181 studies informed NEPA analyses; 80 supported changes to or validated current conclusions; 73 informed CWA, ESA, MMPA, or OCSLA assessments; 69 informed oil spill risk analysis; and 39 resulted in changes to or new policies or NTLs. Figure 11 indicates these different use case scenarios for study results.

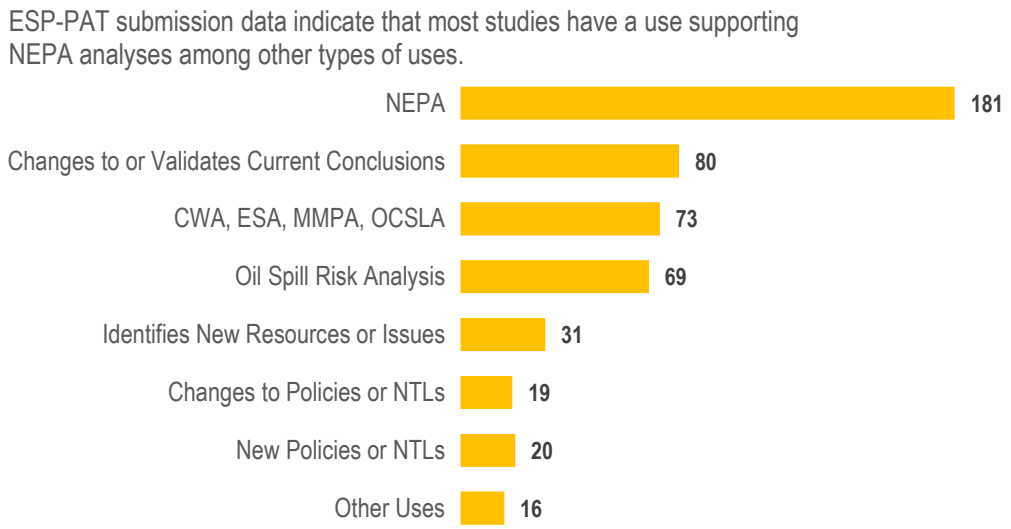

FIGURE 11. USES FOR ENVIRONMENTAL STUDIES DATA AS REPORTED IN ESP-PAT, N=258

2. HOW ARE PRODUCTS OTHER THAN THE FINAL STUDY REPORT (E.G., JOURNAL ARTICLES) USED IN ASSESSMENTS?

The citation analysis indicates that, in addition to the final study report, BOEM assessment documents consistently cited peer-reviewed journal articles resulting from BOEM studies. However, these study-related publications were cited less frequently than final study reports. Among the survey respondents who reported working on assessments, 90 percent somewhat or strongly agreed that external peer-reviewed journal articles inform assessment work (of 88 total respondents). These findings were echoed in interviews where multiple interviewees stated that assessments staff preferred to reference peer-reviewed journal articles over BOEM study reports. Considering findings from the citation analysis, which found that BOEM assessments cited BOEM study reports more often than BOEM-supported peer-reviewed journal articles, there may be a disconnect between preference and practice.

There are several potential explanations for this finding. (1) Interviewees stated a preference for using Google and Google Scholar to find relevant research for use in assessments. Using Google instead of querying ESPIS decreases the likelihood of citing peer-reviewed, BOEM-related study research and increases the likelihood of citing other (i.e., non-BOEM ESP) sources of peer-reviewed research. (2) Although respondents indicate a preference for utilizing peer-reviewed journal articles in assessment work, this does not indicate a refusal to use BOEM study reports. (3) Some interviewees who reviewed the citation analysis findings noted that any studies informing data for mapping or modeling might not be captured in the citation analysis because staff may cite or apply the model containing those data instead of citing the BOEM study that informed the model. (4) This could reflect an analysis limitation: inconsistent referencing or incorrect titling could have reduced the results of the citation analysis queries for journal articles. (5) For some studies there may be a time lag in publishing peer-reviewed articles after a BOEM study is complete. In the absence of a peer-reviewed article, assessments may rely on information from the BOEM published report.

Interview Coding and Qualitative Analysis. Multiple interviewees stated that assessments staff preferred to reference peer-reviewed journal articles over BOEM study reports. Most stated this generally without differentiating between peer-reviewed journal articles that derived from BOEM ESP-funded studies and other peer-reviewed journal articles. The preference for journal articles over BOEM study products could be explained by a number of factors, including but not limited to the specificity of the scientific topics discussed, perceived differences in quality, or document length and perceived ease of access (reports are often much broader and lengthier than articles).

Survey Analysis. Of the survey respondents who reported working on environmental assessments, 90 percent somewhat or strongly agree that external peer-reviewed journal articles inform assessment work (of 88 total respondents, see Figure 12). To better support respondents' preference for using peer-reviewed journal articles to inform assessment work, one survey respondent suggested making it easier for staff to publish studies in peer-reviewed journals. The respondent asked for guidelines for publications and to streamline the process for management review.

Less than half of the survey respondents use models for developing assessments (43 percent of 92 total); however, use of models in assessments may not be relevant for all types of assessments. Of those that do rely on models for their assessments work, most use the Oil Spill Risk Analysis model, which is a BOEM standard model, in assessment development (63 percent of 40 total). As the most widely used model at BOEM, the Oil Spill Risk Analysis model has received significant technical attention at BOEM. Thematic analysis of related open-ended responses found that a few respondents identified room for improvement; specific comments included that the model's calculations can be difficult for non-specialists to understand, and the model assumptions may be too stringent or may not fully reflect oil spill dynamics (three respondents).

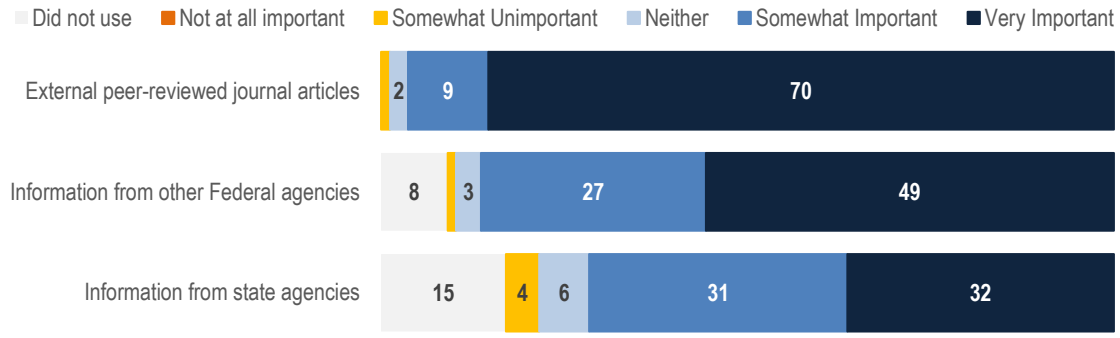

FIGURE 12. USE OF OTHER PRODUCTS IN DEVELOPING BOEM ASSESSMENTS, N=88

Citation Analysis. In addition to BOEM published study reports, BOEM assessment documents consistently cited peer-reviewed journal articles that resulted from BOEM studies. However, these study-related journal articles were cited less frequently than BOEM study reports (Figure 13). The difference between the frequency of citations to BOEM study reports and peer-reviewed journal articles is especially clear from 2011 to 2018. This finding could be explained by the content of a BOEM study report, which is often more detailed than a journal article and often includes information not published elsewhere.

Of the total number of BOEM study reports in the study inventory, 40 percent were cited at least once in an assessment. This ratio is much lower for BOEM related peer-reviewed journal articles (11 percent). This finding suggests that certain BOEM study reports may inform a greater number of assessments than BOEM-related peer-reviewed publications.

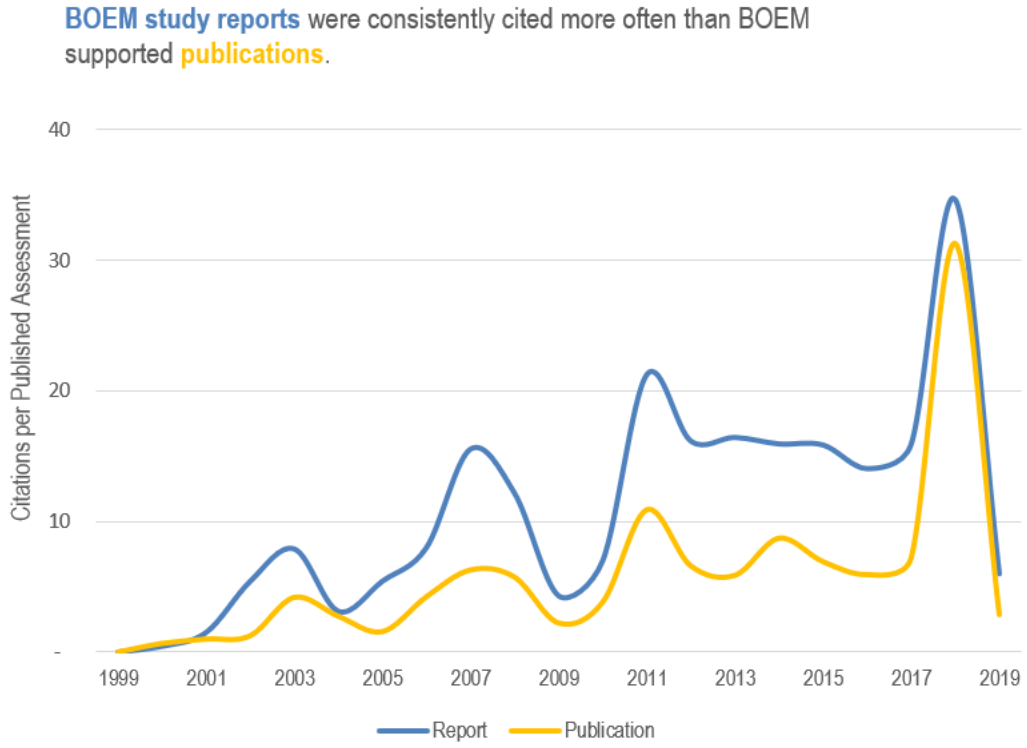

FIGURE 13. CITATIONS OF BOEM STUDY REPORTS AND BOEM PEER-REVIEWED JOURNAL ARTICLES IN BOEM ASSESSMENTS

An individual study can produce one or many BOEM study reports or BOEM related peer-reviewed journal articles. Considering citations at this overall study level, 45 percent of studies were cited in at least one BOEM assessment document during the period of analysis (1999–2019). Some studies did not have any associated study products; after removing those studies from the analysis, IEc found 49 percent of studies with at least one study product were cited at least once. As expected, there was a positive relationship between the number of study products produced by a study and the number of citations in BOEM assessments. Of the studies that BOEM assessments did not cite, 75 percent had three or fewer study products (the average number of study products for a study with citations was slightly over eight). Appendix E lists the studies that did not have an identified citation in at least one BOEM assessment document.

5.2 Q2. How well do assessments inform studies?

Analyses indicate that information needs identified in assessments do inform studies, as BOEM staff develop study ideas based on their experience conducting assessments and their perspective on what information will be needed in future assessments. However, assessment documents themselves do not comprehensively or systematically record information needs. This makes it difficult to track what information needs exist, and the extent to which studies are adequately addressing information needs. Manual effort was required to search throughout the text of the assessment inventory for keywords and phrases indicative of information needs, and in many cases the results were too general to trace the information need to future studies.

There are also other sources for study ideas (e.g., input from other federal and non-federal public agencies, or public comments) and several challenges to getting a study idea funded, even if it is developed into a study profile. Challenges include appropriately targeting BOEM's highest priorities, funding, and timing. Each fiscal year, there is a limited budget for funding studies to address BOEM's information needs. Additionally, external events or pressing stakeholder needs may dictate a short-term realignment of priorities and therefore which study profiles are funded each year. However, the frequency at which survey respondents indicated that proposed studies were not advanced due to low priority for BOEM signals a need for greater transparency around the study profile selection process. In interviews, BOEM staff discussed lack of management buy-in or misunderstanding of a study by the STR team. This perception of "lack of support" suggests that BOEM staff may be confused or uninformed about BOEM priorities (due to lack of information regarding those priorities) or may need to work on better communicating the justification for the studies that they believe are addressing BOEM priorities. This issue may point to a need for greater transparency in Bureau-wide priorities for study funding, wider distribution of selection criteria, or formalizing the decision-making process.

1. Are information needs identified through the assessment process being developed into studies?

Interviewees overwhelmingly reported that BOEM develops studies based on information needs identified in assessments and provided several specific examples of this part of the feedback loop. The topic trend analysis results support this, suggesting a connection between assessments focused on wind energy development and oil and gas activities and subsequent studies focused on those topics. In addition, 55 percent of survey respondents indicate that their own scientific work, including work on assessments, was a source of study ideas, which is intuitive given the number of BOEM staff who conduct both assessments and studies. Finally, in a question about how study ideas originate, some survey respondents specifically added "environmental assessments" as a write-in answer description in addition to the available response options, implying a connection between information needs identified in assessments and the study development process.

However, as noted above, the assessment documents do not identify information needs comprehensively or systematically. Although BOEM staff strongly report that information needs in assessments inform their study ideas, the assessment-to-study part of the feedback loop mostly relies both on individuals interpreting their information needs and on individuals or groups communicating why an information need should be addressed. Therefore, information needs may reflect what is objectively most important for BOEM to address, or they may reflect the suggestions of those who most effectively champion their study. The process also does not have a mechanism to identify persisting information needs that are being left unaddressed.

Interview Coding and Qualitative Analysis. Interviewees overwhelmingly reported that BOEM does develop studies based on information needs identified in assessments. Interviewees identified assessments as the primary source of information needs. They also noted that BOEM pursues some studies based on anticipated information needs for future assessments; one interviewee provided the potential development of floating offshore wind turbines in the Pacific as an example. Most interviewees were able to reference specific examples of instances where BOEM addressed assessment information needs in studies. Interviewees also mentioned some specific examples of persistent information needs in assessments that have not been fully addressed by studies, such as social sciences and environmental justice topics.

Survey Analysis. The survey asked BOEM staff where study ideas originate (Figure 14). Notably, other management and staff at BOEM was the most frequently selected origin for study ideas in the survey. Respondents also indicated relatively high response rates for origin of study ideas from outside of environmental assessments, including input from other federal agencies, public agencies, and public comment. However, study ideas may also emerge from respondents' own scientific work, including work on assessments, which is intuitive given the large number of BOEM staff who conduct both assessments and studies. In addition, though assessments were not included in the list of "select all that apply" answers to this survey question, some survey respondents (3 percent of 115 total) added environmental assessments as a write-in answer description for "other."

FIGURE 14. ORIGIN OF STUDY IDEAS, N=115
Open-ended survey responses to this question were qualitatively coded as "select all that apply" options. Where respondents offered more than one "other" origin, these were individually coded as different origins. As such, the "other" sub-categories should not be summed.

Information Needs Tracing. IEc reviewed funding information to consider whether BOEM was developing identified assessment information needs (coded by topic) into studies. This analysis found moderate to strong positive correlation results for a variety of assessment information need topics and funding levels. Positive correlations indicate that the more times assessments identified an information need, the more funding that studies examining this topic received. Overall, topics that had more identified information needs had higher total studies funding. The topics where information needs had the strongest positive correlation with study funding over time were birds and bats, oil spills, and benthic communities. Renewable energy development, wind, coastal and estuarine habitats, and fish (including essential fish habitats and threatened and endangered fish) also had relatively high (moderate to strong) positive correlations between identified information needs and studies funding levels.

However, the results were not consistent across all assessment information need topics. Topics that had fewer than 25 separate instances of information needs identified in assessments had weaker correlations between information needs and studies funding, implying less or no existing relationship between information needs identified in an assessment and subsequent study funding. If the frequency with which topics are highlighted as an information need in assessments is used as an indicator of priority, BOEM has effectively targeted its ESP funding dollars. In other words, in recent years, *BOEM's investments (in terms of dollars as opposed to numbers of studies) appear to target the priority information needs identified in assessments well*.

IEc's information needs tracing work was complicated by the fact that assessment documents generally do not systematically account for information limitations or recommended directions for future research. Manual effort was required to search throughout the text of the assessment inventory for key words and phrases indicative of information needs, and in many cases the results were too general to trace the information need to future studies. A more intentional subsection of assessments that articulated the information needs that would improve upon future analyses and assessments would better enable tracing between assessments and studies.

Topic Trend Analysis. The topic trend analysis focused on exploring the relationship between the topics addressed by environmental studies and environmental assessments (for more details and results of the topic trend analysis, see Appendix F). Such an analysis does not establish causality between the assessment process and studies. Instead, IEc tested the underlying hypothesis that the topics addressed in both studies and assessments would generally be correlated with one another over time (see Figure 15 for an example). Overall, IEc did not find a correlation for most topics. IEc identified two strong correlations, both positive, for renewable wind energy development and oil and gas activities.[26] The positive correlations implied that topics discussed in assessments were covered in studies in subsequent years for renewable wind energy development and oil and gas activities. These correlations remained strong and positive when considering a one-year lag between topics in assessments and studies. They were still positive, but less strong, when adjusting for a potential two-year lag. No other topics had strong correlations, either negative or positive.

IEc also examined alternative explanations for trends in topics by examining funding levels for ESP by office or region and coded topic. This analysis found that BOEM has largely concentrated study funding in the Alaska (30 percent of total studies funding) and GOM (38 percent) offices and regions from 1999 through 2019, but it has varied by office and region over the timeframe of analysis (Figure 16). The Atlantic is now one of the top funded offices and regions, compared to some of the lowest funding levels early in the period of analysis (1999–2019). This is not surprising given the growing interest in renewable energy in the Atlantic Region over this same time.

IEc also investigated potential trends by study topic. Study funding varied noticeably over time. Studies that could be categorized as related to oil and gas activities (e.g., oil spill risk analyses) received more than 80 percent of funding at the start of the period of analysis but amounted to less than half of annual studies funding in recent years. Marine mammals and physical oceanography were the topics with the second and third highest total study funding; however, they represent two different trends: marine mammals funding increased in recent years while physical oceanography decreased.

These findings are largely consistent with the analysis of the number of studies by topic over time (see Appendix F for additional results). As expected, IEc's analysis of the topic trends and funding amounts over time identified a positive correlation for nearly all topics reviewed.

[26] IEc's correlation analysis calculated a Pearson correlation coefficient. The correlation coefficient ranges from -1 to +1, where weak positive correlation is a coefficient of +0.30, moderate positive correlation is a coefficient of +0.50, and strong positive correlation is +0.70. Positive values indicate that when one variable increases the other value increases as well.

NUMBER OF RELATED STUDIES

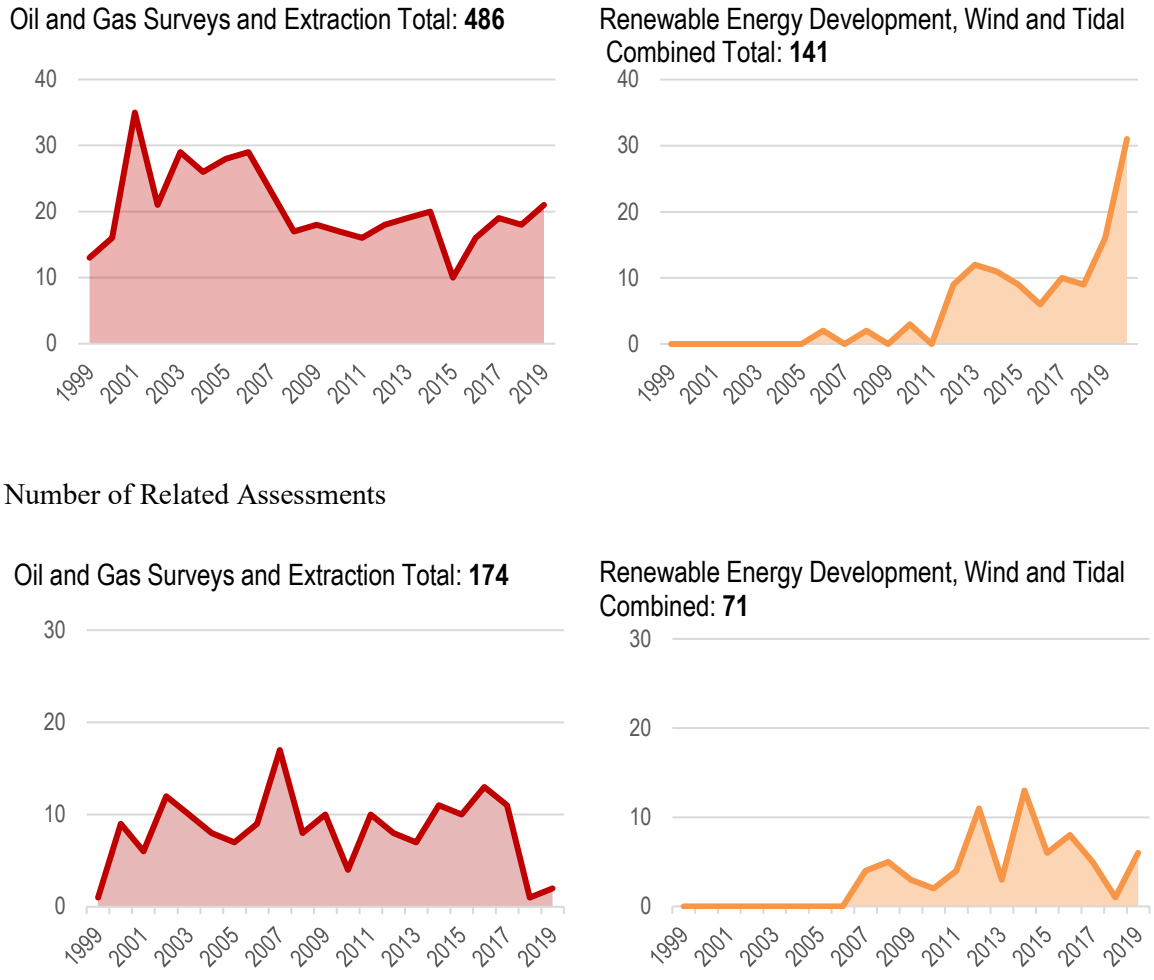

FIGURE 15. TOPIC TRENDS RELATED TO OIL AND GAS SURVEYS AND RENEWABLE ENERGY DEVELOPMENT

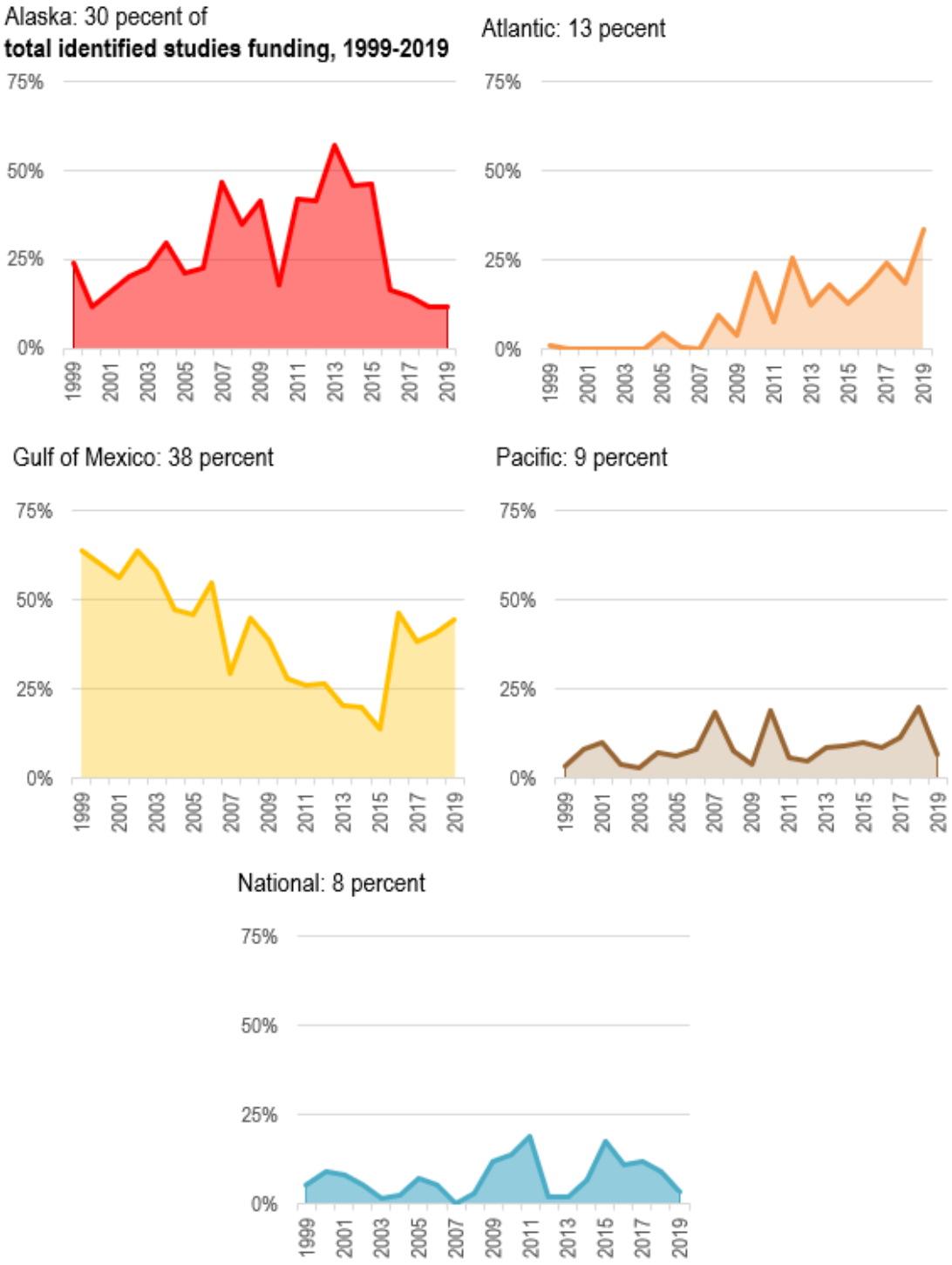

FIGURE 16. PERCENTAGE OF TOTAL IDENTIFIED STUDIES FUNDING BY REGION, 1999-2019
The trends listed here may be related to the large-scale effort to understand and address the impacts of the 2010 Deepwater Horizon oil spill, particularly in understanding GOM trends. See Figure F-39 in Appendix F.

A. IF YES, HOW DO THE RESULTS OF THE STUDIES ADDRESS THE INFORMATION NEEDS IDENTIFIED IN THE STUDY PROFILES? B. IF NOT, WHY?

Based on the survey and interview results, studies generally address the information needs that they seek to answer. Several interviewees across multiple offices and regions discussed research on marine mammals as an example of the strength of the BOEM studies program in addressing information needs. However, as reported by interviewees, in some cases the information needs section of the study profile does not include enough detail to sufficiently explain how BOEM will use the data from the study. Other times there may be a disconnect between the individual authoring the study profile and the individual authoring the statement of work, which may result in a study addressing an information need that is different than the original study profile. In both cases, interviewees recommended building in additional rigor and checks in the study development process to better ensure that the results of the studies address the information needs identified in the study profiles. Interviewees also indicated issues with timing which may hinder the ability of studies to address identified information needs.

Survey data also identified some challenges to BOEM pursuing an information need, even if developed into a study profile. Challenges to study profile selection include appropriately targeting BOEM's highest priorities, funding, and timing. Each fiscal year, there is a limited budget for funding studies to address BOEM's information needs. Additionally, external events or pressing stakeholder needs may dictate a short-term realignment of priorities and therefore which study profiles are funded each year. However, the frequency at which survey respondents indicated that proposed studies were not advanced due to low priority for BOEM signals a need for greater transparency around the study profile selection process. Additional detail on the results of individual analyses is presented below.

Interview Coding and Qualitative Analysis. Interviewees across all offices and regions overwhelmingly agreed that studies address the information needs identified in the study profiles.[27] Specifically, interviewees indicated that well written study profiles with a straightforward and clearly laid out "information need" section typically received funding and resulted in studies that addressed this need. Interviewees also acknowledged that not every study addresses the information needs as originally intended in the study profiles. For example, one interviewee mentioned that some studies result in more questions than answers about a specific topic once research is underway. This may be due to the nature of scientific research: newly identified questions can inform future studies.

Overall, interviewees also agreed that studies generally address the information needs they seek to answer. Several interviewees across multiple offices and regions pointed to research on marine mammals as an example of the strength of the BOEM studies program in addressing identified information needs. However, as reported by interviewees, in some cases the information need section of the study profile does not include enough detail to sufficiently explain how BOEM will use the data from the study.

[27] The interview question asked "Overall, do you think the result of studies address the information needs that are identified in their initial study profiles?"

Interviewees also indicated that study statements of work do not always clearly map to the information needs articulated in the study profile. For example, there may be a disconnect between the individual authoring the study profile and the individual authoring the statement of work, which may result in a study addressing an information need that is not clearly aligned with the original need identified in the study profile. Interviewees recommended building in additional rigor and checks in the study development process to better ensure that the results of the studies address the information needs identified in the study profiles. Interviewees also indicated issues with timing which may hinder the ability of studies to address identified information needs. Aligning the timing of a study to target use in a particular future assessment is a challenge.

Given the length of time needed to complete the ESP process from start to finish, several interviewees provided examples of their office using operational funds to fund studies that ESP otherwise would not have funded or would not have funded as quickly. Despite this critique, some interviewees noted the Bureau has some flexibility to focus on more urgent studies and immediate needs. Interviewees also recommended that a more streamlined ESP process could address this issue. The ability of each office to use alternative, non-ESP funding for meeting information needs varies across offices and regions. Offices with smaller operational budgets are often limited in their ability to fund model development and other information needs outside ESP. Some interviewees noted that operational funds had limitations, and studies funded outside of the ESP process may not reflect the ESP's priorities.

A number of interviewees perceived that some BOEM staff have proposed and received funding for studies relevant to their areas of expertise within BOEM although these studies did not align well with priority information needs for assessments. Some of the interviewees suggested that this may be because BOEM staff are not always well aware of high priority information needs and so they propose studies that would be of interest in the context of their own work. However, studies are more likely to fill priority information needs if proposed study ideas stem from understanding of specific research needed to inform future assessments as opposed to being based on the professional interests of individual staff. While the professional interests of BOEM staff are not necessarily in conflict with BOEM assessment information needs, they are also not necessarily reflective of the highest priority information needs. Of note, a number of these interviewees expressed that increasingly the studies are more useful because they are focused on BOEM's information needs as opposed to expanding scientific knowledge more generally.

Survey Analysis. To examine why information needs identified through the assessment process may not become a study, the survey asked respondents about their experience with developing study profiles. To start, the survey asked respondents about the total number of study profiles they personally submitted as lead in the last three years. Nearly 39 percent of respondents who work on studies indicated they did not submit any study profile, nine percent submitted one, and 52 percent submitted two or more (of 114 total respondents). Of those who submitted studies (61 percent of 69 total respondents), 24 respondents had studies that were not included in the SDP, while 20 respondents had one study included in the SDP. More than one-third of respondents had submitted a study profile that did not receive funding. This result suggests that the SDP selection process is competitive, with limited funding to allocate across all BOEM regional offices. Funding was identified as an important reason why study profiles may not advance (9 respondents), as was lack of management buy-in or misunderstanding of a study by the STR team (11 respondents). While the STR team does not make decisions regarding study advancement, the team's interpretation of a study may influence the managers' decisions. Some staff communicated that their

studies were not funded due to funding constraints, "lack of buy-in," or "misunderstanding" of a study's purpose. However, 22 respondents explained in an open-ended response that the reason why a study does not advance is because the study is either not a priority or is a lower priority for BOEM than other proposed studies. This points to a need for greater transparency around both the Bureau's priorities and the study profile selection decision-making process. For example, BOEM does not currently provide a detailed rubric and ranking process to set expectations for study profile submission, which may improve the caliber of proposals submitted.

5.3 Q3. HOW DOES THE FEEDBACK LOOP FUNCTION?

The feedback loop functions through formal communications—such as study reports, presentations, and ESPIS—but also relies heavily on informal word of mouth to communicate information on both studies and assessments. Presentations were among the top three modes of internal results dissemination identified by survey respondents. Importantly, most respondents also consider presentations useful for *receiving* information about BOEM studies. Despite BOEM's efforts at consolidating studies information in ESPIS, less than 60 percent of the survey respondents indicated that they disseminate information about study findings using ESPIS. Although BOEM's internal mechanisms, by default, require that the COR submit a study report to ESPIS (via the ESPIS data manager or team), interviewees and survey respondents do not view this step as sufficient for information dissemination.

1. HOW ARE THE RESULTS OF STUDIES COMMUNICATED INTERNALLY (CONSIDER BOTH FINAL AND INTERIM RESULTS)?

Multiple analyses indicate that the results of studies are communicated internally, but there is room to improve internal communications. Survey results indicate that studies are communicated internally at BOEM predominantly through word of mouth, study reports, and presentations. Interviewees emphasized the importance of communication and collaboration as a vital piece of the feedback loop, but they acknowledged that communication of study results typically occurred through informal channels. This finding is consistent with the survey findings that "word of mouth" was a common communication method. Further, network analysis showed that BOEM has a well-connected network, defined mainly by close intraoffice connections and frequent interactions with staff at OEP.

Interview Coding and Qualitative Analysis. Most interviewees stated that the feedback loop functions overall, but that BOEM staff could improve their internal communication on study findings. Interviewees emphasized the importance of communication and collaboration as a vital piece of the feedback loop, but

they acknowledged that communication of study results typically occurred through informal channels.[28] This is consistent with the survey findings, discussed below, that "word of mouth" was a common communication method. Multiple interviewees advocated for more digestible and varied methods to disseminate study results, emphasizing that staff typically do not have time to read through longer study reports.

Overall, there were consistent findings across offices and regions. However, multiple interviewees mentioned that because of the reliance on informal communication, smaller offices or teams may have a stronger feedback loop compared to larger offices.

Survey Analysis. The survey analysis indicates that the results of studies are communicated internally at BOEM predominantly through word of mouth, study reports, and presentations (Figure 17). Study reports and presentations are expected, as they are conventional for science communication. The popularity of word of mouth as a mode of communication suggests that peer-to-peer conversations are an important piece of the feedback loop at BOEM. Formal avenues of information dissemination (e.g., quarterly reports) are beneficial for archival or query purposes, but are not considered as useful a means of receiving information as study reports, presentations, and peer-reviewed articles (Figure 17).[29]

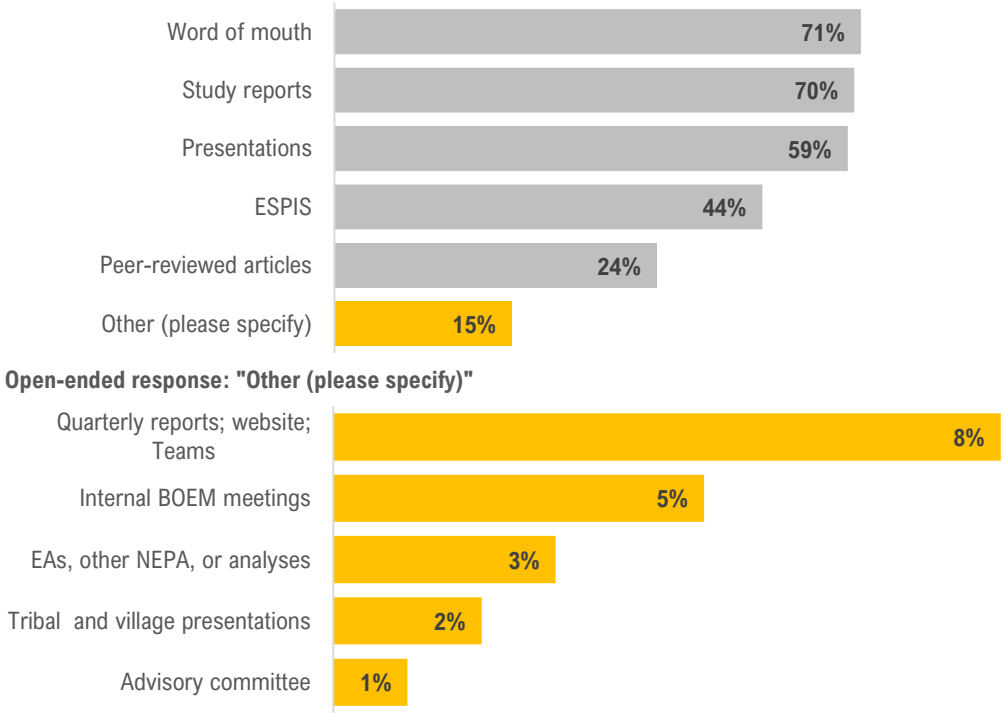

FIGURE 17. METHODS OF DISSEMINATING INFORMATION ABOUT STUDY FINDINGS WITHIN BOEM, N=111

[28] In written comments provided on the draft report, one reviewer noted the "number and diversity" of internal study presentations, final findings, and mid-term findings. According to the reviewer, the issue may be in part that SMEs are unable to attend all these presentations.

[29] Survey question: "For each item, please indicate its usefulness to receive information about studies in the past year."

Compared to other methods for communicating study results, ESPIS and peer-reviewed articles were cited less frequently, which aligns with interview results. ESPIS received critique from interviewees regarding its navigability, and likely received an inflated survey response because it is a required mode of reporting for BOEM studies. Survey respondents reported peer-reviewed articles with study findings as important for receiving information about studies (Figure 18). However, ESPIS was considered the least useful mode to receive information about studies at BOEM.

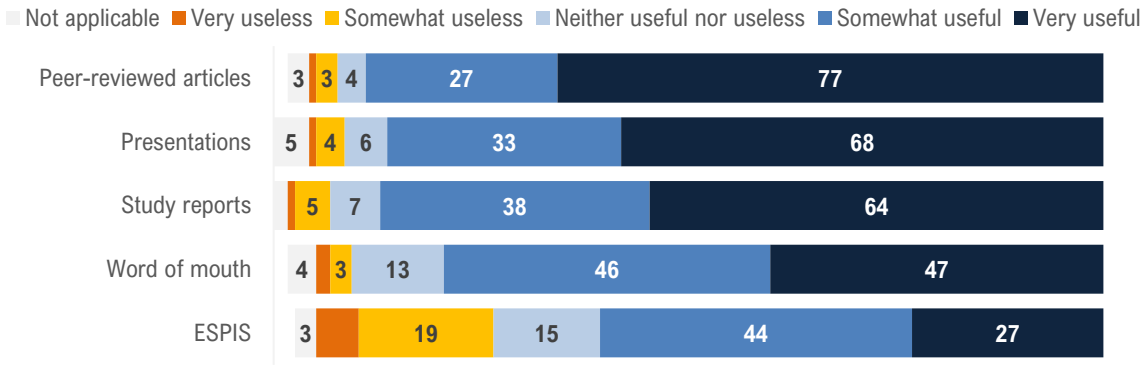

FIGURE 18. REPORTED USEFULNESS OF VARIOUS METHODS FOR RECEIVING INFORMATION ABOUT STUDIES, N=117

Open-ended responses to the survey suggest that BOEM resources (e.g., Quarterly Report, the BOEM website, and Microsoft Teams) and BOEM meetings are also avenues for communicating study results. However, these modes of internal communication may not be sufficient to meet BOEM staff needs. Thirty survey respondents specifically stated in an open-ended response that more frequent sharing of information about study results, including presentations and/or written summaries of study findings, would be beneficial (of 126 responses).[30] Twenty additional respondents suggested involving studies managers and staff directly in assessments work, whether in "doing the homework" of NEPA assessments, or in "drafting and/or overseeing environmental assessments" as a hands-on way to demonstrate what types of information are most needed in assessments (of 126 responses).

SNA. Network analysis shows that BOEM consists of a well-connected network, defined mainly by close intraoffice connections, and frequent interactions with staff at OEP. BOEM study and assessment staff reported directly engaging with an average of 11.5 contacts across the Bureau, of which 4.5 were located at OEP and 5.6 were reported within each staff member's own office.[31] These connections often involve

[30] Survey question: "If you could change one thing to strengthen the 'feedback loop' between studies and assessments, what would it be, and why?"

[31] These results were calculated based on survey responses asking respondents with whom they interact within BOEM. The survey limited respondents to a maximum of 20 responses. Fifteen percent of survey respondents filled out all 20 connections, including at least 10 percent from each office except for the MMP (no respondents filled out all 20 contacts). This suggests that the number of connections with whom BOEM staff interact is likely higher than the averages reported here, as some respondents likely would have reported more contacts if given the space.

information sharing. Staff indicated that they share information with an average of 9.7 contacts. Again, this information sharing occurs most frequently within staff's own office (4.8 contacts) and with OEP (3.7 contacts). These close connections with OEP and between intraoffice staff suggest that these are the major pathways of information flow. While frequent contact in staff's own offices likely indicates strong communication of study results and other information within each office, this relationship shows the strong need for OEP to facilitate the flow of information among offices, unless communication across the entire Bureau is increased.

Table 6 shows the average number of contacts reported by staff within each office or region. Of all offices and regions, OEP (13.4 contacts), Alaska Region (12.2), and the Pacific Region (11.4) reported contact with the highest number of staff. Although the Alaska Region reported the highest number of contacts (other than OEP), 89 percent of these were in either the Alaska Region or OEP, again suggesting limited communication with other BOEM offices or regions. MMP and OREP reported the fewest average contacts (9.0), although these interactions were less centered on OEP and each respective office compared to Alaska and the Pacific. Separate from the individual SNA analysis, survey respondents reported the office with which they most closely communicated. These responses aligned with the most frequent contacts listed in the SNA portion of the survey, suggesting agreement with individual responses.

TABLE 6. CHARACTERISTICS OF BOEM INTERNAL CONTACTS

Characteristic	All	Alaska	GOM	OEP	MMP	OREP	Pacific
Number of SNA Survey Respondents	*111*	*17*	*29*	*40*	*7*	*10*	*8*
Average Number of Internal Contacts	11.5	12.2	9.9	13.4	9.0	9.0	11.4
Average Number of Contacts at OEP	4.5	3.5	2.5	7.1	2.7	3.6	3.3
Average Number of Contacts in Own Office	5.6	7.4	6.2	7.1	4.0	3.7	5.0
Other Office (excluding OEP) with Highest Avg. Contacts	N/A	Pacific (0.6)	MMP (0.6)	GOM (1.9)	GOM (1.6)	Pacific (0.7)	OREP (1.5)
% Listing 20 Internal Contacts (maximum allowed in survey)	15.3%	17.6%	10.3%	22.5%	0.0%	10.0%	12.5%

Note: OEP = Office of Environmental Programs

Figure 19 illustrates the BOEM information network, as depicted through survey responses. Nodes (i.e., dots), color coded by office, represent staff members, while edges (i.e., lines) depict the directionality and the type of interactions between individuals; purple indicates interactions occurring due to work on assessments, orange indicates interactions due to work on studies, and green indicates interactions covering both studies and assessments.[32] As shown, OEP plays a central role in connecting staff across

[32] Thicker edge lines indicate more frequent interactions.

BOEM. The nodes in the network center around closest/most frequent connections.[33] As displayed, this resulted in clustering within each office, with OEP taking a central role between contacts. These connections were fairly balanced across relationships based on communication regarding assessments (37 percent), studies (33 percent), and both types of interactions (31 percent).[34]

The average number of staff that the network must "run through" to connect any two staff (i.e., average path length for this network) is 2.6. The longest distance between any two nodes (i.e., the network diameter) is 5.0. The average path length increases to just over 3.0 when excluding OEP from the network, while the average number of contacts—when excluding both OEP and intraoffice staff—is just 1.9. Within the full network, our SNA analysis revealed the presence of six communities (i.e., tightly clustered groups).[35] This data suggests that subnetworks within BOEM are generally centered around each office, although as Figure 19 shows, there are some BOEM staff whose "primary community" may not be their own office. In certain cases, such as MMP, this is anticipated based on the known structure of the office within GOM. For others it may reflect the communities built from common subject matter expertise or similar functional roles of staff in different regional offices. Looking at interactions between these subnetworks may provide an opportunity for BOEM to review information sharing across each of these networks.

The network's modularity (a measure of how strongly a network is broken into groups or clusters) is 0.435. A higher modularity indicates weaker connections between groups. This can be seen when looking at the network while excluding OEP, which results in an increase in modularity of nearly 40 percent to 0.607. This again suggests that the presence of OEP keeps the overall network more closely grouped. Appendix F provides additional details on this network analysis.

[33] We used the ForceAtlas2 alignment in Gephi, an SNA software, to generate this clustering effect.

[34] The survey question asked: "For each person, please indicate how often you interact, types of interactions (formal, informal), you have with the person related to your studies and/or assessment work. Please use the drop-down menu in each column to indicate your answer. Formal interactions include shared workgroup assignments, joint programs, boards, etc. Informal interactions include emails, phone calls, conversations, etc."

[35] This analysis was based on output from the Gephi SNA software. The software identified several single node communities, which we do not include in this total.

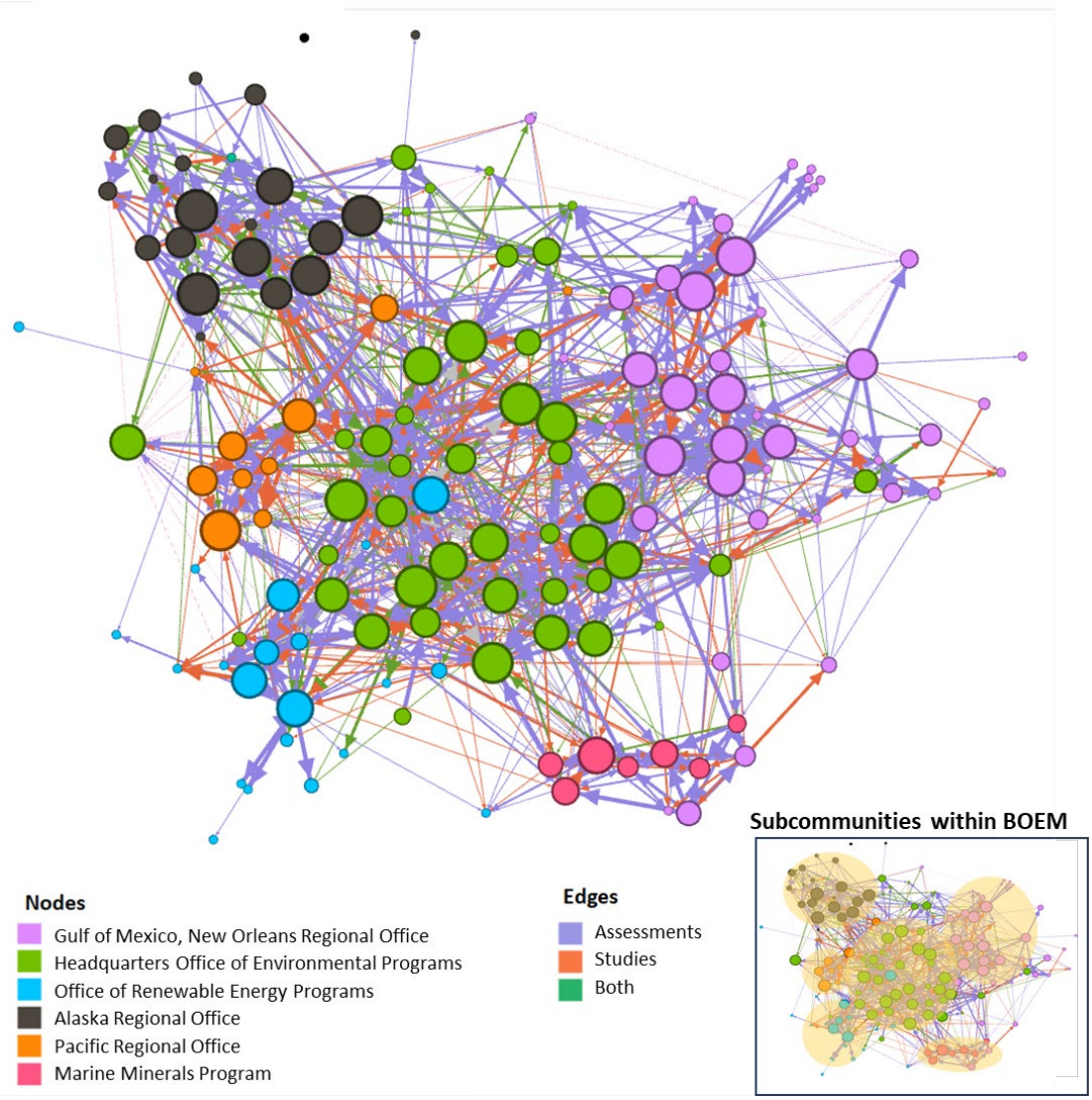

FIGURE 19. BOEM INTERNAL NETWORK

A. ARE THE RESULTS PRESENTED INTERNALLY?

Presentations were among the top three modes of internal results dissemination identified by survey respondents. Importantly, most respondents also consider presentations useful for receiving information about BOEM studies. Interview results provide additional context to internal presentation practices and indicated less consistent internal presentation practices compared to the survey results. Some interviewees indicated teams had discussions or presentations, while others acknowledged that most discussions were informal. Examples of existing practices for sharing study results include brown bag lunches, webinars, and "lunch and learn" events.

Interview Coding and Qualitative Analysis. The coding and analysis of interviews is consistent with the survey analysis in that the presentation and sharing of study results appears to be an area for improvement. Interviews suggested some differences in internal presentation practices across offices and regions. Some interviewees indicated teams had discussions or presentations, while others acknowledged that most discussions were informal. Examples of existing practices for sharing study results included brown bag lunches, webinars, and "lunch and learn" events. Even in offices that interviewees mentioned have more formal presentations to share study results, these were typically occasional events. Interviewees indicated these study presentations are essential for assessment staff, who otherwise might not have time to digest and integrate studies results into assessments.

Some interviewees also mentioned asking staff directly involved in a study, or who might be knowledgeable on the topic, about relevant studies.

Survey Analysis. As mentioned in Section 5.3.1, most survey respondents identified presentations as a means of study results dissemination (71 percent of 111 total). In fact, presentations were among the top three modes of internal results dissemination identified by survey respondents. Importantly, most respondents also consider presentations useful for *receiving* information about BOEM studies (86 percent of 117 total). Presentations were among the top two preferred internal modes of communication for study results. Eight respondents recommended presentations as a means of enhancing the feedback loop within BOEM.[36]

SNA. Network analysis results indicate that BOEM staff have formal interactions about studies and assessments with their personal contact network.[37] When asked if their interactions with other BOEM staff were formal, informal, or both, respondents reported having formal and/or both types of interactions with 73 percent of their contacts, perhaps indicating that many of these interactions involve presentations or debriefs. Similarly, BOEM staff reported that they share information with 83 percent of their contacts, further suggesting that the nature of many relationships within BOEM facilitates information sharing. While formal interactions may suggest presentations, the SNA also often documented a two-way flow of information between contacts with formal interactions. Survey respondents reporting formal interactions mutually reported each other as contacts (39 percent of interactions) at a rate similar to those reporting formal or informal interactions (36 percent).[38] Figure 20 shows the BOEM social network when limited to formal interactions. The average path length (2.8) is similar to the overall network (2.6), while the number of communities (six) is identical to the overall network, suggesting that formal interactions and general interactions follow the same patterns. Thirty-seven percent of these formal interactions pertained to assessments, 31 percent to studies, and 33 percent to both types of interactions.

[36] Survey question: "If you could change one thing to strengthen the 'feedback loop' between studies and assessments, what would it be, and why?"

[37] Definitions provided to survey respondents: formal interactions include shared workgroup assignments, joint programs, boards, etc. Informal interactions include emails, phone calls, conversations, etc.

[38] Just over 10 percent of all respondents reported interactions with BOEM staff who did not complete the survey. Therefore, it is likely that these numbers would be slightly higher if all staff had completed the survey because some of these non-respondents likely would have reported interacting with other survey-takers.

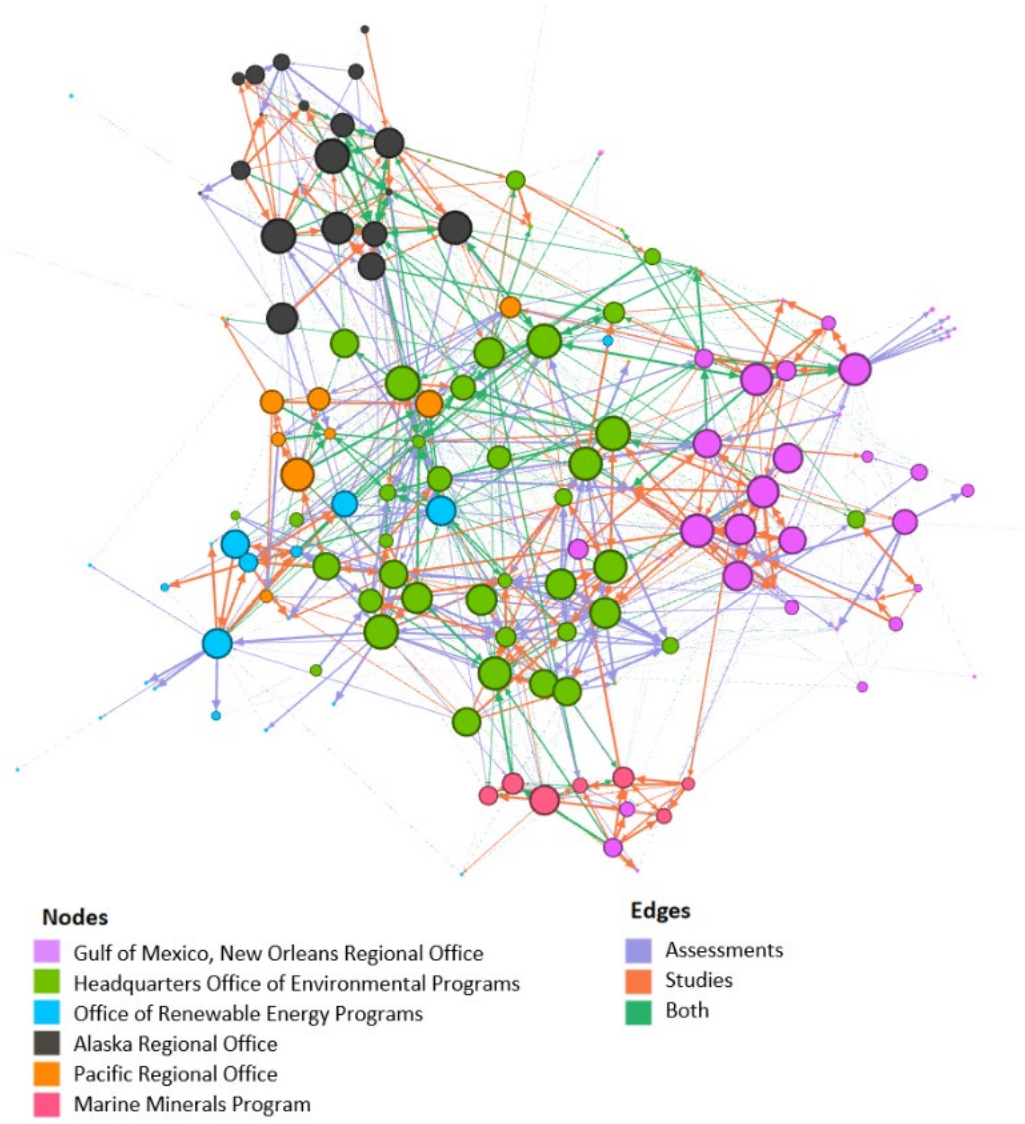

FIGURE 20. BOEM INTERNAL NETWORK WITH FORMAL INTERACTIONS ONLY

B. ARE THE RESULTS PUBLISHED IN ESPIS?

Despite BOEM's efforts at consolidating studies information in ESPIS, less than 60 percent of the survey respondents indicated that they disseminate information about study findings using ESPIS. Interviews reflected similar findings, and further illuminated that low rates of using ESPIS for information dissemination may be driven, in part, by negative experiences with ESPIS for obtaining information on studies. BOEM notes that ESPIS was designed to be a repository of studies as opposed to a searchable resource library.

Interview Coding and Qualitative Analysis. Interviewees acknowledged that ESPIS can be helpful and that it contains study results; however, many interviewees did not find ESPIS particularly effective or user friendly and did not consistently use it. Several stated a preference for searching on Google or BOEM web pages to identify relevant research over ESPIS, unless they already knew of a study and could easily find it in ESPIS. Interviewees reported issues with querying and indexing, which inhibited the ability of staff to quickly find studies. This interview finding is largely consistent with the survey.

Improving ESPIS is crucial for incorporating previous studies that are relevant to BOEM's environmental assessments. Multiple interviewees emphasized the limitations of ESPIS search and indexing functionality as well as occasional delays in uploading studies. Some acknowledged that ESPIS had improved in recent years. Most interviewees stated a preference for Google as a search engine, with one interviewee saying they occasionally found previous BOEM research they were not aware of via Google. This interviewee stated that people did not have confidence in ESPIS searches to find the relevant research. Some interviewees did acknowledge that if one knew what one was looking for then one could find it in ESPIS, but indicated that looking by theme or topic was not effective. Another interviewee echoed this sentiment and mentioned that sometimes people are not aware of relevant past studies and therefore do not include these during assessments, or possibly propose a study idea that is similar or identical to past research.

Survey Analysis. Upload of studies to the ESPIS repository is required at BOEM; however, only slightly over half of the survey respondents indicated that they disseminate information about study findings using ESPIS (59 percent of 111). Although the ESPIS team publishes BOEM study reports and study products in ESPIS, the study authors may not identify ESPIS as a method for disseminating study results because i) the authors are not themselves the individuals loading the study reports into ESPIS, and ii) they may view the study results as only being disseminated when they are actively shared (e.g., by sending a link to the study findings in ESPIS) rather than when they are logged in ESPIS.

A similar percentage of respondents reported ESPIS as being somewhat useful or very useful as a means of disseminating information (61 percent of 117). When asked about the feedback loop at BOEM, three respondents reported that ESPIS is not effective as a searchable database or as a means to effectively communicate key study findings to BOEM staff; [39] in fact, two of the three respondents reported that they found it easier to find results on Google. One respondent shared:

> *"ESPIS does not provide the results needed most of the time; in fact, it is often easier to search through Google to find what is needed. The results should come back with the high-lighted sections of the report focused on the search terms. The way that Google Scholar searches are returned is helpful."*

The respondent expressed the logistical challenges with ESPIS use succinctly; not only do queries within the ESPIS database not bring up desired results (even when searching with words or phrases in the study title), but they also do not focus the user on the portions of the report that triggered the search result. Google Scholar, on the other hand, does offer some of that desired functionality. Similar user-friendliness

[39] Survey question: "If you could change one thing to strengthen the 'feedback loop' between studies and assessments, what would it be, and why?"

and functionality challenges with ESPIS also came up in multiple interviews. In summary, improvements to the database to mimic Google Scholar may enhance the user experience. Of note, BOEM notes that ESPIS was designed to be a repository of studies as opposed to a searchable resource library.

C. ARE THE RESULTS SHARED USING THE ESP-PAT TOOL?

BOEM staff did not report using ESP-PAT as a dissemination mechanism. Furthermore, people familiar with the tool explained this was not its intended purpose. Overall, the survey, interviews, and ESP-PAT data itself indicate that BOEM staff do not often use ESP-PAT.

Interview Coding and Qualitative Analysis. Consistent with survey findings, interview results suggest low use of the ESP-PAT tool. One interviewee suggested that the ESP-PAT process should incorporate a peer-review process where staff evaluate whether the study was useful to them.

Survey Analysis. Only a small portion of survey respondents reported using ESP-PAT to report study results (16 percent of 111), and half of these work at OEP. As anticipated, 25 percent of survey respondents identified ESP-PAT as somewhat useless or very useless for receiving information about studies. When asked about the feedback loop at BOEM, one respondent reported that the ESP-PAT process needs to be more rigorous, involving peer review to evaluate whether a study addressed an assessment need.

Supplemental Document Analysis. Data directly from ESP-PAT suggests overall moderate usage rates across the Bureau, but with slightly higher use by the Alaska office or region (Figure 21). Despite these moderate usage rates, these data were useful for evaluating the feedback loop.

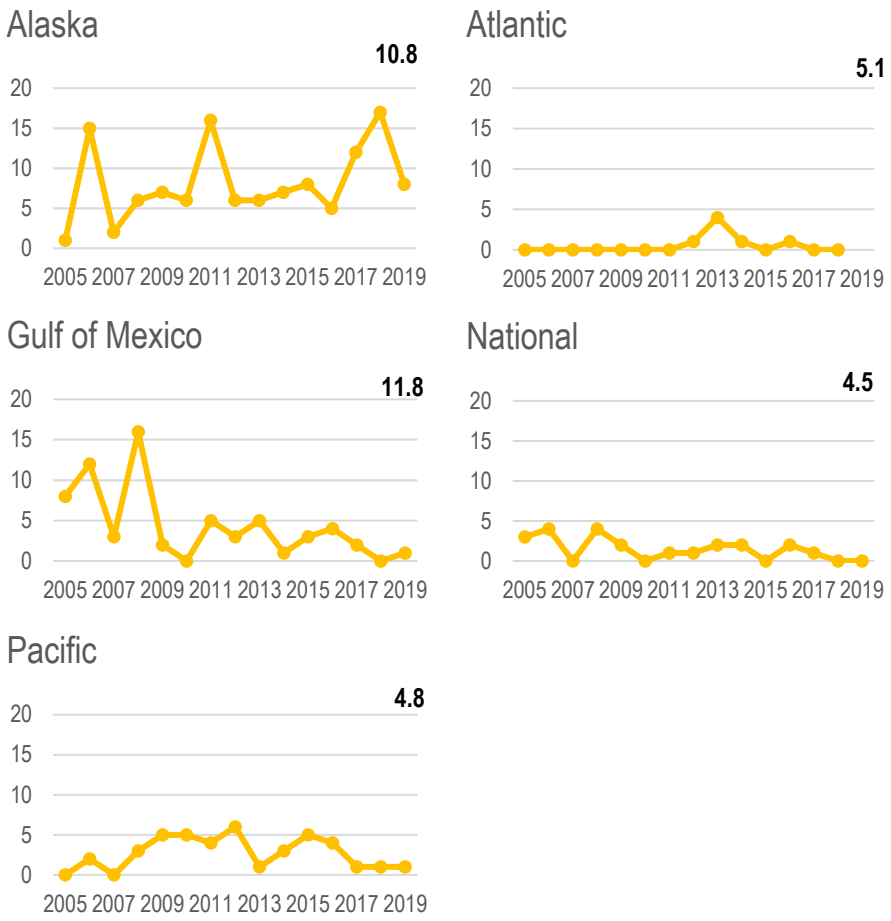

FIGURE 21. ESP-PAT SUBMISSIONS OVER TIME FOR EACH OFFICE OR REGION

The year of the ESP-PAT submission does not have to align with the year the study was completed. For context, we report the average number of studies completed each year in the upper right corner.

2. HOW ARE ASSESSMENT INFORMATION NEEDS IDENTIFIED?

A. WHO IDENTIFIES ASSESSMENT INFORMATION NEEDS?

BOEM assessment documents identify information needs within the assessment documents themselves, although this practice is more common for recent assessments. Additionally, many staff found that their experience and knowledge of their program, office, or region provided insight into existing or future assessment information needs. Consistent with the findings of the information needs tracing analysis, some assessments staff mentioned identifying information needs when creating the "Incomplete or Unavailable Information" section of NEPA documents.

Interview Coding and Qualitative Analysis. Interviews found that information needs come from multiple sources but that the primary source was typically from assessments staff, thus highlighting the importance of BOEM's internal communication network. Many staff found that their experience and

knowledge of their program, office, or region provided insight into existing or future assessment information needs. Consistent with the findings of the information needs tracing analysis, some assessments staff mentioned identifying information needs when creating the "Incomplete or Unavailable Information" section of NEPA documents. Some interviewees mentioned collaboration with other agencies on assessments as an additional source of information needs. The public and other stakeholders are also a source of information needs via public comments on assessments or other engagement, although differences exist across offices and regions. The most notable difference was an emphasis on coordination and collaboration with Tribes in Alaska as a method for identifying information needs. Other offices and regions also mentioned public comments and stakeholder engagement as a potential method for identifying information needs. Outside of Alaska, these were more often with industry stakeholder groups (e.g., fishing in the Atlantic or oil and gas in the GOM). Multiple interviewees noted that ongoing studies could also result in new study proposals where new information needs arose or where outdated information needed to be revised.

Survey Analysis. When asked about improvements to the BOEM feedback loop, survey respondents emphasized a need for a more simplified and structured way to receive information needs from assessments staff to develop into profiles. This critique tacitly recognizes assessments staff as the people who identify information needs; however, information needs may be identified in other ways, by other individuals.

Information Needs Tracing. BOEM assessments often identify information needs within the assessment documents themselves, but the approach for documenting these needs is not systematic or consistent and these mentions can be difficult to locate within the documents themselves. Assessments occasionally include a summary of uncertainties and limitations, identified information needs, or scientific knowledge gaps; however, IEc's review of environmental assessments often identified general descriptions of information needs, as opposed to a more specific need that may inform a study. In some assessments, public comments or other agency comments also identify information needs. These comments are usually included as an appendix to the main body of the document.

Our evaluation identified that the assessment documents most likely to include stated information needs are NEPA analyses, and this information is most frequently included within the "Environmental Consequences" sections of these documents. NEPA EISs can be quite long, and the information needs were often interspersed throughout the document. In more recent NEPA assessments, the EIS sections describing "Incomplete or Unavailable Information" (a requirement of NEPA) provide descriptions of information needs relevant to the context of the EIS. Following the Deepwater Horizon oil spill, these sections and more detailed information needs descriptions appeared to become standard practice in GOM assessments. However, the "Incomplete or Unavailable Information" sections are a requirement of NEPA analyses but not other types of assessments, and they are focused on the statutory requirements of these sections regarding information for evaluating reasonably foreseeable significant adverse effects on the human environment within the context of the specific EIS (40 CFR §1502.21). Accordingly, the purpose and scope of these sections is not intended to be inclusive of all information needs that may be useful or helpful to BOEM.

3. ONCE IDENTIFIED, HOW ARE THE INFORMATION NEEDS COMMUNICATED INTERNALLY?

A. WHO COMMUNICATES INFORMATION NEEDS?

Overall, survey and interview data indicate that BOEM staff and managers communicate information needs primarily through informal conversations with study and assessment colleagues, and through internal meetings. The SNA analysis also supports this finding regarding internal informal communication within offices. Though a popular means of communication, the largely informal, person-to-person information sharing is not a consistent or rigorous mode of information needs tracking. Although many SMEs across offices and regions mentioned having their own list of ideas based on their work, these were informal and not necessarily communicated between staff. The lack of a central repository systematically storing information needs prevents BOEM from better understanding connections between information needs and proposed efforts to address those information needs.

Interview Coding and Qualitative Analysis. Interviewees did not consistently or clearly define methods or systems for internally communicating information needs. Multiple interviewees stated that there was not a common or centralized place for information needs. Many SMEs across offices and regions mentioned having their own list of ideas based on their work, but these were informal and not necessarily communicated between staff. This communication appeared to be mainly word of mouth, SME discussions, and institutional knowledge. Different offices and regions have varying degrees of communication, but generally all had informal processes for sharing and tracking information needs.

Many interviewees noted that informal discussion may sometimes be adequate to identify and develop study profiles from information needs. However, interviewees expressed that a more systematic way to share information needs with the people writing the study profiles would better facilitate the process. Two interviewees stated that staff turnover and training are also important components to consider for the identification and communication of information needs in the feedback loop. Staff from offices and regions with more frequent communication between studies and assessments staff tended to believe that these connections result in a stronger feedback loop from information needs to study ideas. This level of engagement is relatively subjective in the interview process and is better observed and evaluated in the SNA analysis.

Survey Analysis. Most survey respondents cited informal conversations with BOEM study colleagues as the mode of communication for study ideas (98 respondents), followed by internal BOEM meetings (92 respondents) and informal conversations with BOEM assessment colleagues (81 respondents, Figure 22). Though a popular means of communication, the largely informal, person-to-person information sharing is not a consistent or rigorous mode of information needs tracking. Identification and communication of information needs and/or study ideas was identified as a key area of the BOEM feedback loop that could use improvement by 31 total survey respondents. Eleven survey respondents suggested maintaining a more formal running list of information needs at a shared or mutually accessible location, where information needs can be recorded in real time; however, such a system may require both buy-in and support from a champion to be effective. Twenty survey respondents reported an interest in more regular

communication between studies and assessments staff and managers alike about information needs and recommended that this communication begin with or include hands-on experience with writing assessments to give studies staff a better sense of the type of information needed in an assessment (exposure to end-user context).

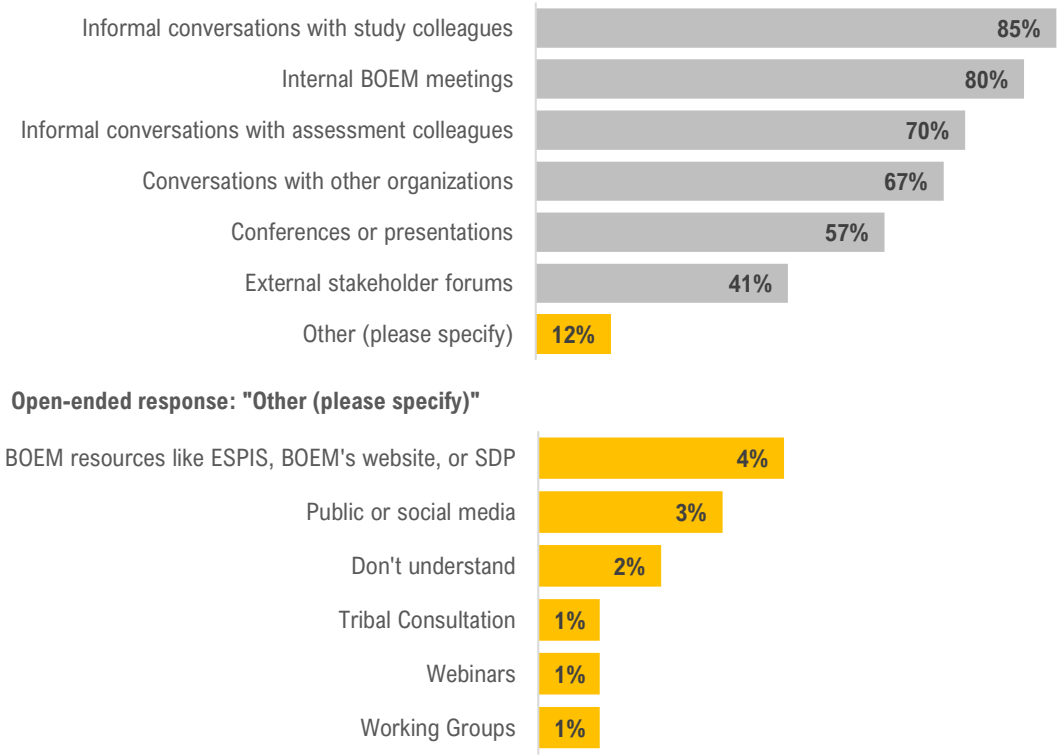

FIGURE 22. FREQUENCY OF HOW INFORMATION ABOUT STUDY IDEAS IS SHARED, N=115

SNA. As described previously, the BOEM network is well established for communication to flow within individual offices and through OEP. The nature of these interactions may limit the ability for information needs to flow effectively across all of BOEM, since this suggests that regional staff are not always in touch with what is going on in other offices, unless this is communicated through OEP. Based on the limited number of interactions that BOEM staff have with other offices, it is likely that staff are communicating information needs mainly within their own office or to OEP. As such, there may be an opportunity to increase the awareness of available information from other offices at BOEM through increased communication. Table 7 shows a matrix of the average number of contacts that BOEM staff at each office reported having across the other offices. Interactions are limited outside of each internal office or region and OEP. Connections with other offices and regions, excluding OEP, only reach or exceed an average of one contact in interactions between the GOM and MMP, the GOM and Pacific Regions, and OREP and the Pacific Region. Conversely, MMP respondents reported no interactions with Alaska or the Pacific Region. Although these interactions do not specify if they are centered around information needs, the limited interactions between non-OEP offices create limited opportunities for information needs to be communicated across these channels.

TABLE 7. AVERAGE NUMBER OF BOEM CONTACTS BETWEEN OFFICES

Area	*N*	All	Alaska	GOM	OEP	MMP	OREP	Pacific
All	111	11.4	1.6	2.6	4.5	0.6	1.1	0.9
Alaska Region	17	12.2	7.4	0.4	3.5	0.0	0.4	0.6
GOM Region	29	9.9	0.2	6.2	2.5	0.6	0.2	0.2
OEP	40	13.1	1.0	1.9	7.1	0.5	1.5	1.0
MMP	7	9.0	0.0	1.6	2.7	4.0	0.7	0.0
OREP	10	9.0	0.3	0.3	3.6	0.4	3.7	0.7
Pacific Region	8	11.4	0.5	1.0	3.3	0.1	1.5	5.0

Note: Green = contacts with respondent's own office

Based on the network analysis, supervisors tend to communicate with other BOEM staff at a slightly more frequent rate (12.5 contacts on average) than those not in such a role (11.3 contacts); however, this varies substantially by office and region. Non-supervisor staff reported more contacts than those in supervisory roles in the Pacific Region (13.4 versus 8.0 contacts) and at OEP (13.9 versus 10.7 contacts). In all other offices, supervisors reported substantially more contacts within BOEM than non-supervisors. Supervisors' reported average number of contacts exceeded non-supervisors' contacts by at least four across each office. This data suggests that supervisors and upper management in most offices and regions are in the best position to communicate information needs across the Bureau, and bear responsibility to convey their staff's needs throughout BOEM.

Supplemental Document Analysis. IEc previously documented the study development process in the evaluation methodology. BOEM staff use the development of study profiles to communicate information needs. However, through development of the metrics and analyses for use in this evaluation, IEc noted a disconnect in internal tracking processes between study profiles, NSL funded studies, and studies stored in ESPIS. Although study profiles are consolidated in the SDPs, there is no central and systematically recorded repository for profiles across the Bureau. The lack of a central repository systematically storing information (e.g., separate columns for each section; consistent use of terminology; etc.) from the study profiles prevents BOEM from better understanding connections between information needs and proposed efforts to address those information needs. Further, the separate, disconnected NSL list is a barrier to better understanding the trajectory of various proposed studies in order to evaluate reasons that certain studies are not ultimately funded.

5.4 RECOMMENDATIONS & MEASUREMENT APPROACHES

This recommendations and measurement approaches section is responsive to all sub-questions from each primary evaluation question, including the following:

- If changes to the feedback process are needed, what would they be and who would be responsible for implementing the changes?
- How can BOEM identify, document, and measure the internal communication of their studies?
- How can BOEM identify, document, and measure the internal use of the studies?

- How can BOEM identify, document, and measure the assessment information needs to inform studies?
- How can BOEM identify, document, and measure the internal communication of their information needs?

Recommendations and measurement approaches span across individual topics and are most impactful when presented collectively.

1. **Organize and strengthen the process for tracking information needs across BOEM.** Tracing how information needs are identified, communicated informally, and then incorporated into study profiles was a challenging part of this evaluation. Although IEc pieced together this information from multiple sources, looking ahead, IEc recommends that BOEM systematize the process for tracking information needs. Implementing a process for documenting, communicating, and tracking information needs would help BOEM evaluate the feedback loop in the future, while also helping ensure that information needs are addressed in studies.

    a. **Require a formal process of documenting (and ideally, prioritizing) information needs that emerge directly from development of assessments.** Although our work documented instances of information needs being identified in assessment documents, there was no definitive way to connect that information need to subsequent studies (though in some cases interviews provided anecdotal accounts). Additionally, identifying the information needs that were highlighted in BOEM assessment documents was a relatively laborious and imperfect process. We suggest BOEM develop a prescriptive process for documenting information needs either within assessment documents or within a separate tracking system. This may include summarizing them in a section of the assessment or within a separate document describing the relevant assessment(s), tagging them with relevant topic categories, and ideally including some indication of priority and expected influence on policy or planning decisions. We then recommend BOEM institute a post-assessment process that consolidates the stated information needs from the assessment into the central repository (described in the next bullet). Additionally, BOEM may benefit from a process for prioritizing these information needs. This may include, for example, establishing an internal committee for annually prioritizing information needs from assessments. The process for prioritizing information needs should then be explicitly linked to the development of the strategic science questions and SDP to ensure priority information needs are represented.

    b. **Develop a central repository for documenting information needs.** This could be considered relatively informal (e.g., does not require management approval prior to inclusion); BOEM staff could submit their ideas, and the repository would provide a means for sharing ideas and facilitating conversations across the Bureau. Individuals who submit ideas would be asked to tag their information needs with specific topic category flags (same as used in assessments) and anticipated geographic applicability. Additional types of information that should be included are the "owner" of the information need,

origin of the study idea (e.g., anticipated upcoming assessment, past assessment, public comment, etc.), and collaborators in identifying the information need. This process may begin at the program or regional level and be aggregated across the Bureau to identify important, cross-cutting themes. This approach provides the basis for the information required for developing study profiles, but at a lower standard or level of effort for BOEM staff. If BOEM staff later develop a study profile to address the information needs, they would provide the full set of required information when they develop their profile.

c. **Build and assign responsibility for documenting information needs.** Although documenting information needs in the central repository would be a responsibility for all studies and assessment staff, IEc recommends managers play a role in utilizing the information captured in the database. Managers should be responsible for regularly reviewing information needs stemming from assessments and from their staff and across the Bureau to identify opportunities to collaborate across BOEM and identify opportunities to develop a single or set of information needs into a study profile.

d. **Improve internal tracking to trace study ideas from study profiles, to funded studies (NSL), to ESPIS study information and products**. IEc also recommends BOEM adopt a centralized database for systematically storing study profiles. The database should include all components of the study profile, stored by study profile component, and normalized across profiles (e.g., consistent phrasing).[40] This could be an (internal-only) extension of ESPIS, but if it is not, IEc recommends establishing a unique identifier to allow for continuous tracking of a study idea from development of study profile potentially through the study products for the funded studies. NSL and overall funding may also be tied to this study profile database. This would allow BOEM to better understand funding by topic over time and whether there are persistent information needs (unfunded studies or topics) over time.

e. **Require that study profiles provide a clear description of the relevant information need the study is targeting, the origin of the information need, and co-developers.** Clearly and systematically documenting information needs would be helpful in fleshing out targeted study profiles focused on addressing these needs. Currently, the study profiles frequently include only generalized descriptions of the relevant information needs. Staff developing study profiles should be directed to be clear about the specific information need and potential uses of the scientific information that would be provided by the study. Additionally, IEc recommends that study profiles include a subsection to the current "BOEM Information Needs" section that documents the origin(s) of the information need. In addition to assessment documents, sources may include other technical publications, colleagues, and stakeholders, such as scientists at regional universities or other agencies. The study profile should also include a section that explains who was consulted in the development of the study profile, including internal

[40] Implementing this recommendation would allow BOEM to systematically track study ideas, including for studies that do not ultimately get funded. This method of tracking would ensure the specific sections of a study profile are uniformly organized; however, the specific content of the individual sections would continue to be specific to the unique study.

and external stakeholders. If BOEM does not want to include certain information, for example the list of co-developers, in a public-facing document, this information may instead be tracked in a separate place and tied to the unique study identifier.

2. **Improve communication regarding the process for prioritizing studies to increase transparency.** IEc recommends that BOEM clarify and communicate the national priorities and process for study funding. We also recommend that BOEM increase transparency around regional and national selection criteria (and how they are weighted), priorities, and funding decisions to support framing of SDPs and inform responses to BOEM staff whose profiles are not selected. While the Bureau-wide process for developing the SDP streamlines the budgeting and prioritization process and ensures that funding decisions are made through a national (Bureau-wide) lens, the survey results suggest that staff's understanding of and satisfaction with the process could be improved if management's priorities and reasons for prioritizing particular studies over others were clearer. This process could, for example, take the form of specific, written feedback for why certain studies were not selected, or providing examples highlighting the strengths of study profiles that were funded (e.g., identifying their alignment with high priority information needs). A wider distribution/notification of rubric criteria—and some explanation of how management defines and weights different priorities—would set more concrete expectations for study profile submission and may improve the caliber of proposals submitted by ensuring they target management priorities.

3. **Expand the functionality and usability of ESPIS**.[41] ESPIS is a powerful tool for both internal and external information consolidation and sharing, but the evaluation identified several options for improving its usefulness.

    a. **Create a streamlined process that allows CORs to easily update information in ESPIS**. After the initial submission of information into ESPIS, CORs should be able to update information about the study, especially pertaining to the addition of known peer-reviewed publications emerging from the work. This does not necessarily mean providing full editing access to all aspects of ESPIS for all CORs but may involve increased access at some permission level. BOEM should consider options that balance maintaining the security and integrity of the database with facilitating the need to accommodate regularly updating information.

    b. **Send CORs an annual prompt to update information for up to five years after completion of a study.** This prompt should be automatically sent on the anniversary of when the information was initially submitted to ESPIS.

    c. **Subsume the type of data collected in ESP-PAT into ESPIS or other tracking system.** ESP-PAT provides a key set of information to measure internal use of studies, but its moderate usage rates suggest that it is not a viable option in its current format for comprehensively collecting this information. This would include adding the existing ESP-PAT data as another table in the current database; database managers on the ESPIS team would need to make some additional modifications and normalization between the

[41] IEc acknowledges internal BOEM efforts at updating ESPIS based on other previous internal feedback. In some cases, the recommendations here may reflect changes that BOEM is already pursuing but IEc is not privy to.

two existing database structures. Database managers would also need to build out the data input for ESP-PAT data. CORs would continue to be responsible for completing data input on their studies; in addition, BOEM may consider extending access to assessments staff to document usage of BOEM studies within assessments. This process could serve as a central way to document the connection from BOEM research to its use in BOEM assessments. Further, BOEM should consider how to validate this self-reported information in ESP-PAT. BOEM should clearly and regularly communicate the responsibilities of BOEM studies and assessments staff regarding the use of the tracking system. Although this supports measuring the feedback loop between studies and assessments, it is also important to note that exploratory studies may not support specific assessments. However, as interviewees routinely reported, exploratory studies are important for understanding baseline subjects—e.g., subsistence in the Atlantic—which may then support BOEM decision-making.

d. **Use standard topic tags across assessments and studies.** For use in this evaluation, IEc developed a standard set of resource and activity topics based on the topics addressed in BOEM assessments and informed by conversations with BOEM managers during scoping interviews. BOEM currently uses a keyword tag in ESPIS to group topics, but these are not standardized keywords. Further, the NSL of funded studies includes separate, but also not standardized keywords. Aligning the list of resource and activity topics would allow BOEM to better understand high-level trends in funding priorities over time. Any systems set up to track assessments may also apply the same list of topic tags to facilitate tracking between studies and assessments. As part of refining the topic tags, BOEM should include tags that reflect Tribal and environmental justice interests to support tracking in these priority areas.

e. **Improve the usability of ESPIS as a tool to obtain study information.** Although ESPIS could play an important role in the feedback loop, 40 percent of survey respondents indicated that ESPIS is less than useful (very useless, somewhat useless, or neither useful nor useless) for receiving information about studies; and interviewees reported difficulties in searching ESPIS to find the information they need. We recommend that BOEM improve the search functionality and navigability of ESPIS so that BOEM studies and assessments staff can more easily find the study information and products they are seeking. This may include regular ESPIS demonstrations from an end-user perspective to show staff how to use ESPIS to identify information relevant to their assessment needs. We also recommend that BOEM consider ways for ESPIS to proactively push studies information to potential users. For example, one option would be for ESPIS to send alerts to users who sign up to receive notifications when new studies are published on a particular topic or geographic area, or that address a particular information need documented in study profiles. BOEM may consider allowing search engines (e.g., Google) to index the ESPIS website so that study reports may be identified with targeted searches (e.g., via Google Scholar).

4. **Strengthen BOEM's ability to track citations of environmental studies, both in peer-reviewed publications and in BOEM assessments.** Citation analysis is a simple but useful tool for tracking the influence of BOEM studies on assessments. BOEM's ability to comprehensively

track peer-reviewed publications that stem from BOEM's environmental studies is a necessary first step to identify environmental study-related publications that were cited in BOEM's assessment documents. Identifying citations of BOEM studies (or peer-reviewed publications that stemmed from the original studies) in BOEM assessments is a partial, but useful and repeatable measure of the strength of the feedback loop. Being able to link peer-reviewed publications to BOEM's environmental studies is also useful for measuring BOEM's contributions to the broader scientific community.

   a. **Consider specifying within contracts that requirements for referencing BOEM obligation numbers in study publications extends beyond the period of performance for the contract.** To aid future efforts in measuring use of studies both internally and externally, IEc recommends strengthening the requirement for funding recipients to reference the BOEM obligation number in publications emerging from the BOEM funding. This should be consistently included as a requirement in contract language with a provision explaining it applies after the period of performance is closed. For example, BOEM could consider specifying that they would view adherence to this request favorably in considering future bids or proposals for work with ESP (e.g., as a component of past performance). Referencing BOEM obligation numbers in publications would enable BOEM to better utilize citation tools in the future to measure the use and impact of ESP studies. This could be built as an automated search process tool that would regularly summarize and provide updates to BOEM staff on studies use.

   b. **Require assessments to include a section specifically identifying the BOEM studies referenced in analyses**. When developing assessments, require the assessment staff to include a section identifying the BOEM studies that were used for developing the assessment. For example, BOEM provided IEc with a preview of the 2022–2027 National OCS Oil and Gas Leasing Program Programmatic EIS, which contains an appendix with a list the relevant ESP-funded studies utilized to complete the assessment. Although any reports used in an assessment are included in the references section, these sections can be very lengthy, and it is not always obvious which reports and articles are associated with ESP studies.

5. **Create a central location for storing and accessing all BOEM assessments**. In contrast to the studies, which are stored in ESPIS, assessments are stored in multiple locations, which makes tracking the feedback loop difficult. As described in the Year 1 methodology report (Volume 1), IEc spent considerable time finding, compiling, and coding assessment documents. Going forward, IEc recommends that BOEM develop a central repository of assessments to facilitate tracing of information needs and use of study results in assessments. In developing the central repository of assessments, BOEM should consider how to incorporate Tribal documents that might not be considered "assessments" but are important for BOEM's study and assessment work in an environmental justice context (e.g., documents that characterize Tribal cultural landscapes).

6. **Commit to regular communication of study results through formal channels.** Interview and survey results suggest that study results need to be shared more regularly. Most survey respondents identified presentations as their preferred mode of results communication, but the interviews suggest that results presentations are informal and/or irregular. "Brown bag" seminars and "lunch and learn" events may be insufficient for this purpose if they are optional and

irregular, because study results may not be communicated consistently (or may have limited reach). Regular, formal presentations may be a good alternative to a haphazard brown bag seminar approach. Written reports were also a popular recommendation for improving communication of results. For example, a report that presents the high-level methods, results, and conclusions and contains more detail than a technical summary (but much less information than a study report) would provide the level of detail sought by assessments staff. Quarterly Report entries with title, abstract, and ESPIS lookup information (study number) for studies, or listserv-style announcements when studies are posted to ESPIS or published in peer-reviewed journals, may fit the needs of other staff. In addition to formal channels, peer-to-peer relationships and informal communications are very important. Ultimately, it is the responsibility of both the person with the information and the person who needs information to communicate effectively.

7. **Monitor effects of COVID and working remotely on communication channels and the feedback loop.** As BOEM and other federal agencies consider the transition back to in-office work and/or adjust to a new culture around variable remote and in-person working arrangements, BOEM should consider the effects of remote work on the communication of study ideas and study and assessment findings. While individuals continued to communicate through virtual platforms (e.g., Teams) during the pandemic, remote work reduces opportunities for "chance encounters" that can spur spontaneous discussions and connections. The effect of remote work on informal communication pertaining to studies and assessments is uncertain, but warrants attention, particularly given the importance of informal networks to the feedback loop. While more regular communications through formal channels is important, it will not replace informal communications.

APPENDIX A: INTERVIEW GUIDES

INTERVIEW GUIDE FOR ENVIRONMENTAL ASSESSMENT MANAGERS

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently oversee staff who conduct assessments?

Assessment – Specific

2. Are there specific studies that have been, or currently are, of particular importance to your assessment work? If yes, explain.
3. If information needs are identified during the assessment development process (this includes planning, conducting, or reviewing assessments), where are they documented? When we refer to an "information need" here, this is a generic way of describing a situation where more information or data on a topic would be helpful for informing future assessments.
    a. Who documents them?
    b. How do you track these assessment information needs internally?
4. Can you think of examples of persistent information needs in assessments that have not been addressed in studies?
    a. If yes, explain.
5. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
6. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Study to Assessment Loop

7. We consolidated the top study and assessment topics over time in the interview packet that was sent to you with this interview guide. Focusing on your office/region, what do you think explains these trends?
    a. Do you have a sense for why these particular topics came up when they did?
        i. What information needs or other factors drove the focus on these topics?
8. The interview packet shows citation analysis findings for your region/office, including assessments that cited a lot of BOEM studies. Can you tell us more about why these assessments may have used so many BOEM studies?
9. Our citation analysis findings for your office/region also show studies that were frequently cited in BOEM assessments. Can you tell us more about why these studies may have been used in so many assessments?
10. Can you describe any specific examples where studies were developed to address information needs:
    a. Based on past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified?
            1. Why or why not?
    b. To inform future anticipated assessments?
        i. [*If yes*] Please describe the situation.

11. We are interested in learning more about the connection between studies, assessments, and policy.
    a. In your experience, what specific planning decisions and policies have BOEM studies informed? This could occur either through the assessment process or external to it.
    b. Focusing solely on Notices to Lessees (NTLs), can you think of any examples where a BOEM study informed an NTL?
12. Other than any examples we have previously discussed, are there any particularly influential studies that informed key assessments and or led to major policy decisions at BOEM?
13. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Wrap-up

14. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to improve the assessment to study connection and feedback loop process?

INTERVIEW GUIDE FOR ENVIRONMENTAL STUDIES AND ASSESSMENTS MANAGERS

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently oversee staff who conduct studies and assessments?

Study - Specific

2. Could you briefly describe how you typically identify information needs for developing study profiles?
3. How do you track identified information needs internally?
4. From our scoping interviews we know that studies can make it to the SDP but may not be conducted. Once a study idea makes it to the SDP, what are some reasons why it may not be conducted (beyond general budget constraints)?
5. We have heard of instances when studies are implemented that were not in the SDP as a study profile. Do you have experience with this?
    a. [*If yes*] Why and how does this occur?
6. Overall, do you think the results of studies address the information needs that are identified in their initial study profiles?
    a. If no, why not?
7. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
8. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Assessment – Specific

9. Are there specific studies that have been, or currently are, of particular importance to your assessment work? If yes, explain.
10. If information needs are identified during the assessment development process (this includes planning, conducting, or reviewing assessments), where are they documented? When we refer to an "information need" here, this is a generic way of describing a situation where more information or data on a topic would be helpful for informing future assessments.
    a. Who documents them?

b. How do you track these assessment information needs internally?

11. Can you think of examples of persistent information needs in assessments that have not been addressed in studies?
    a. If yes, explain.

Study to Assessment Loop

12. We consolidated the top study and assessment topics over time in the interview packet that was sent to you with this interview guide. Focusing on your region/office, what do you think explains these trends?
    a. Do you have a sense for why these particular topics came up when they did?
        i. What information needs or other factors drove the focus on these topics?
13. The interview packet shows citation analysis findings for your region/office, including assessments that cited a lot of BOEM studies. Can you tell us more about why these assessments may have used so many BOEM studies?
14. Our citation analysis findings for your office/region also show studies that were frequently cited in BOEM assessments. Can you tell us more about why these studies may have been used in so many assessments?
15. Can you describe any specific examples where studies were developed to address information needs:
    a. Identified in past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified?
            1. Why or why not?
    b. To inform future anticipated assessments?
        i. [*If yes*] Please describe the situation.
16. We are interested in learning more about the connection between studies, assessments, and policy.
    a. In your experience, what specific planning decisions and policies have BOEM studies informed? This could occur either through the assessment process or external to it.
    b. Focusing solely on Notices to Lessees (NTLs), can you think of any examples where a BOEM study informed an NTL?
17. Other than any examples we have previously discussed, are there any particularly influential studies that informed key assessments and/or led to major policy decisions at BOEM?
18. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Wrap-up

19. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to improve the assessment to study connection and feedback loop process?

INTERVIEW GUIDE FOR ENVIRONMENTAL STUDIES MANAGERS

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently oversee staff who conduct studies?

Study - Specific

2. Could you briefly describe how you typically identify information needs for developing study profiles?
3. How do you track identified information needs internally?
4. From our scoping interviews we know that studies can make it to the SDP but may not be conducted. Once a study idea makes it to the SDP, what are some reasons why it may not be conducted (beyond general budget constraints)?
5. We have heard of instances when studies are implemented that were not in the SDP as a study profile. Do you have experience with this?
    a. [*If yes*] Why and how does this occur?
6. Overall, do you think the results of studies address the information needs that are identified in their initial study profiles?
    a. If no, why not?
7. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
8. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Study to Assessment Loop

9. We consolidated the top study and assessment topics over time in the interview packet that was sent to you with this interview guide. Focusing on your region/office, what do you think explains these trends?
    a. Do you have a sense for why these particular topics came up when they did?
        i. What information needs or other factors drove the focus on these topics?
10. The interview packet shows citation analysis findings for your region/office, including assessments that cited a lot of BOEM studies. Can you tell us more about why these assessments may have used so many BOEM studies?
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12. Can you describe any specific examples where studies were developed to address information needs:
    a. Identified in past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified?
            1. Why or why not?
    b. To inform future anticipated assessments?
        i. [*If yes*] Please describe the situation.
13. We are interested in learning more about the connection between studies, assessments, and policy.
    a. In your experience, what specific planning decisions and policies have BOEM studies informed? This could occur either through the assessment process or external to it.
    b. Focusing solely on Notices to Lessees (NTLs), can you think of any examples where a BOEM study informed an NTL?
14. Other than any examples we have previously discussed, are there any particularly influential studies that informed key assessments and/or led to major policy decisions at BOEM?
15. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Wrap-up

16. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to improve the assessment to study connection and feedback loop process?

INTERVIEW GUIDE FOR ASSESSMENTS STAFF

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently work on assessments?

Assessment – Specific

2. Are there specific studies that have been, or currently are, of particular importance to your assessment work? If yes, please explain.
3. If information needs are identified during the assessment development process (this includes planning, conducting, or reviewing assessments), where are they documented?
    a. Who documents them?
    b. How do you track these assessment information needs internally?
4. Can you think of any examples of when an information need identified through the assessment development process was developed into a study or studies? When we refer to an "information need" here, this is a generic way of describing a situation where more information or data on a topic would be helpful for informing future assessments.
5. Can you think of examples of persistent information needs in assessments that have not been addressed in studies?
    a. If yes, explain.
6. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
7. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Study to Assessment Loop

8. Can you describe any specific examples where studies were developed to address information needs based on:
    a. Past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified? Why or why not?
    b. Future anticipated assessments?
        i. [*If yes*] Please describe the situation.
    c. Other uses within BOEM?
9. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Models

10. Do you play a role in developing BOEM models?
    a. *[If yes]* which models?
        i. How (if at all) do BOEM studies inform your model inputs, assumptions, etc.?
11. Do you use models or modeling data to develop assessments?
    a. *[If yes]* Which models or modeling data do you use?
    b. How do you use it?

Wrap-up

12. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to strengthen the assessment to study connection and feedback loop process?

INTERVIEW GUIDE FOR STUDIES AND ASSESSMENTS STAFF

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently work on studies and assessments?

Assessment – Specific

2. Are there specific studies that have been, or currently are, of particular importance to your assessment work? If yes, please explain.
3. If information needs are identified during the assessment development process (this includes planning, conducting, or reviewing assessments), where are they documented?
    a. Who documents them?
    b. How do you track these assessment information needs internally?
4. Can you think of any examples of when an information need identified through the assessment development process was developed into a study or studies? When we refer to an "information need" here, this is a generic way of describing a situation where more information or data on a topic would be helpful for informing future assessments.
5. Can you think of examples of persistent information needs in assessments that have not been addressed in studies?
    a. If yes, explain.
6. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
7. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Study - Specific

8. Could you briefly describe how you typically identify information needs for developing study profiles?
9. How do you track identified information needs internally?
10. Have you submitted a study profile or profiles within the past three years?
    a. [*If yes*] Was the study implemented?
        i. [*If no*] Why not?
11. Overall, do you think the results of studies address the information needs that are identified in their initial study profiles?
    a. If no, why not?

Study to Assessment Loop

12. Can you describe any specific examples where studies were developed to address information needs based on:
    a. Past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified? Why or why not?
    b. Future anticipated assessments?

i. [*If yes*] Please describe the situation.

c. Other uses within BOEM?

13. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Models

14. Do you play a role in developing BOEM models?
    a. *[If yes]* which models?
        i. How (if at all) do BOEM studies inform your model inputs, assumptions, etc.?
15. Do you use models or modeling data to develop assessments?
    a. *[If yes]* Which models or modeling data do you use?
    b. How do you use it?

Wrap-up

16. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to strengthen the assessment to study connection and feedback loop process?

INTERVIEW GUIDE FOR STUDIES STAFF

Background

1. Please briefly describe your current role at BOEM and any other positions you previously held at the Bureau related to studies and assessments.
    a. Can you confirm you currently work on studies?

Study - Specific

2. Could you briefly describe how you typically identify information needs for developing study profiles?
3. How do you track identified information needs internally?
4. Have you submitted a study profile or profiles within the past three years?
    a. [*If yes*] Was the study implemented?
        i. [*If no*] Why not?
5. Overall, do you think the results of studies address the information needs that are identified in their initial study profiles?
    a. If no, why not?
6. To what extent do study results inform mitigation measures?
    a. Can you think of an example where this has happened? If yes, please describe.
7. To what extent do studies inform NTL documents?
    a. Can you think of an example where this has happened? If yes, please describe.

Study to Assessment Loop

8. Can you describe any specific examples where studies were developed to address information needs based on:
    a. Past assessments?
        i. [*If yes*] Did the studies successfully address the information needs identified? Why or why not?
    b. Future anticipated assessments?
        i. [*If yes*] Please describe the situation.
    c. Other uses within BOEM?

9. Based on your observations and experiences, can you identify any best practices for sharing study and assessment results within BOEM?
    a. [*If yes*] Please explain.

Models

10. Do you play a role in developing BOEM models?
    a. *[If yes]* which models?
        i. How (if at all) do BOEM studies inform your model inputs, assumptions, etc.?
11. Do you use models or modeling data to develop assessments?
    a. *[If yes]* Which models or modeling data do you use?
    b. How do you use it?

Wrap-up

12. Other than what we have already discussed, can you think of any other updates or changes that BOEM could make to strengthen the assessment to study connection and feedback loop process?

APPENDIX B: SURVEY QUESTIONNAIRES

Part 1 – General Survey

Part 2 – SNA Survey

APPENDIX C: ENVIRONMENTAL STUDIES IN EVALUATION

The complete environmental studies inventory captured by IEc of studies that were active between January 1, 1999, and December 31, 2019, is available in a Microsoft® Excel file for download at https://www.boem.gov/environment/evaluating-connections-vol-2-appendix-c-environmental-studies-evaluation. The total number of studies captured in this spreadsheet is 876 entries.

APPENDIX D: ENVIRONMENTAL ASSESSMENTS IN EVALUATION

The Microsoft® Excel file capturing the complete environmental assessment inventory (completed June 2020) is available for download at https://www.boem.gov/environment/evaluating-connections-vol-2-appendix-d-environmental-assessments-evaluation.

The workbook contains all files that IEc downloaded from BOEM's website via web-scraping and classified as assessments. The spreadsheet also contains a list of assessment files provided directly to IEc by BOEM and files obtained from the online EPA repository of consultations for EISs conducted by federal agencies.

A summary of environmental assessments by type, region, and office is presented in Table D-1 on the following page.

TABLE D-1. SUMMARY OF ASSESSMENT INVENTORY 1999-2019

Type of Assessment	Alaska Oil and Gas	Atlantic Marine Minerals[4]	Atlantic Renewable Energy	GOM Oil and Gas[5]	GOM Multiple *	National Oil and Gas	National Marine Minerals	National Renewable Energy	National Multiple *	Pacific Oil and Gas	Pacific Renewable Energy	TOTAL
NEPA Environmental Assessment[1,2]	26	3	17	26	1	0	2	1	0	8	0	**84**
NEPA Environmental Impact Statement[1,2]	14	0	4	29	1	5	0	1	1	0	0	**55**
NEPA Reference Documents	0	0	1	3	0	0	0	0	0	1	0	**5**
NHPA Section 106 Evaluation[3]	1	0	24	0	0	0	0	0	0	0	1	**26**
Essential Fish Habitat Assessment	0	0	1	1	0	0	0	0	0	0	0	**2**
Clean Air Act Compliance	0	0	1	0	0	2	0	0	0	0	0	**3**
ESA Section 7 Biological Assessment	2	0	12	0	0	0	0	0	1	0	0	**15**
ESA Section 7 Biological Evaluation	7	0	0	0	0	0	0	0	0	0	0	**7**
Resource Assessment Report	6	0	0	28	0	3	0	0	0	3	0	**40**
Oil Spill Risk Analysis	8	0	0	8	0	1	0	0	0	1	0	**18**
Cost-Benefit Analysis	0	0	0	0	0	0	0	1	0	0	0	**1**
TOTAL	**64**	**3**	**60**	**95**	**2**	**11**	**2**	**3**	**2**	**13**	**1**	**256**

Notes.

* Assessment documents that identified all three programs (Oil & Gas, Marine Minerals, and Renewable Energy) are listed as "Multiple." Assessments documents pertaining to three programs (Oil & Gas, Marine Minerals, and Renewable Energy) include programmatic documents related to geological and geophysical activities.

1. Includes draft/final/programmatic/revised/supplemental versions.
2. Includes files which have FONSIs, FONNSIs, NHPA Section 106 evaluations, or essential fish habitat assessments attached.
3. Includes NHPA findings and NHPA Section 106 Programmatic Agreements. For most NHPA findings, their associated assessment document was obtained via web scraping as well, as such the bundle of documents was counted as one unique assessment. The count of NHPA Section 106 evaluations presented here is mostly Programmatic Agreements, or NHPA findings for research or commercial leases.
4. Most of the MMP assessments are led by another lead agency, and BOEM, as a cooperating agency, adopts many of these environmental documents. Adopted documents prepared by another lead agency were not included in the inventory but will be part of the "external" (i.e., outside of BOEM) phase of the feedback loop evaluation.
5. This inventory of assessments does include "pre-lease" assessments for proposed geological and geophysical activities and some site-specific G&G survey documents from Alaska and the Gulf. As described in this report, the assessment does not include "post-lease" environmental assessments.

APPENDIX E: CITATION ANALYSIS – ENVIRONMENTAL STUDIES WITH NO CITATIONS IDENTIFIED IN BOEM ASSESSMENTS

The environmental studies with no identified citations in BOEM assessments are presented a Microsoft® Excel file available for download at https://www.boem.gov/copyright/evaluating-connections-vol-2-appendix-e-citation-analysisenvironmental-studies-no.

There are multiple reasons why a study may not be cited in an assessment, such as when there is a temporal lag between the start and end of a study (e.g., ongoing studies may not have published and/or reliable results); when assessments focus on different study topics (e.g., no relevant assessment was published since the study was completed); or when studies may have a different purpose than informing assessments (e.g., pilot projects, evaluation of current practices).

APPENDIX F: ADDITIONAL RESULTS

This section presents additional detail for the results discussed in the main body of the report by analytical approach.

TOPIC TREND – STUDIES

IEc identified the topic(s) that each environmental study addressed using multiple fields in ESPIS and from information in the study profiles. Relevant ESPIS fields for this coding include keywords, abstract, category, and title. Because of slight differences in how the topics are worded and used across documents, the automated coding using only the keywords did not capture the full set of topics covered in some studies. In addition, the generic nature of certain topics made it difficult for automated coding to identify all instances of the term as well as meaningful uses of the topic. As a result, IEc manually coded each study with the appropriate topics, for both activities and resources. Where applicable, we assigned multiple activities or resources to a single study. With a standardized list of topics coded to both studies and assessments, IEc developed counts of topics over time based on study and assessment year.

The graphs below indicate the number of studies that include the topic of interest.

ACROSS ALL PROGRAMS AND REGIONS

Physical oceanography was the top resource examined in studies, while **areas of special concern** was the least, across all years. Counts below indicate number of studies.

FIGURE F-1. BOEM STUDY RESOURCE TOPICS, TOTAL FOR ALL REGIONS AND PROGRAMS

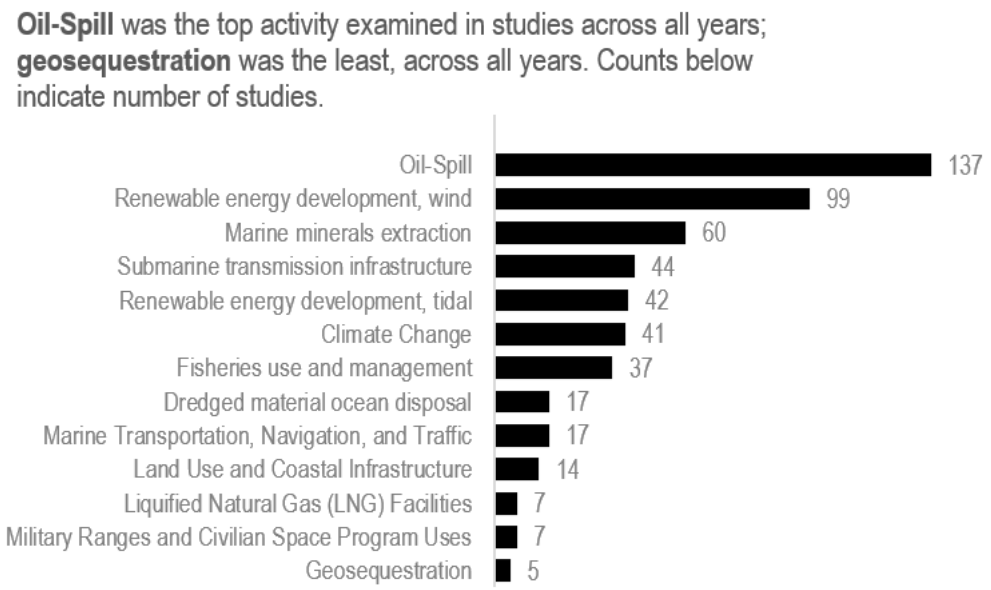

FIGURE F-2. BOEM STUDY ACTIVITY TOPICS, TOTAL FOR ALL REGIONS AND PROGRAMS

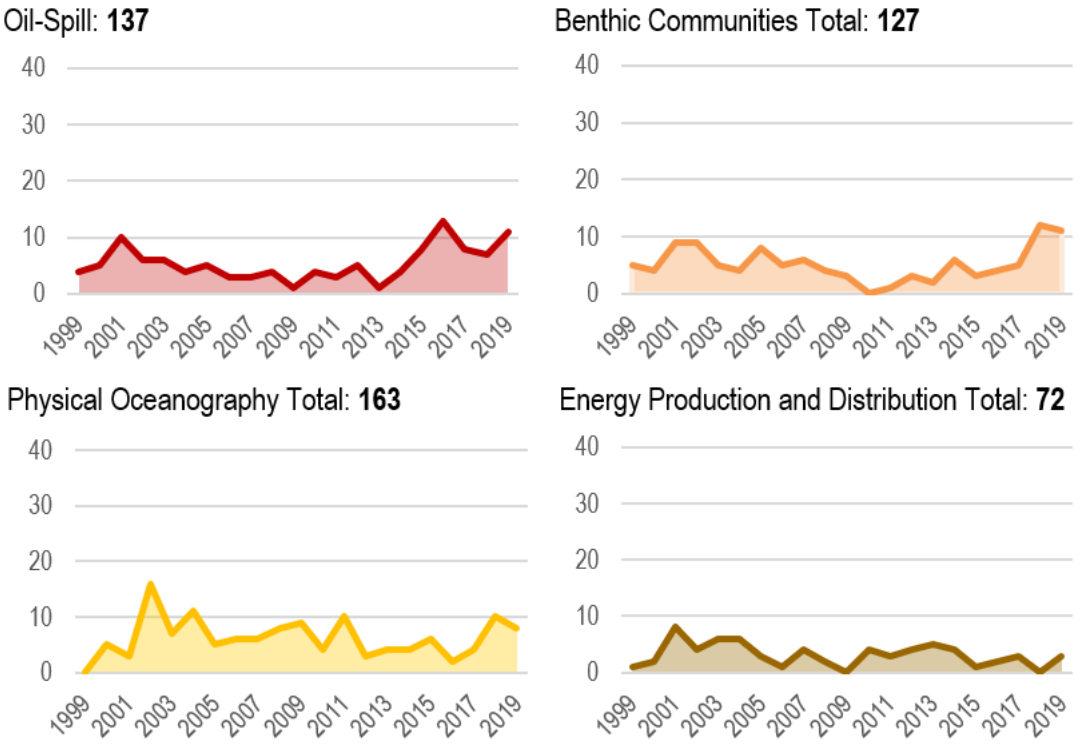

FIGURE F-3. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES ACROSS ALL REGIONS AND PROGRAMS, OVER TIME

ALASKA

In the Alaska Region, **physical oceanography** was the top resource examined in studies, while **sea turtles** was not identified as a resource in any study, across all years. Counts below indicate number of studies.

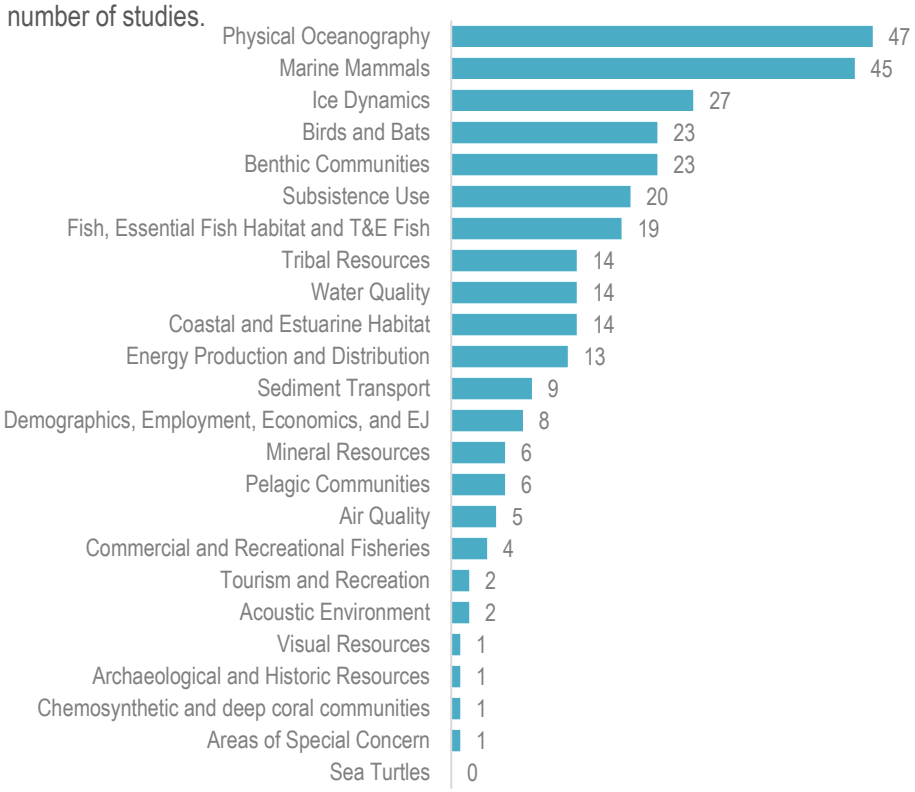

FIGURE F-4. BOEM STUDY RESOURCE TOPICS, ALASKA

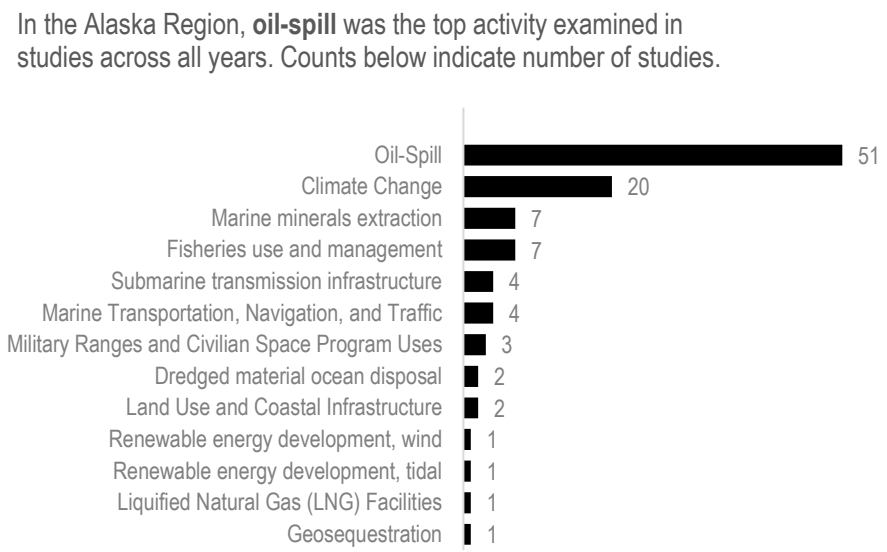

FIGURE F-5. BOEM STUDY ACTIVITY TOPICS, ALASKA

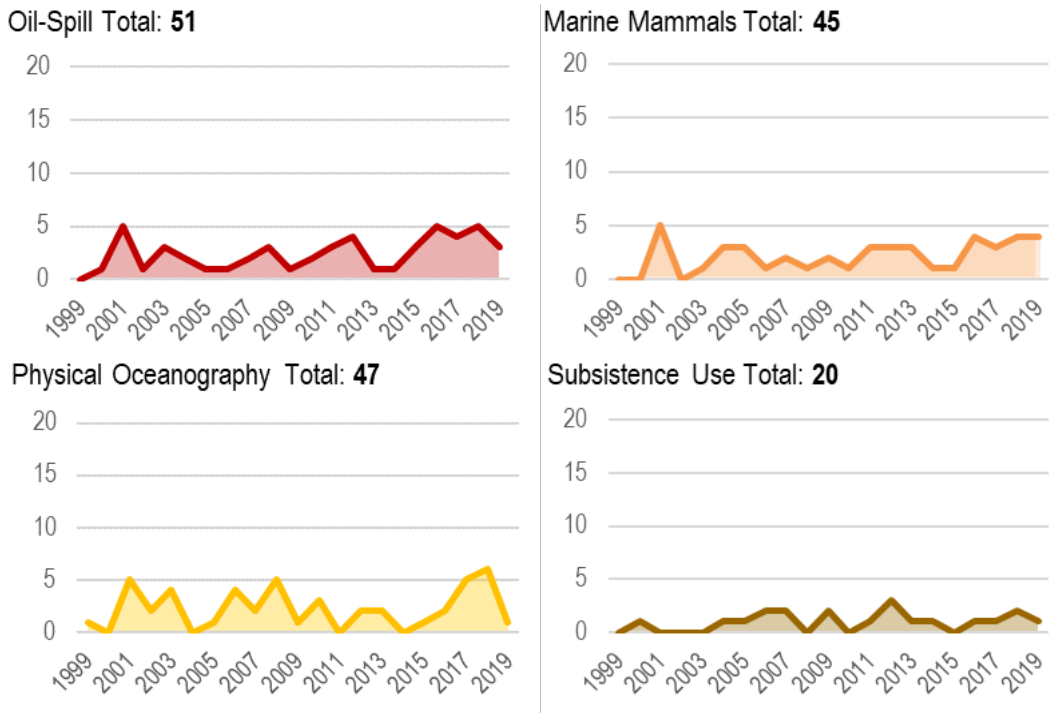

FIGURE F-6. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES FOR ALASKA, OVER TIME

ATLANTIC

In the Atlantic Region, **acoustic environment** was the top resource examined in studies, followed by **birds and bats.** Counts below indicate number of studies.

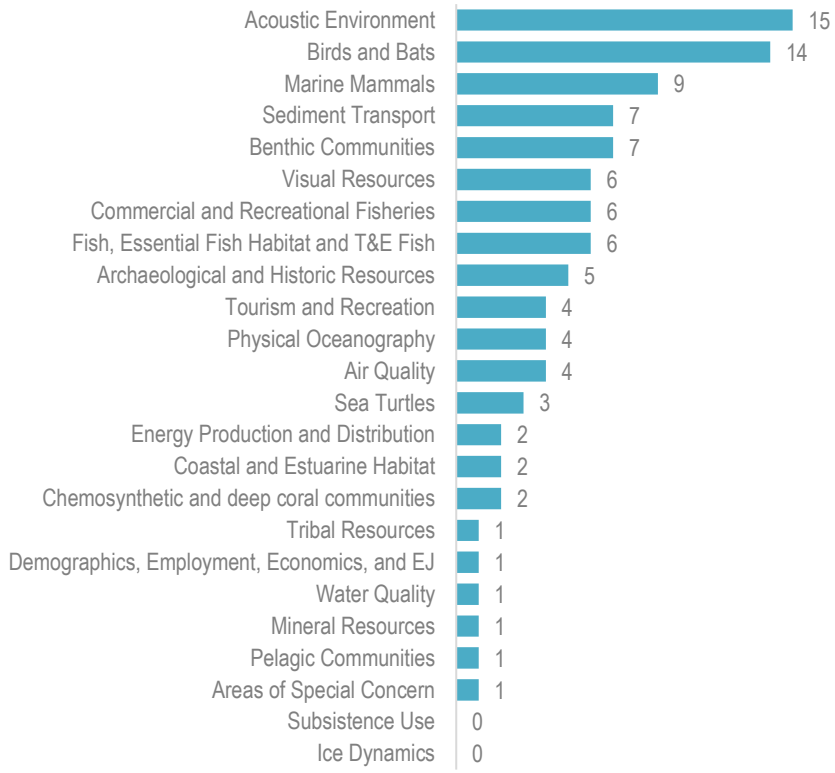

FIGURE F-7. BOEM STUDY RESOURCE TOPICS, ATLANTIC

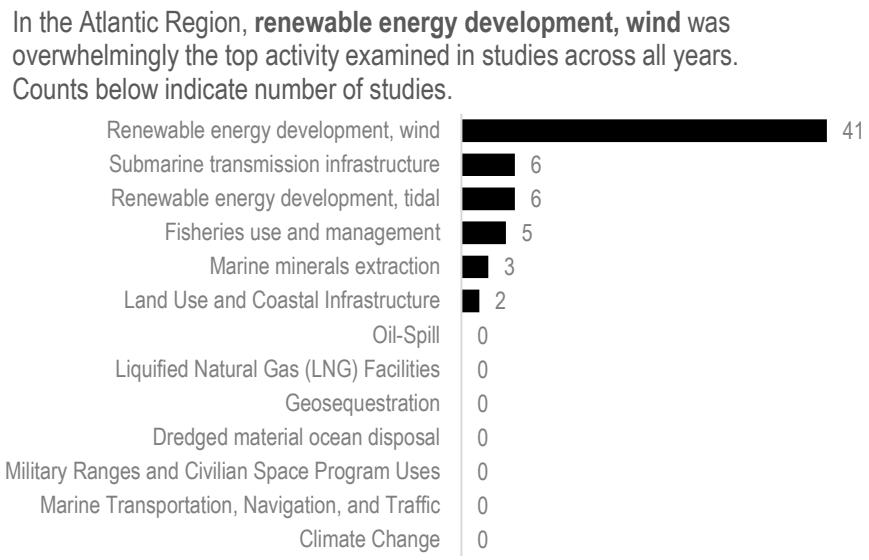

FIGURE F-8. BOEM STUDY ACTIVITY TOPICS, ATLANTIC

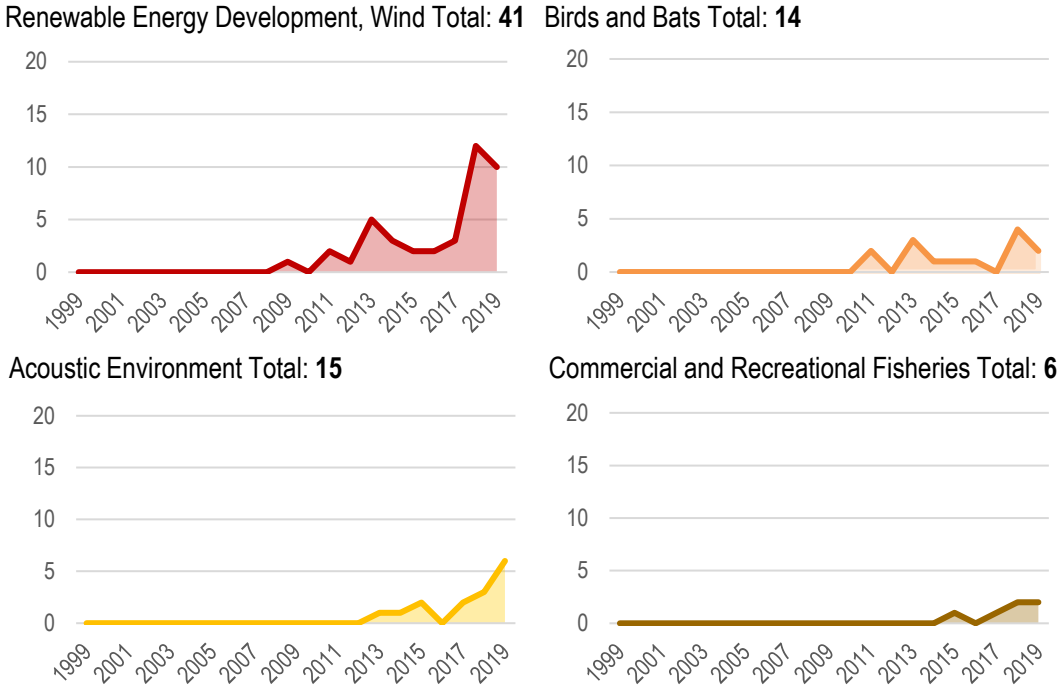

FIGURE F-9. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES FOR ATLANTIC, OVER TIME

GULF OF MEXICO

In the Gulf Region, **physical oceanography** was the top resource examined in studies, followed by **benthic communities**, and **energy production and distribution**. Counts below indicate number of studies.

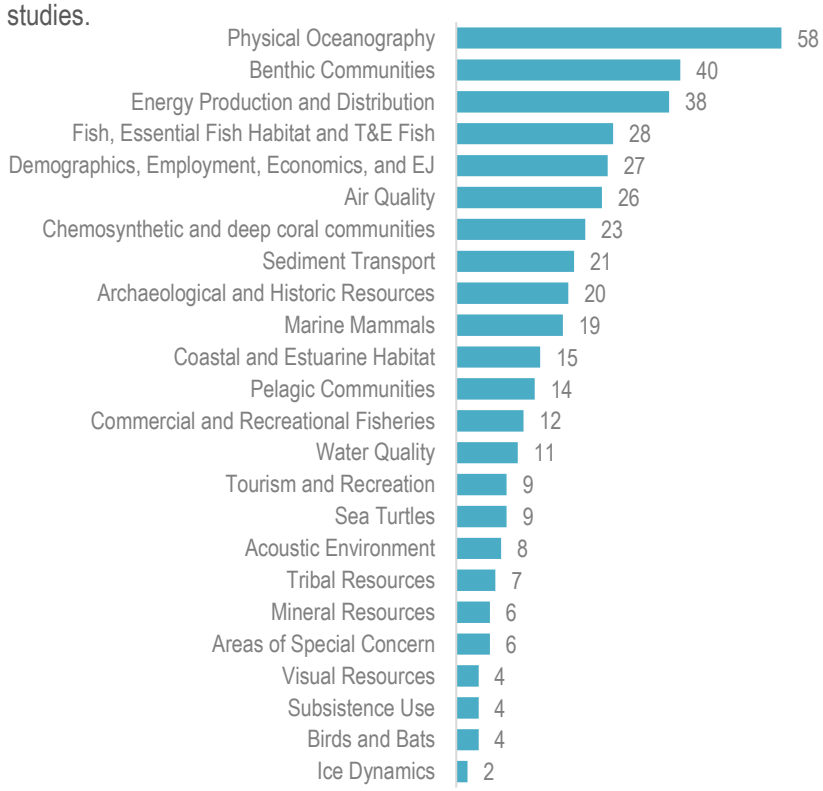

FIGURE F-10. BOEM STUDY RESOURCE TOPICS, GOM

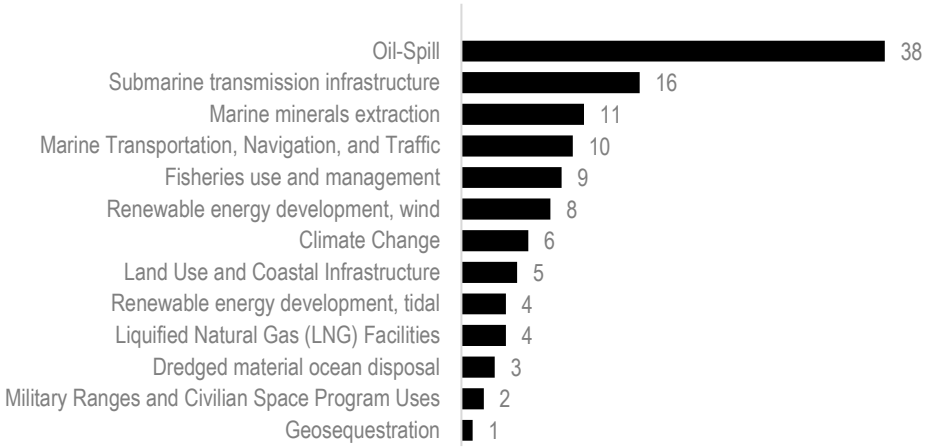

FIGURE F-11. BOEM STUDY ACTIVITY TOPICS, GOM

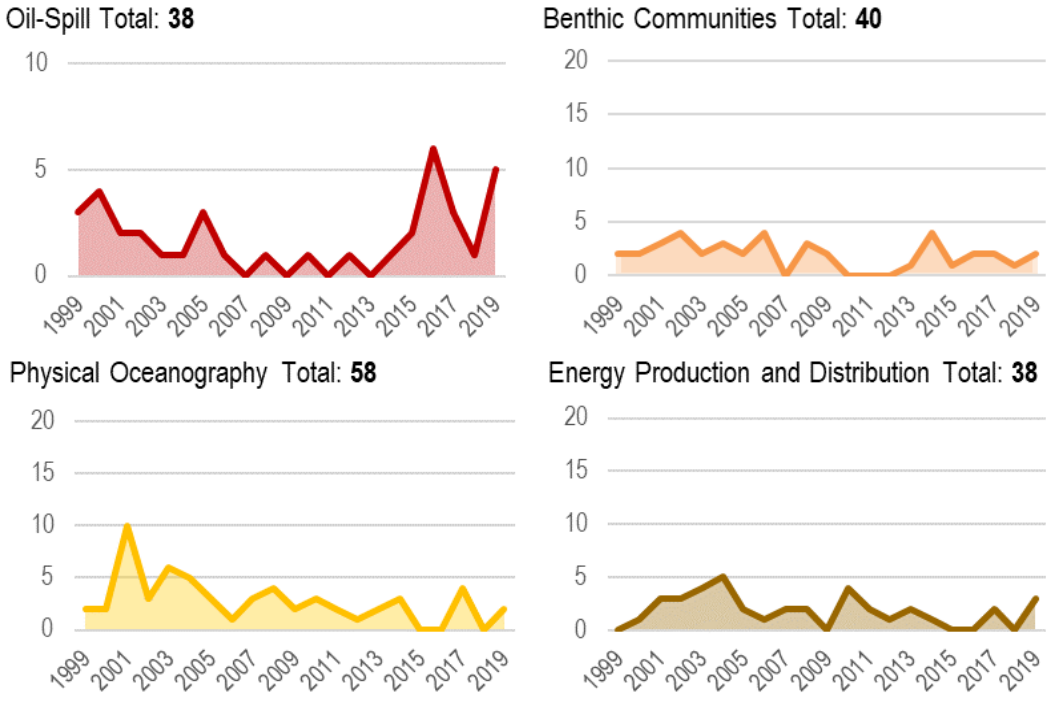

FIGURE F-12. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES FOR GOM, OVER TIME

NATIONAL[42]

On the National level, **sediment transport** was the top resource examined in studies, while **chemosynthetic communities and deep water coral communities** was the least, across all years. Counts below indicate number of studies.

FIGURE F-13. BOEM STUDY RESOURCE TOPICS, NATIONAL

[42] MMP studies are typically included in the National portfolio.

On the National level, **marine minerals extraction** was the top activity examined in studies across all years; **land use and coastal infrastructure** was the least, across all years. Counts below indicate number of studies.

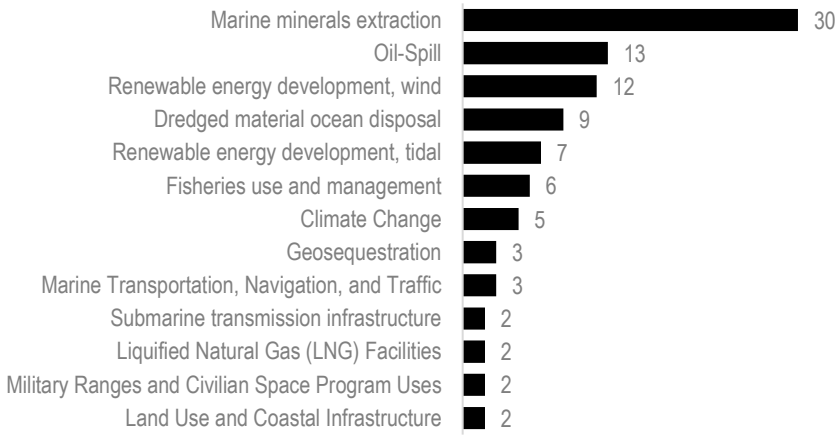

FIGURE F-14. BOEM STUDY ACTIVITY TOPICS, NATIONAL

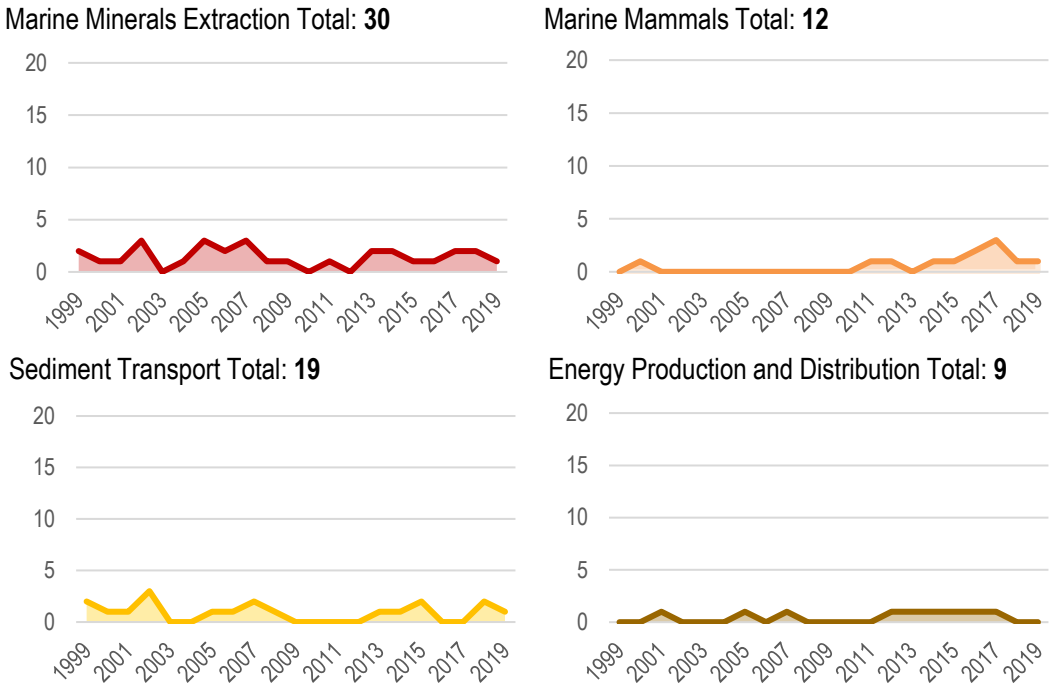

FIGURE F-15. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES FOR NATIONAL, OVER TIME

PACIFIC

In the Pacific Region, **benthic communities** was the top resource examined in studies, across all years. Counts below indicate number of studies.

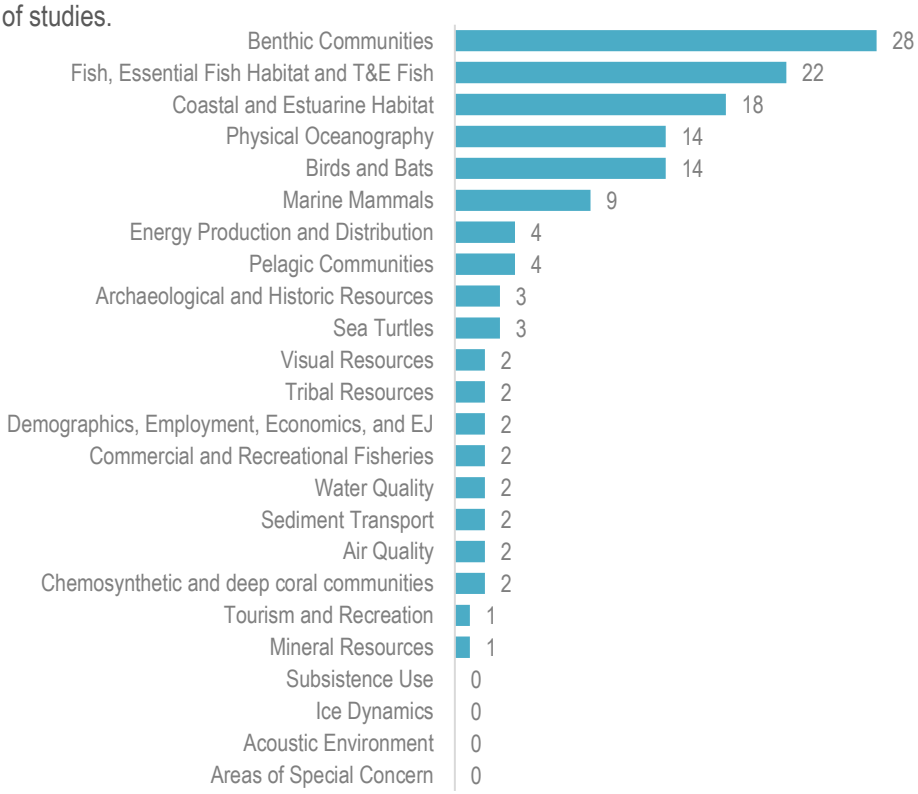

FIGURE F-16. BOEM STUDY RESOURCE TOPICS, PACIFIC

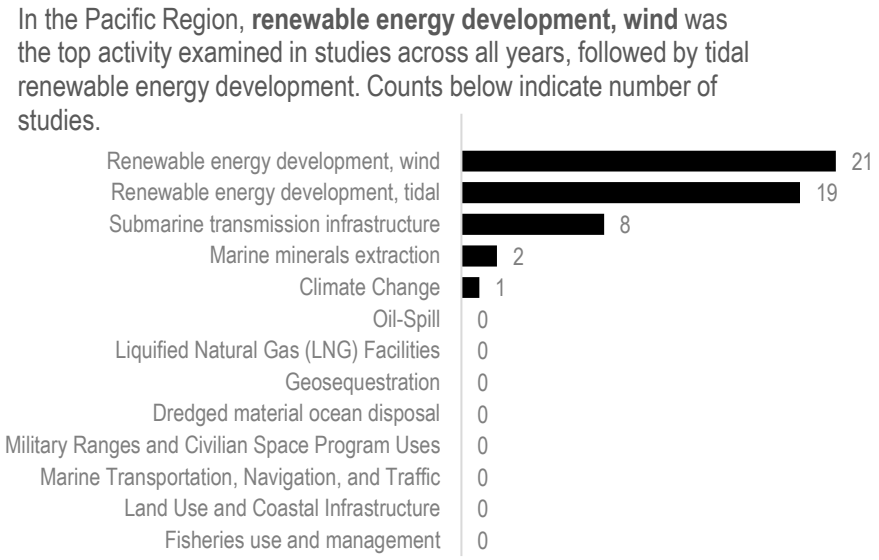

FIGURE F-17. BOEM STUDY ACTIVITY TOPICS, PACIFIC

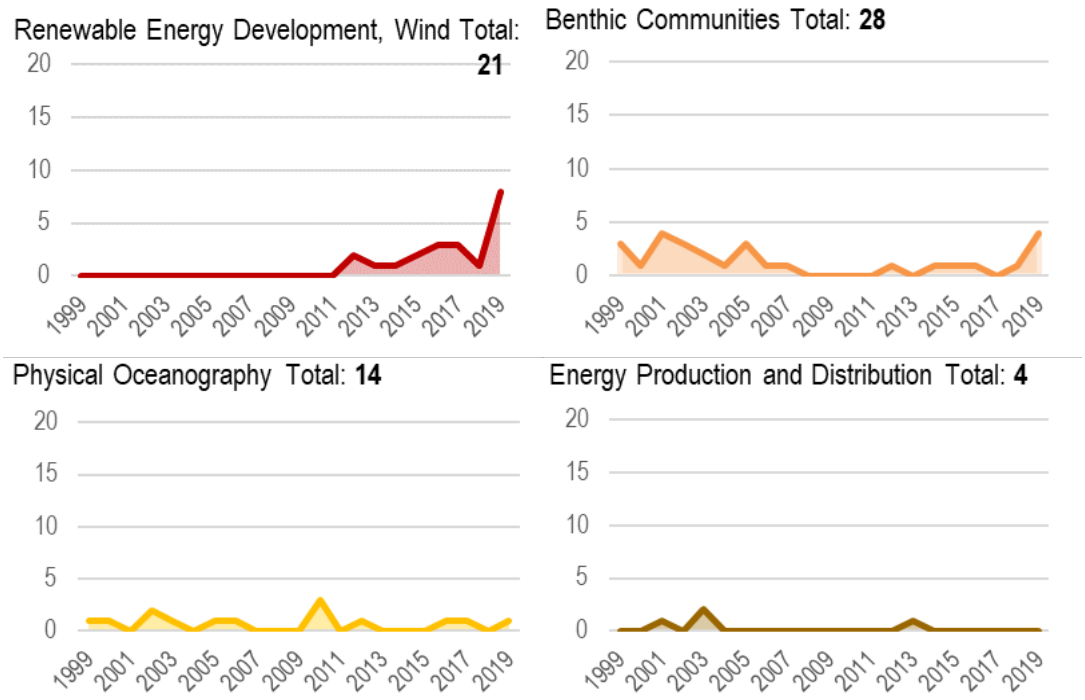

FIGURE F-18. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN STUDIES FOR PACIFIC, OVER TIME

TOPIC TREND – ASSESSMENTS

By their nature, assessments cover a wide range of topics. Based on a review of a selection of assessment documents (approximately 10 percent of the total inventory, across each assessment category), IEc targeted specific sections of the assessment documents to determine the most important topics the assessment addresses. These sections include the table of contents; mitigation section; appendices, focused on appendices that indicate in-depth analysis on a topic; and index of common terms. IEc referenced these sections to code each assessment with the relevant topics covered. Initial attempts at relying on software to automatically code the documents identified complexities. Specifically, because of slight differences in how the topics are worded and used across documents, the automated coding did not capture the full set of topics covered in some assessments. In addition, the generic nature of certain topics made it difficult for the automated coding to not only identify all instances of the term, but also identify meaningful uses of the topic. As a result, we found that manual review and topic coding of the assessments was the more efficient and thorough approach. For a small subset of topics, we relied on a keyword query using NVivo.

The graphs below indicate the number of assessments that include the topic of interest. The four graphed topics are the top activity (upper left), the top biological resource (upper right), the top physical resource (lower left), and the top socioeconomic resource (lower right) in assessments over time.

ACROSS ALL PROGRAMS AND REGIONS

Marine mammals, birds and bats, archaeological and historic resources, and fish, Essential Fish Habitat, and T&E Fish were the top resources examined in assesments, while **visual resources** and **mineral resources** were the least, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

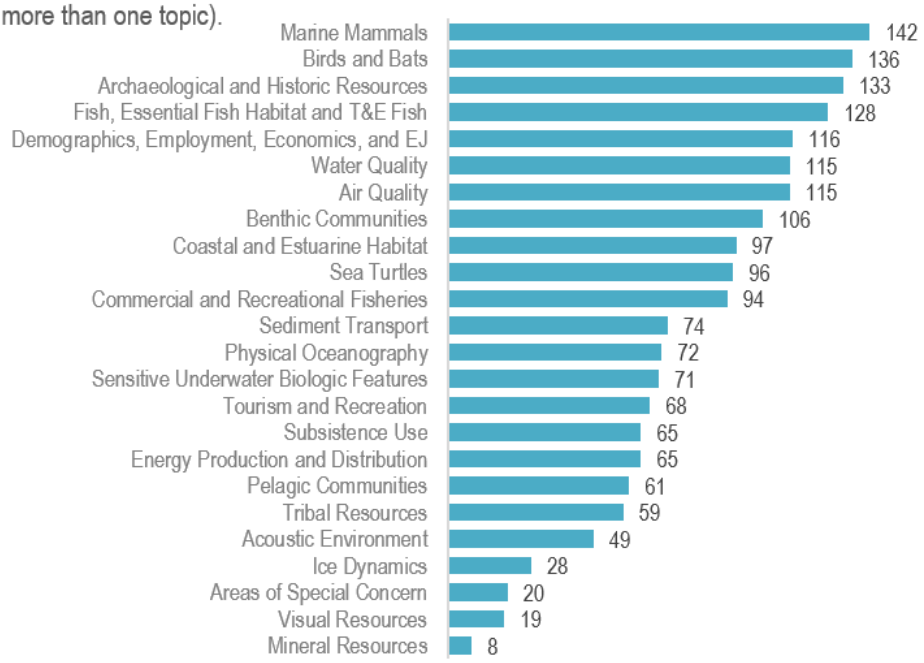

FIGURE F-19. BOEM ASSESSMENT RESOURCE TOPICS, ALL REGIONS AND PROGRAMS

Oil-spill was the top activity examined in assessments while **geosequestration** was the least, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

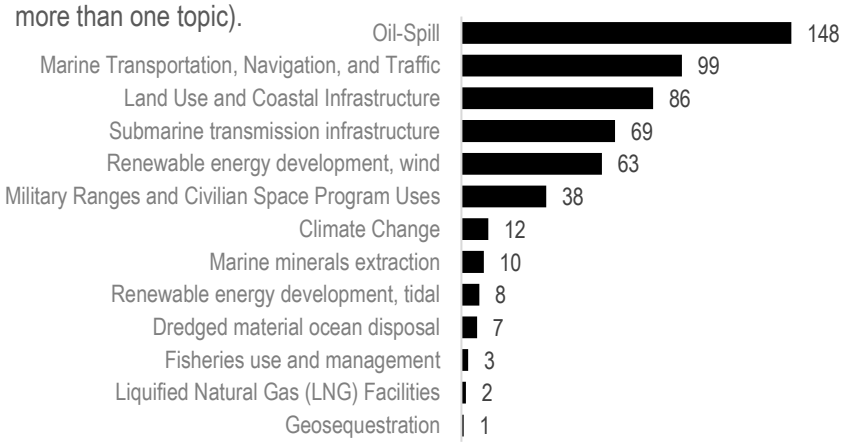

FIGURE F-20. BOEM ASSESSMENT ACTIVITY TOPICS, ALL REGIONS AND PROGRAMS

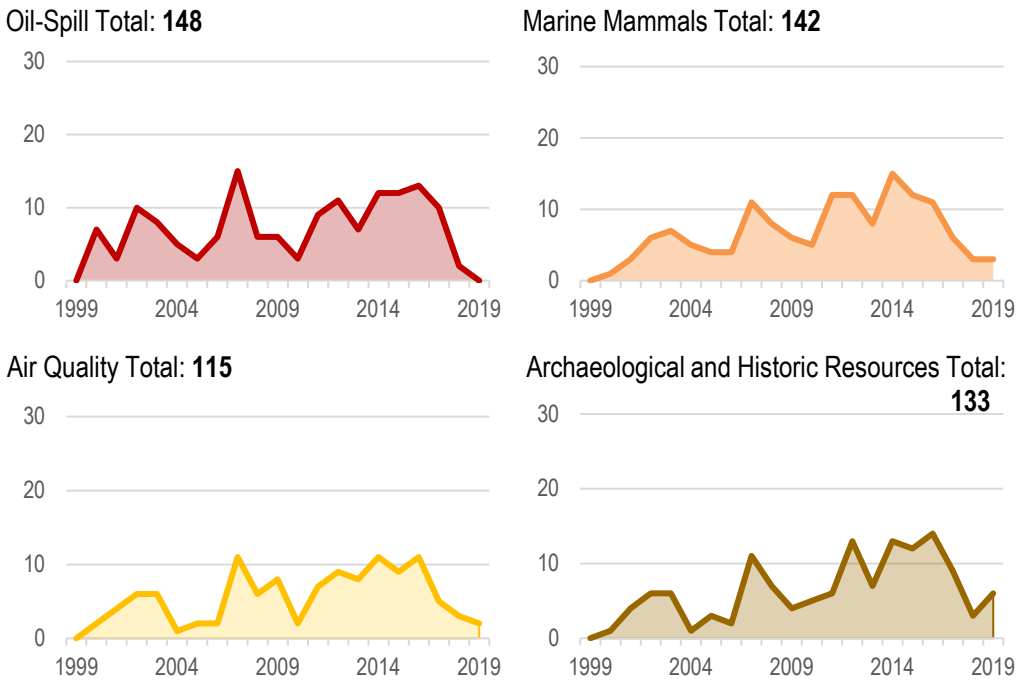

FIGURE F-21. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS ACROSS ALL REGIONS AND PROGRAMS, OVER TIME

ALASKA

Subsistence use was the top resource examined in assesments, while **sea turtles and cultural and sensitive underwater biologic features** were the least, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

FIGURE F-22. BOEM ASSESSMENT RESOURCE TOPICS, ALASKA

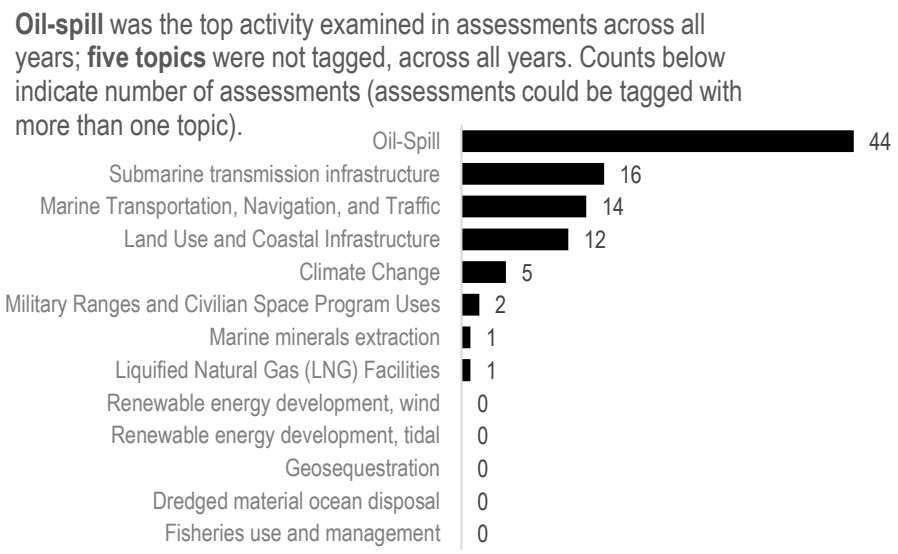

FIGURE F-23. BOEM ASSESSMENT ACTIVITY TOPICS, ALASKA

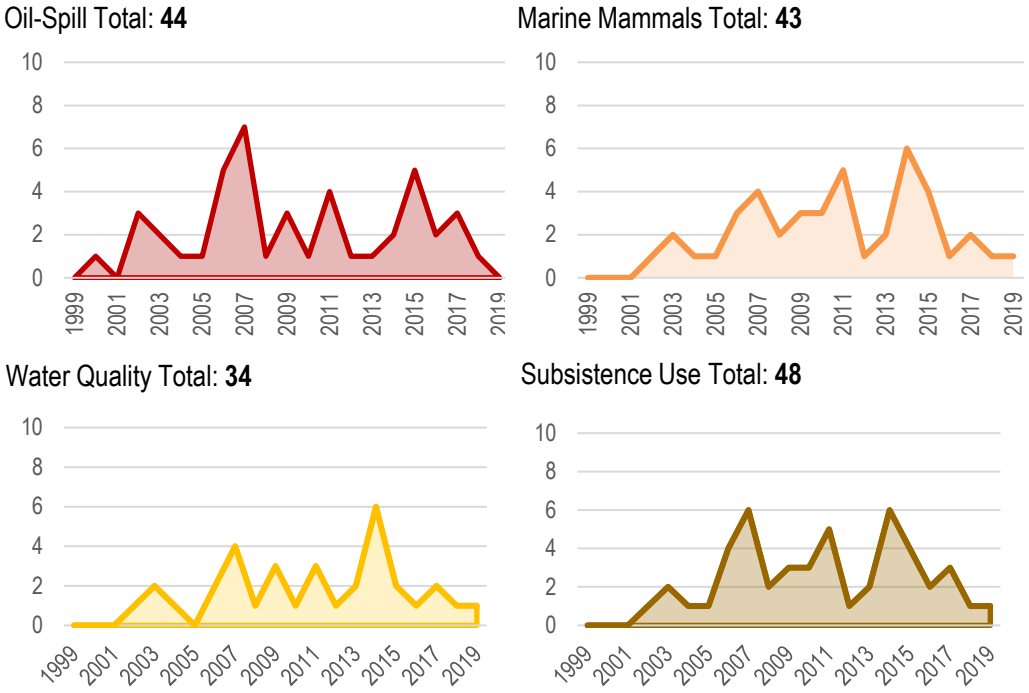

FIGURE F-24. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS FOR ALASKA, OVER TIME

ATLANTIC [43]

Archaeological and historic resources was the top resource examined in assesments, while **two topics** were not tagged, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

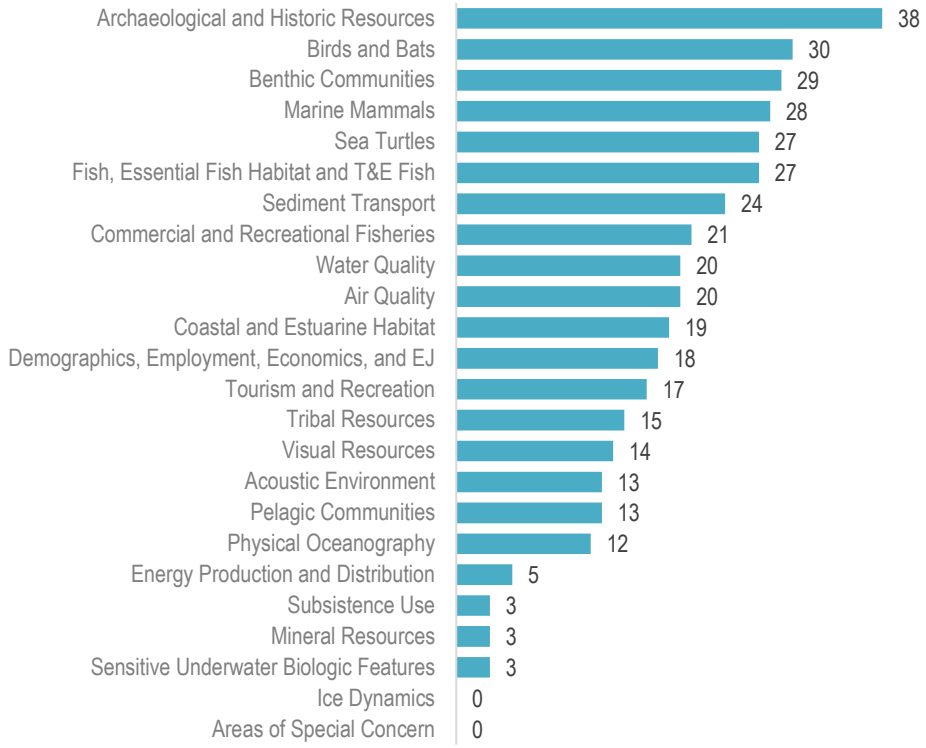

FIGURE F-25. BOEM ASSESSMENT RESOURCE TOPICS, ATLANTIC

[43] MMP assessments are likely considered in the Atlantic, GOM, or National assessment portfolios. It is anticipated that many of the MMP assessments will be included in the external evaluation.

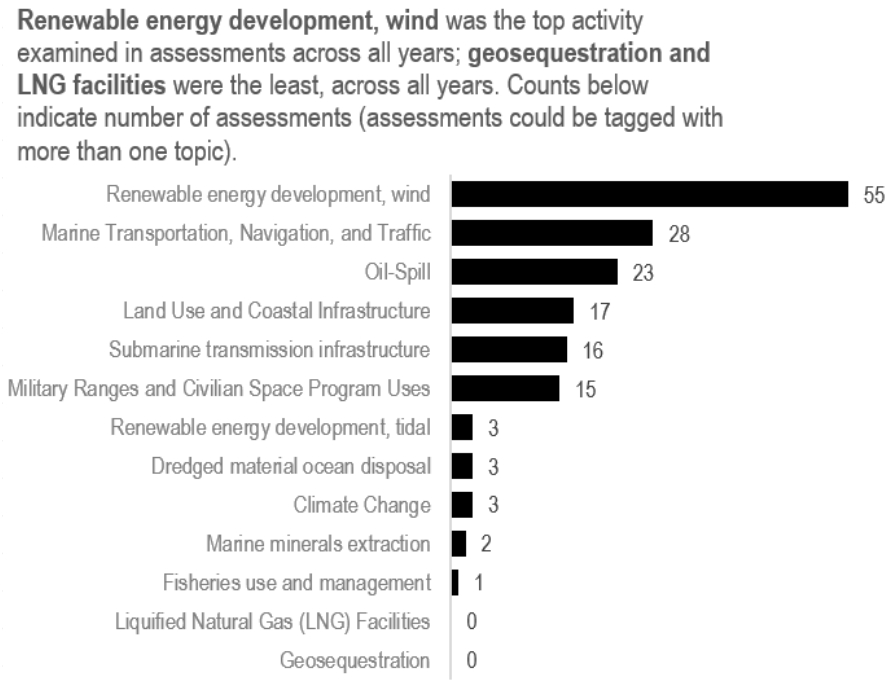

FIGURE F-26. BOEM ASSESSMENT ACTIVITY TOPICS, ATLANTIC

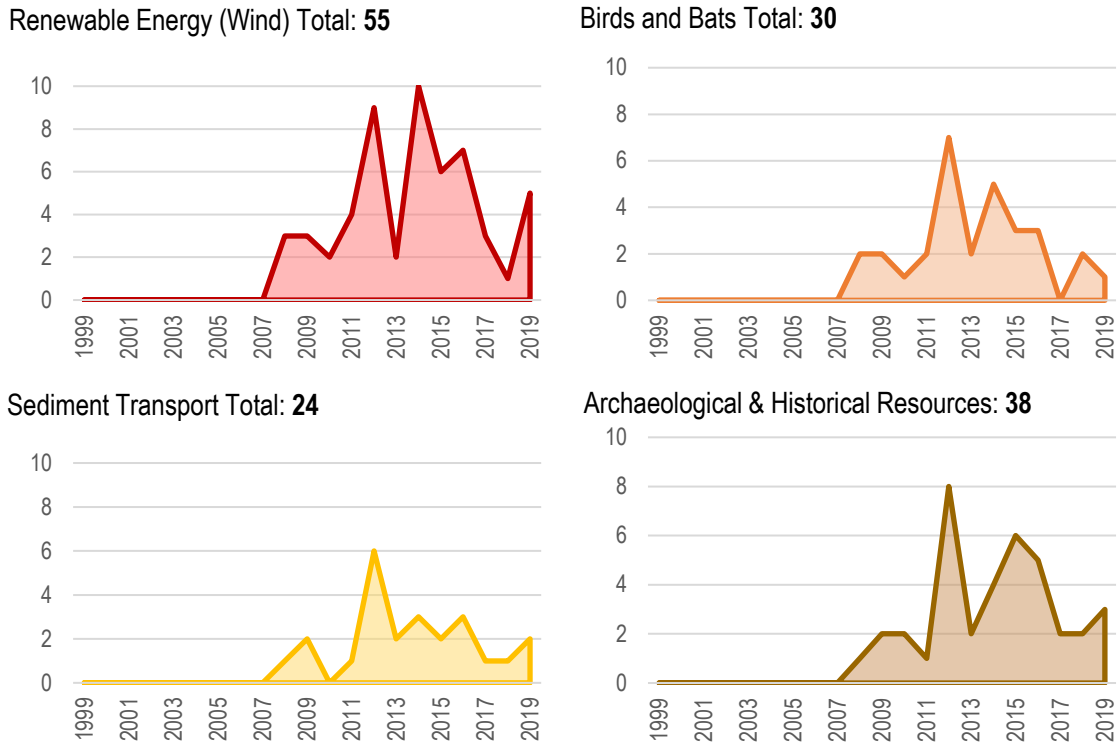

FIGURE F-27. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS FOR ATLANTIC, OVER TIME

GULF OF MEXICO[44]

Sensitive underwater biologic features was the top resource examined in assesments, while **ice dynamics and visual resources** were the least, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

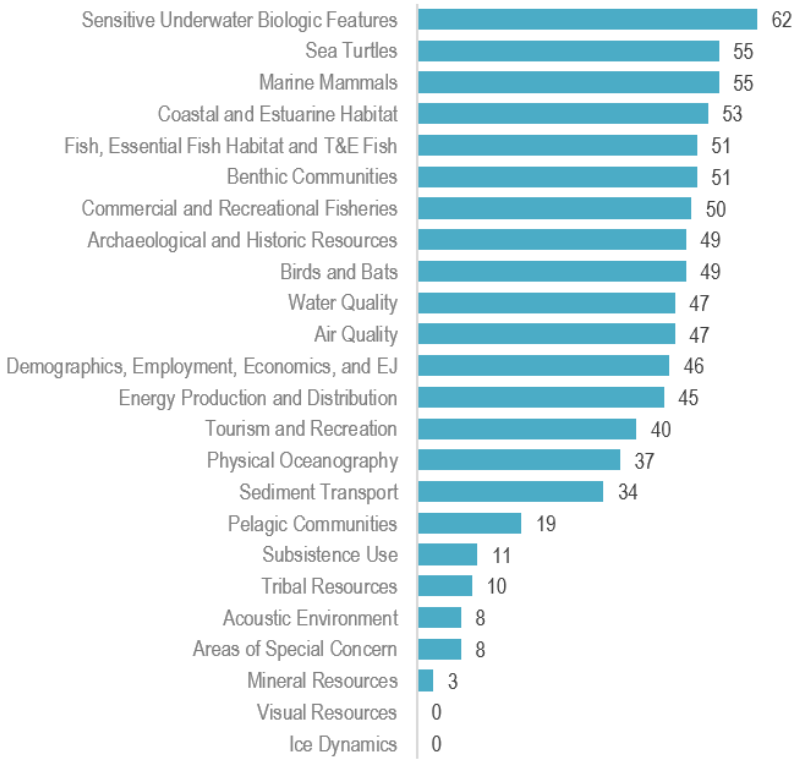

FIGURE F-28. BOEM ASSESSMENT RESOURCE TOPICS, GOM

[44] MMP assessments are likely considered in the Atlantic, GOM, or National assessment portfolios. It is anticipated that many of the MMP assessments will be included in the external evaluation.

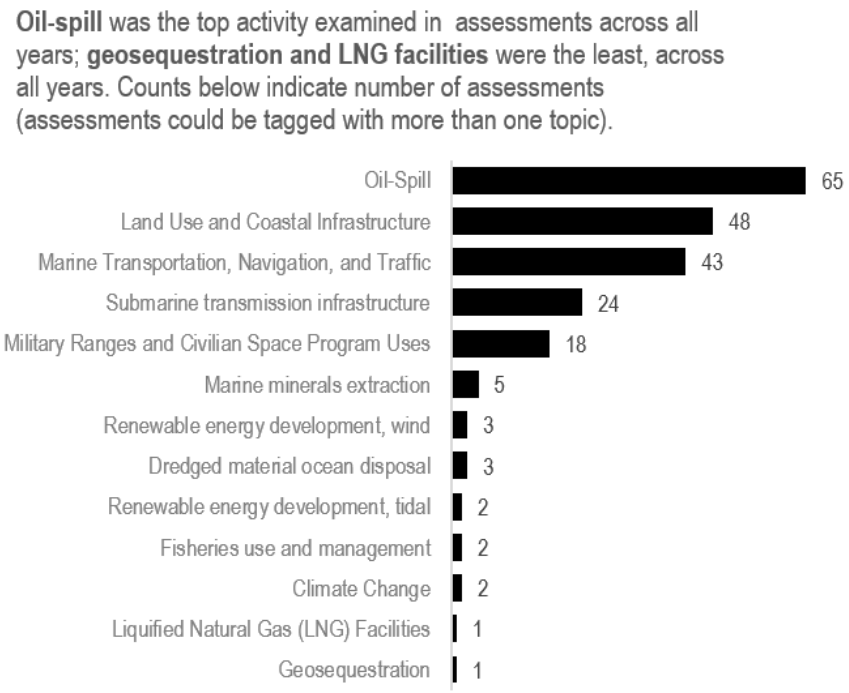

FIGURE F-29. BOEM ASSESSMENT ACTIVITY TOPICS, GOM

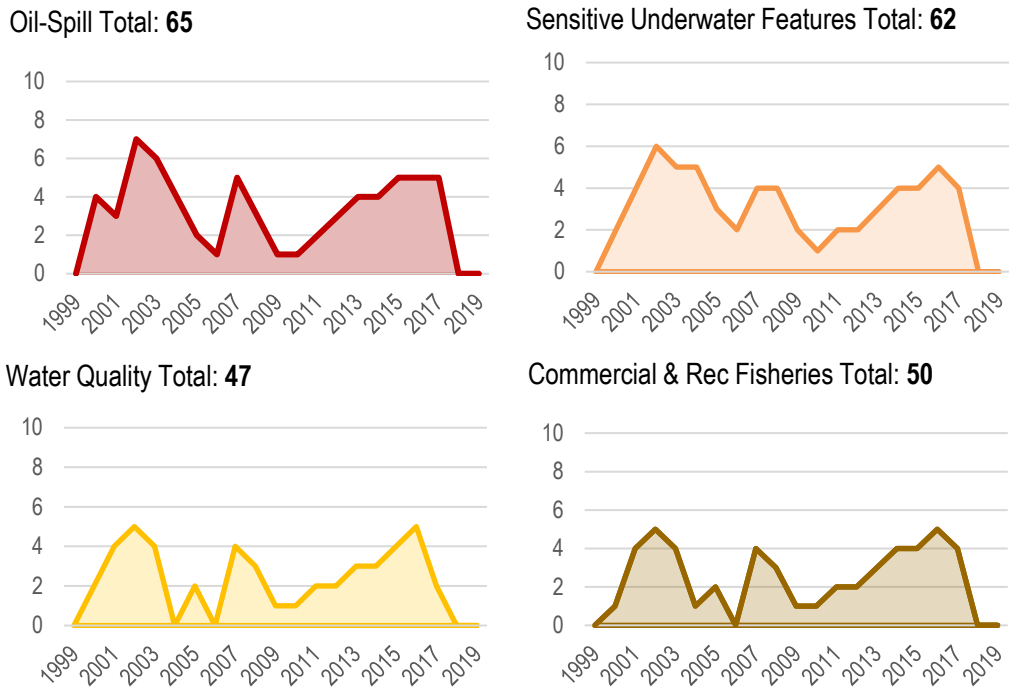

FIGURE F-30. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS FOR GOM, OVER TIME

NATIONAL[45]

Marine mammals and birds and bats were the top resources examined in assesments, while **mineral resources** were the least, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

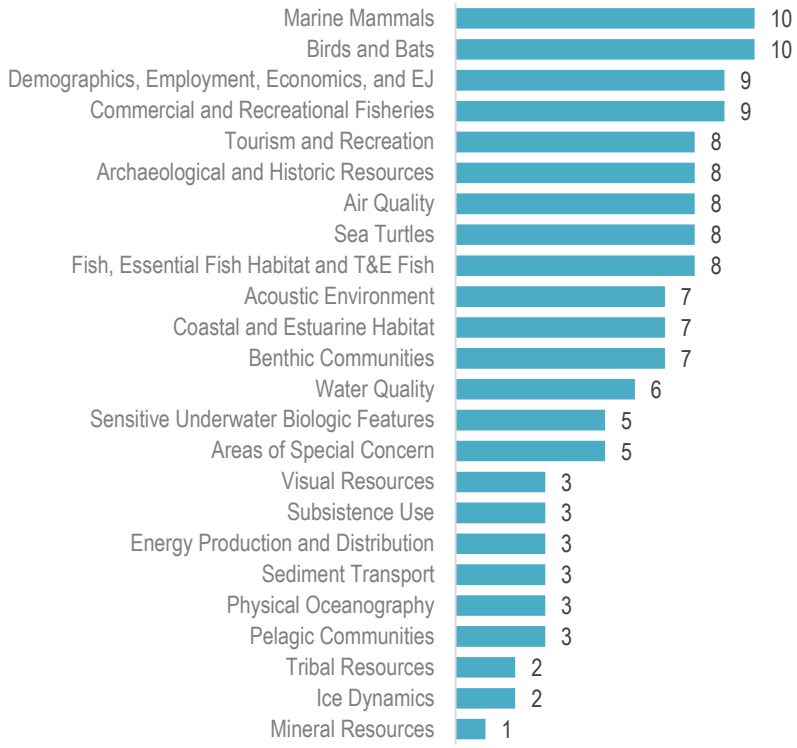

FIGURE F-31. BOEM ASSESSMENT RESOURCE TOPICS, NATIONAL

[45] MMP assessments are likely considered in the Atlantic, GOM, or National assessment portfolios. It is anticipated that many of the MMP assessments will be included in the external evaluation.

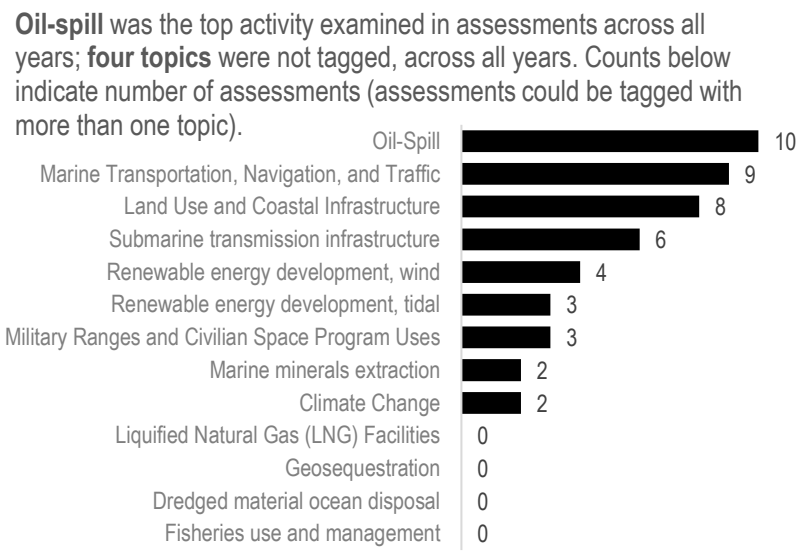

FIGURE F-32. BOEM ASSESSMENT ACTIVITY TOPICS, NATIONAL

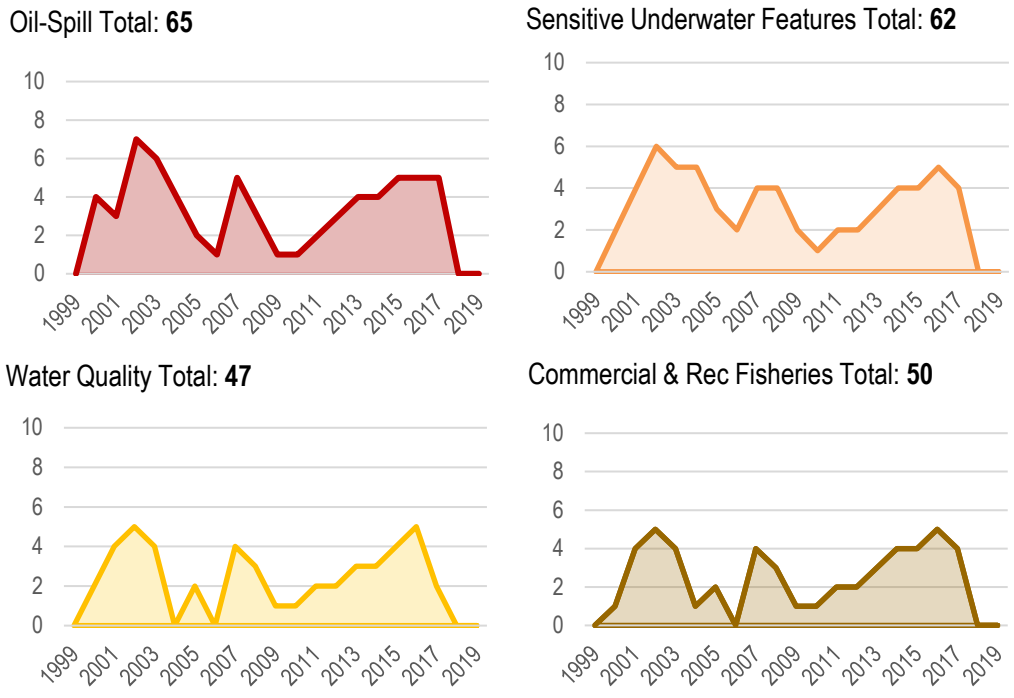

FIGURE F-33. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS FOR NATIONAL, OVER TIME

PACIFIC

Commercial and recreational fisheries, archaeological and historic resources, water quality, air quality and benthic communities were the top resources examined in assesments, while **six topics** were not tagged, across all years. Counts below indicate number of assessments (assessments could be tagged with more than one topic).

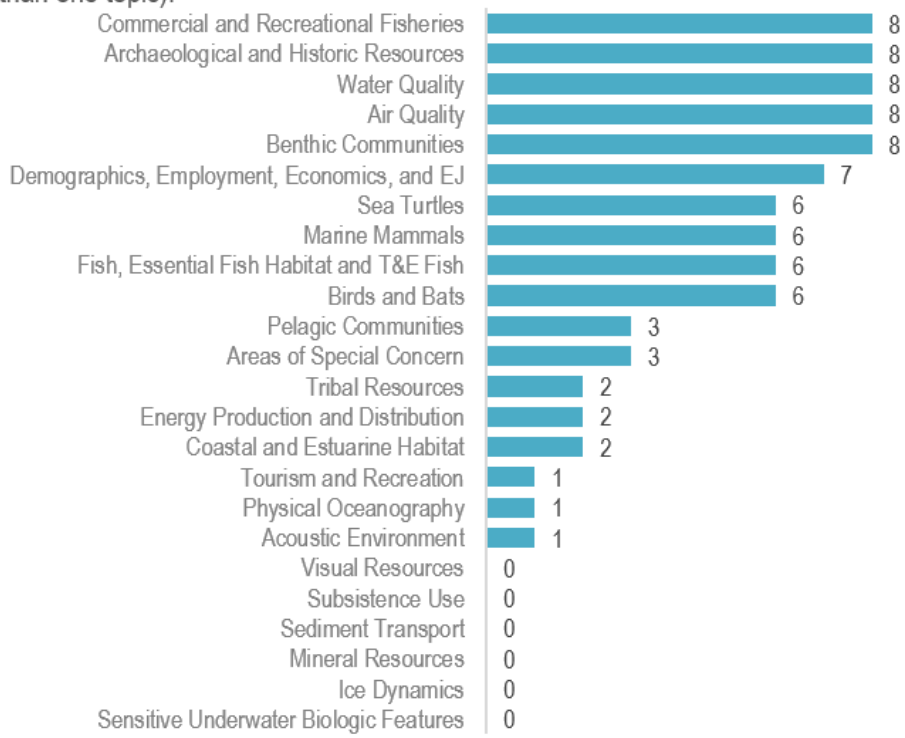

FIGURE F-34. BOEM ASSESSMENT RESOURCE TOPICS, PACIFIC

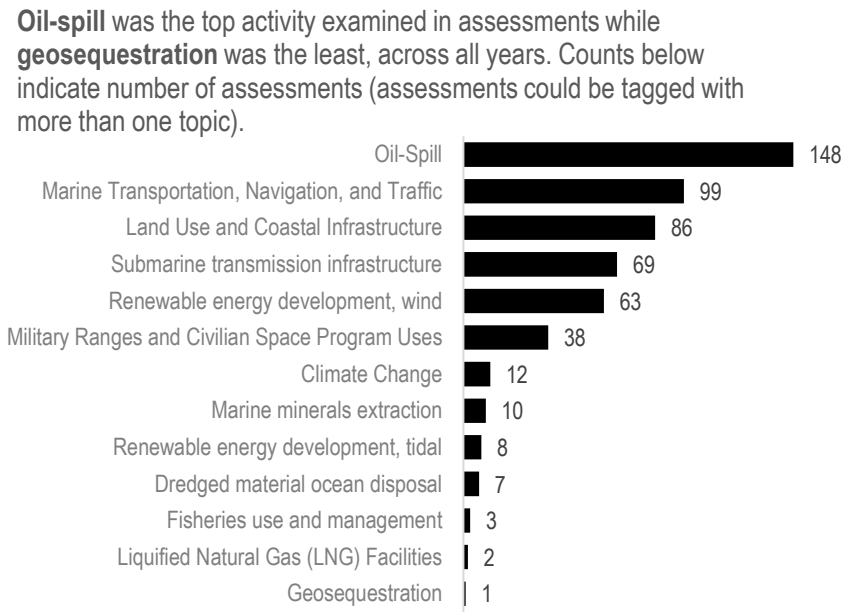

FIGURE F-35. BOEM ASSESSMENT ACTIVITY TOPICS, PACIFIC

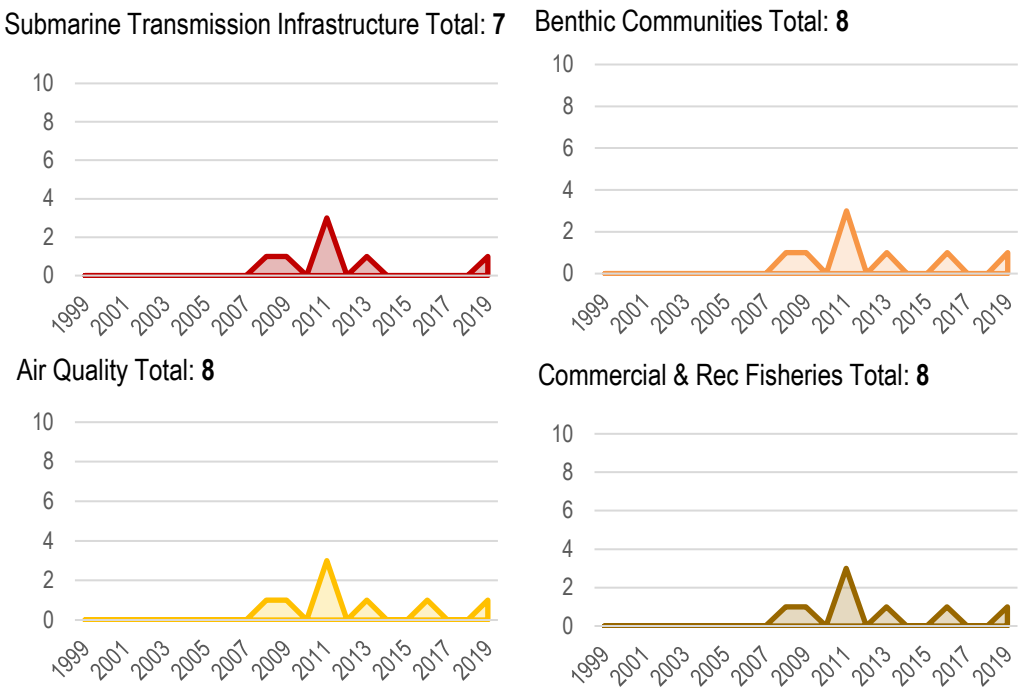

FIGURE F-36. TOP ACTIVITY (UPPER LEFT), BIOLOGICAL RESOURCE (UPPER RIGHT), PHYSICAL RESOURCE (LOWER LEFT), AND SOCIOECONOMIC RESOURCE (LOWER RIGHT) EXAMINED IN ASSESSMENTS FOR PACIFIC, OVER TIME

INFORMATION NEEDS ANALYSIS

The information needs analysis used NVivo to identify information needs in BOEM assessment documents. This was in addition to information needs identified in ESP-PAT and information needs in study profiles. The NVivo analysis included the use of both automatic and manual coding to identify, track, and refine our identification of authentic information needs. To identify potential information needs, IEc ran multiple automated queries in NVivo for the following terms:

- Information need(s)
- Incomplete information
- Unavailable information
- Best available information
- Data gap(s)
- Next step(s)
- Future research
- Professional judgement
- Key uncertainty(ies)

Once NVivo completed these queries across all assessment documents, IEc reviewed and coded these information needs by topic. These queries yielded thousands of hits across over 100 assessment files that IEc refined and categorized to a set of roughly 900 information needs. Information needs could be repeated across assessments or within one assessment, so these are not unique information needs. The following figures summarize these findings from NVivo. Figure F-37 summarizes information needs by resource. Marine mammals, fish, and water quality were the resources with the most identified information needs. Figure F-38 summarizes information needs by activity. The activities with the most identified information needs were oil spills and oil and gas activities by a wide margin. This is likely due to the repetitive nature of information needs related to Deepwater Horizon in recent assessments, which IEc coded to the oil spill activity and the relevant resource (see further discussion below). If a topic does not have any identified information needs in the figures, that does not mean that BOEM has not explicitly identified one. The figures only include the NVivo results from assessments documents and not the ESP-PAT or study profile data.

Over time, the topics of information needs have shifted. The most noticeable trend in topics was the increase in oil spill and associated information needs following Deepwater Horizon. The number of identified information needs increased to well above historical levels in the years following the spill. For example, Figure F-39 shows the information needs per assessment over time for oil spills and oil and gas activities.

Marine mammals was the top information need identified in assessments, while **areas of special concern and mineral resouces** had none identified, across all years.

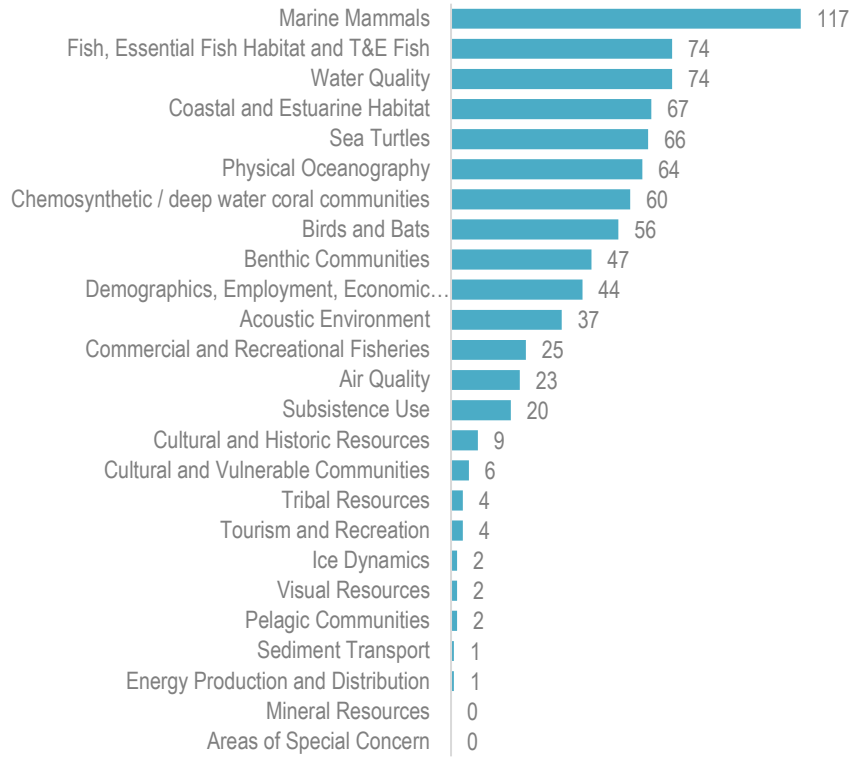

FIGURE F-37. BOEM INFORMATION NEEDS BY RESOURCE, ALL YEARS

Oil spills and oil and gas surveys and extraction were the activities with the most identified information needs; **geosequestration** and dredged material had the least.

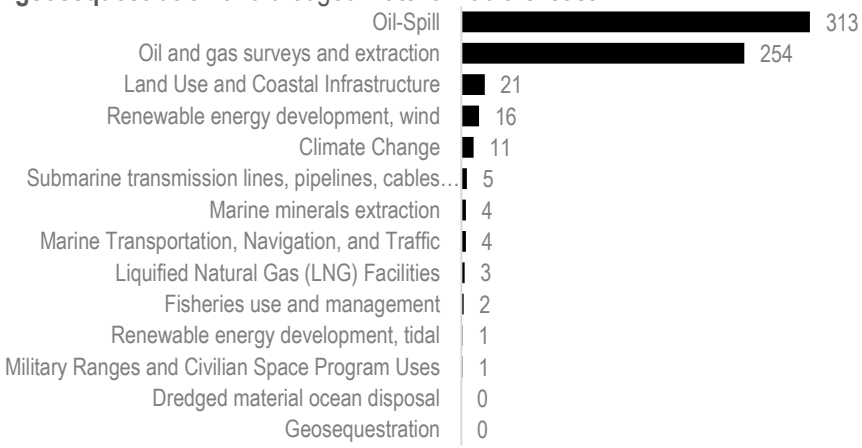

FIGURE F-38. BOEM INFORMATION NEEDS BY ACTIVITY, ALL YEARS

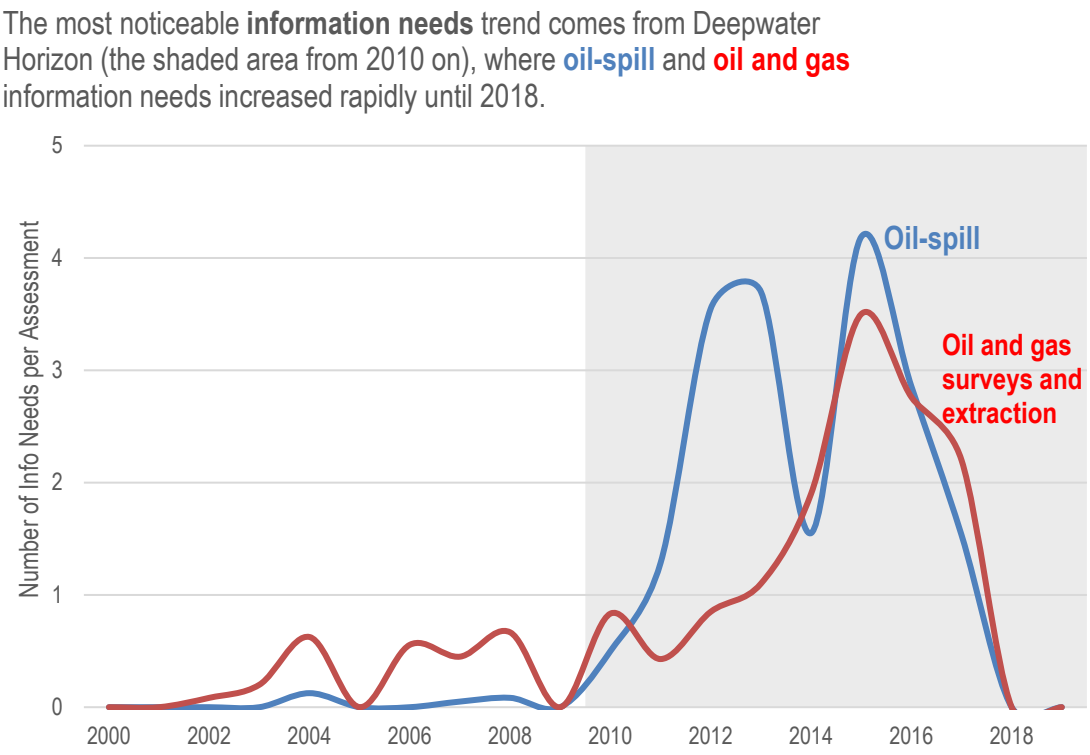

FIGURE F-39. NUMBER OF IDENTIFIED INFORMATION NEEDS PER ASSESSMENT OVER TIME FOR OIL SPILLS AND OIL AND GAS ACTIVITIES, 1999-2019

Note: Post *Deepwater Horizon* years shaded gray

CITATION ANALYSIS

Figure F-40 indicates the ratio of BOEM studies with at least one citation in BOEM assessments.[46]

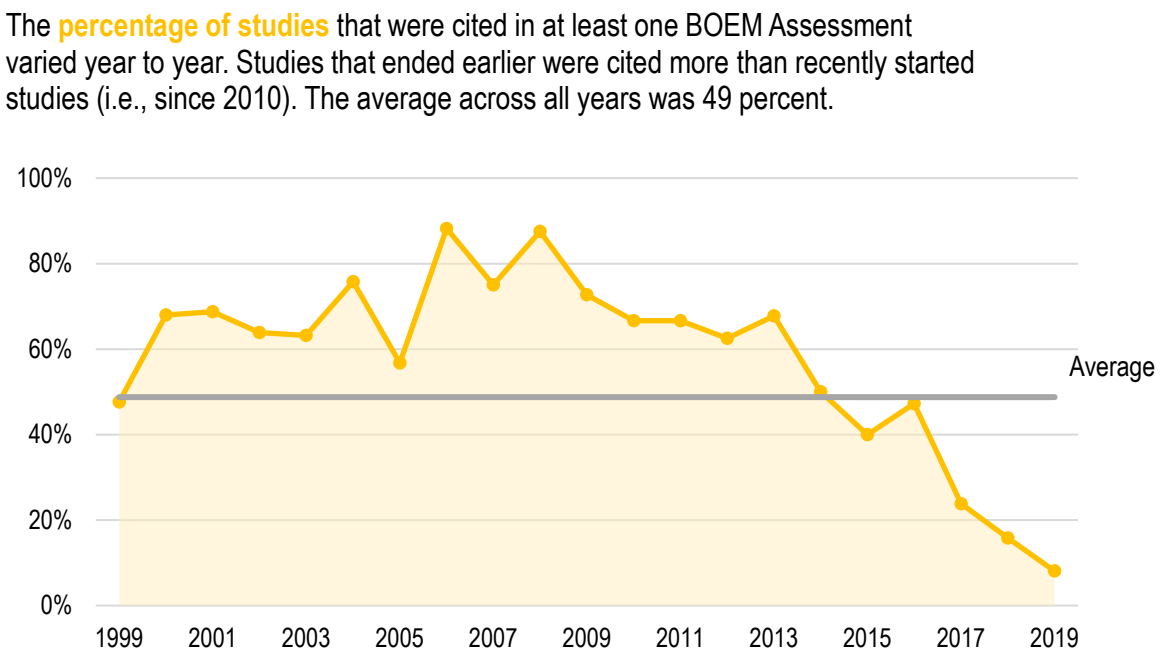

FIGURE F-40. RATIO OF BOEM STUDIES WITH AT LEAST ONE CITATION, BY STUDY END YEAR 1999-2019

[46] This figure excludes studies with end years later than 2019. IEc also excluded a small number of studies (less than 1 percent of total citation analysis results) for which the study start year was later than the year of the assessment that cited the study, assuming errors in the studies tied to the cited study products. While this potentially leads to undercounting study citations, this likely has a negligible impact on the overall results and findings. The results indicate that newer BOEM studies, which have had fewer opportunities to be cited in assessments, are less likely to be cited. This is time lag is expected, as assessments cannot include up-to-the-minute references.

SOCIAL NETWORK ANALYSIS

As part of the survey, BOEM staff were asked to list their internal contacts, and to indicate the nature of these interactions including:

- **Frequency of interaction** (at least once per week, more than twice a month but less than once a week, once or twice a month, at least once a year but less than once a month)
- **Type of interaction** (formal, informal, both)[47]
- **If information is shared between contacts** (yes/no)
- **What areas contacts collaborate on** (studies, assessments, both)

For every BOEM staff member listed in the dropdown list, we generated a unique ID. We then created two new tables to conduct the analysis:

- **Nodes Table**: A list of all unique IDs with respondent-specific characteristics (region, role, and survey completion status). This table contained 150 unique IDs comprised of: 111 survey respondents, 38 BOEM staff who were listed as contacts in the survey but did not complete the survey themselves, and one staff member who was included in the dropdown list but did not take the survey and was not listed as a contact by any survey takers.
- **Edges Tables**: A list with unique rows for every interaction specified during the survey. Each row contained the source (i.e., survey taker), and the target (i.e., the contact the survey taker listed as someone with whom they communicate), along with the nature of each interaction (i.e., the frequency and other nature of interaction variables listed above). This table consisted of 1,261 interactions. Of these, 460 (36 percent) were cases where the source and target mutually listed each other as contacts.

To conduct the SNA, we analyzed summary statics from survey responses and used the open-source SNA software package Gephi to generate network graphics and advanced statistics.[48] This appendix provides additional details from this analysis.

Types of Collaboration

Roughly half of all connections (49.6 percent) were reported as collaborating on both studies and assessments (Table F-1). Staff who do not collaborate on both were much more likely to indicate collaboration on studies (38.2 percent) than assessments (12.2 percent). Staff in the Alaska Region reported the highest average number of contacts on studies (6.2), while OEP staff reported the greatest number of interactions on assessments (2.4). The MMP had the greatest average number of contacts with whom they collaborated on both studies and assessments (8.4).

[47] Definitions provided to survey respondents: formal interactions include shared workgroup assignments, joint programs, boards, etc. Informal interactions include emails, phone calls, conversations, etc.

[48] See: https://gephi.org/

TABLE F-1. BOEM STAFF TYPES OF COLLABORATION

Group	All	Alaska	GOM	OEP	MMP	OREP	Pacific
N (All SNA Survey Respondents)	111	17	29	40	7	10	8
N (Collaborating on Studies)	32	8	5	14	1	2	2
N (Collaborating on Assessment)	12	1	2	6	0	2	1
N (Collaborating on Both)	47	7	15	11	6	5	3
Total Contacts Collaborating on Studies	420	105	67	198	4	26	20
Average	*3.8*	*6.2*	*2.3*	*5.0*	*0.6*	*2.6*	*2.5*
Total Contacts Collaborating on Assessments	135	10	22	97	0	3	3
Average	*1.2*	*0.6*	*0.8*	*2.4*	*0.0*	*0.3*	*0.4*
Total Contacts Collaborating on Both	547	89	163	141	59	56	39
Average	*4.9*	*5.2*	*5.6*	*3.5*	*8.4*	*5.6*	*4.9*

BOEM staff were also asked to report on whether they share information with their contacts. The majority of interactions between BOEM staff involve sharing information (1,072 out of 1,261; 85 percent), while 82 percent of survey respondents reported sharing information (91 of 111; Table F-2). The Alaska office reported sharing information with the most contacts on average (12.2) followed by OEP (10.9) and the MMP (9.0). All respondents in these offices and regions reported sharing information. Over two-thirds (five out of eight) Pacific staff reported that their interactions with their listed contacts did not involve sharing information about study results or assessments, the highest of any office.

TABLE F-2. BOEM STAFF SHARING INFORMATION

Group	All	Alaska	GOM	OEP	MMP	OREP	Pacific
N (All)	111	17	29	40	7	10	8
N (Sharing Information)	91	17	22	31	7	9	5
Total Sharing Information	1,072	208	240	435	63	70	56
Average	9.7	12.2	8.3	10.9	9.0	7.0	7.0

Figure F-41 depicts the network within BOEM when limited to sharing information. The average path length of 2.8 is nearly the same as the path length in the full BOEM network (2.6), reaffirming that information is generally shared throughout all interactions. The SNA software revealed the presence of eight unique communities within this network. Once again, connections and information generally travel through OEP, although there are other subnetworks that are notably clustered together including information sharing between the GOM Region and the MMP, and OREP and the Pacific Region. Based on this network, Alaska's information sharing appears to be more internal or directly through OEP.

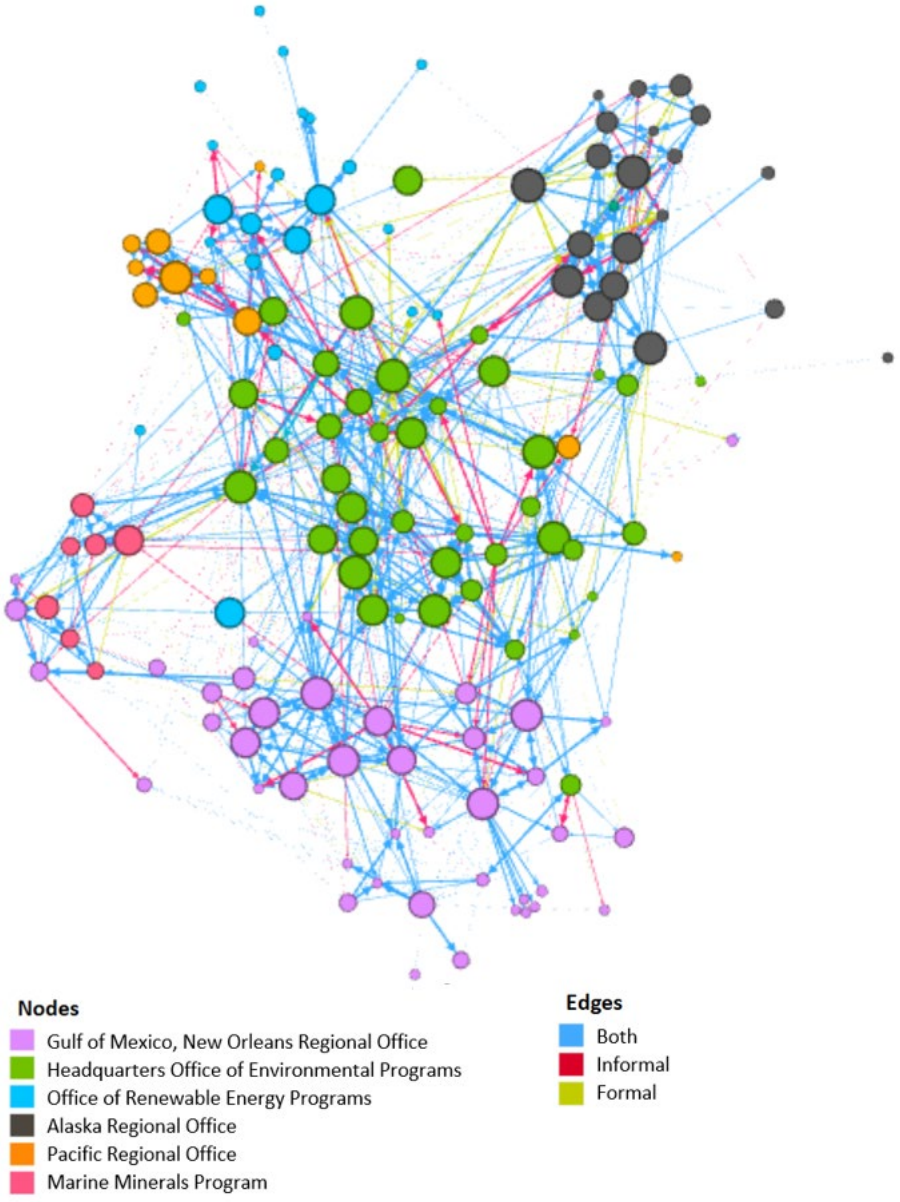

FIGURE F-41. BOEM INFORMATION SHARING NETWORK

Excluding OEP Analysis

The SNA analysis revealed that many connections within BOEM center around contacts within staff members' own offices and with OEP. To further examine the central role that OEP plays in connecting BOEM staff and facilitating information, we looked at several network trends when removing OEP (Figure F-42). As mentioned previously, the average path length increases from 2.6 to 3.0 when excluding OEP, meaning information must travel through more BOEM staff to reach other parties. There are also eight unconnected nodes in this network, compared to just one in the full network, meaning that several

BOEM staff only interact substantially with staff at OEP. The number of unique communities decreases by just one (from six to five) when excluding OEP (as anticipated), but the modularity of the network increases from 0.435 to 0.607 indicating weaker connections between these communities. This weakening of ties between communities shows that excluding OEP reduces the opportunities for meaningful interactions between BOEM subnetworks. Finally, the location of the nodes indicates there is no central presence to disseminate information when OEP is removed. Staff members at OREP and GOM become the most central figures in this network, but regional offices are generally relatively isolated. This illustrates the responsibility of OEP to pass information between offices and regions as the center of the network, with relatively few replacements.

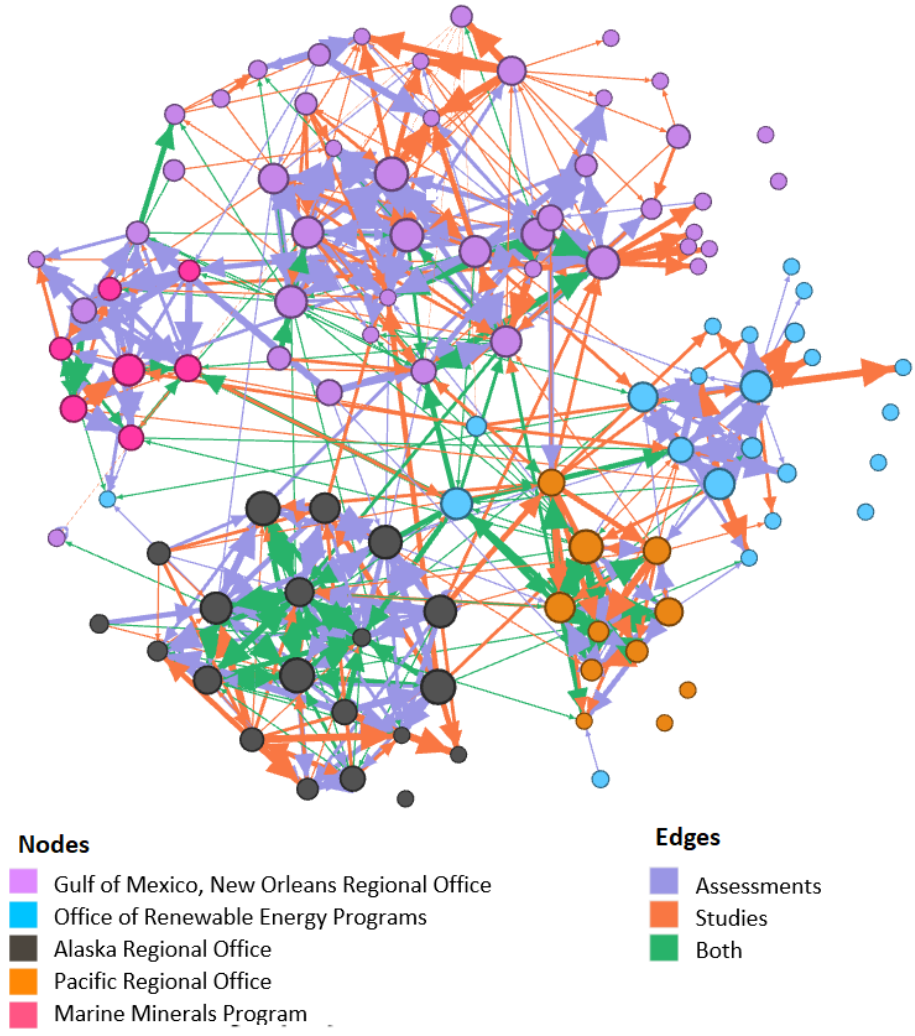

FIGURE F-42. BOEM NETWORK EXCLUDING OEP

Mutual Reporting Analysis

IEc conducted analysis to determine the similarities between how BOEM staff view their interactions. We analyzed the rate at which survey respondents mutually reported one another as contacts and the type and frequency of their interactions. As Table F-3 shows, 63 percent of connections were only reported by one respondent (including respondents reporting non-survey takers), compared to 37 percent that were mutually reported. Of the mutually reported connections, 94 percent reported the same type of interactions, but just 36 percent reported the same frequency.

TABLE F-3. BOEM STAFF ONE-WAY AND MUTUAL CONNECTIONS

Type	Number of Connections	Percent
One-Way Connections	801	63%
Mutual Connections	460	37%
Reported Same Type of Interaction (Formal vs. Informal)[1]	*432*	*94%*
Reported Same Frequency of Interaction	*214*	*36%*

[1] This number includes combinations of all respondents who reported having "both" formal and informal interactions with respondents who reported only one of the two. If this were limited to exact matches, the total would be 244 mutually reported interaction types, or 53 percent.

To determine how many connections went unreported, we analyzed the distribution of mutually reported and one-way connections.[49] As noted above, of the 1,261 internal connections reported, 37 percent were mutually reported. The remaining 63 percent of connections that were reported in only one direction were comprised mostly of respondents who reported having an interaction with another survey taker who did not reciprocate the response (75 percent). Only one-quarter of one-way connections came from a respondent reporting an interaction with a non-survey taker.

Using these percentages, we identified the average number of 1) mutually reported contacts, 2) one-way contacts identifying a survey taker, and 3) one-way contacts identifying a non-survey taker, by multiplying the share for each of these groups by the 11.5 total contacts that the average survey taker reported having within BOEM. As a result, we determined that 4.3 contacts were mutually reported, 5.4 were one-way reports of interactions with another survey taker, and 1.8 were one-way reports with a non-survey taker. Using this analysis, we estimate that had the full population of 146 BOEM staff who received the survey completed it, there could have been up to 189 more connections reported (5.4 one-way connections multiplied by 35 non-SNA survey takers, a 15 percent increase from the number of reported connections). However, this number likely overestimates the total number of unreported connections because many of the currently reported one-way interactions would simply become mutual rather than new connections with the addition of all non-respondents to the survey. Based on the 37 percent of mutually reported connections, we believe that at least one-third of the connections that would

[49] One-way connections included all BOEM employees who reported a connection that was not mutually reported, which may have been due to another survey taker not reciprocating the response or a respondent reporting a non-survey taker as a contact.

be reported by non-survey takers are already captured in the data. This reduction of our high-end estimate of 15 percent unreported connections would suggest that it is likely that 90 percent or more of all interactions are currently captured.

APPENDIX G: STUDY PROFILE TEMPLATE

Environmental Studies Program: Studies Development Plan | FY 2022–2023

Title	Study title
Administered by	Administrative unit conducting the study
BOEM Contact(s)	Name (e-mail)
Procurement Type(s)	Contract, Interagency Agreement, Cooperative Agreement
Conducting Organization(s)	TBD
Total BOEM Cost	$XXX,XXX (Costs at this stage are expected to be an estimate. Please also note any expected cost-share or in-kind support from partners.)
Performance Period	FY 202X–202X
Final Report Due	TBD
Date Revised	Month Day, Year
PICOC Summary	Write **1–2 sentences** for each of the following elements, as appropriate.
Problem	What or who is potentially affected? This includes baseline studies.
Intervention	What is your solution to the problem? How do you measure potential interactions and/or change?
Comparison	This is measured against the intervention. Think of hypothesis testing, control *vs.* treatment, and/or natural change.
Outcome	What is the expected or predicted outcome, and understanding?
Context	What are the circumstances and/or geographic domain(s)?

BOEM Information Need(s): Provide brief and conclusive reason(s) why BOEM needs the information. Explain how this information will be used to manage OCS resources. The specific decision or document relying on the information should be stated.

Background: Include details about what information is required and whether this project ties-in with other efforts, and if so, how. Include a description of the current status of information (*e.g.*, what is the level of adequacy of existing information, does any exist, or does it need to be more site-specific).

Objectives: Clearly and succinctly state what the overall purpose of the study is. If there is more than one objective, use a bulleted list.

Methods: All study profiles must provide a sound research concept (including questions asked), design, and methodology. This does not require a high level of detail, but the basic proposal concept, design, and methodology must be sound.

Specific Research Question(s): What are the specific research questions this study proposes to address? If there is more than one question, use a numbered list.

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References: Include references for only those works cited in the profile. This section does not count against the 2-3 page length limit for the profile. Please write out your entries in plain text and do not use Word's internal *Manage Sources* function. Please use the Council of Science Editors (CSE) 8th Edition Bibliography Formatting guidelines. See below for some examples, additional examples can be found here.

Journal article:

Johnson M, de Soto NA, Madsen PT. 2009. Studying the behaviour and sensory ecology of marine mammals using acoustic recording tags: a review. Mar Ecol Prog Ser. 395:55–73.

Smart NP, Fang ZT, Bervick RL. 2003. Practical guidance for sperm whale studies. J Card Fail. 9(1):45–78.

Book:

Richardson WJ, Greene Jr CR, Malme CI, Thomson DH. 1995. Marine mammals and noise. San Diego (CA): Academic Press. 502 p.

Technical report:

Feller BA. 1981. Health characteristics of persons with chronic activity limitations. United States, 1979. Hyattsville (MD): National Center for Health Statistics (US). 68 p. Report No. VHS-2345. Available from: NTIS, Springfield, VA; PB88-284858.

Sheridan P. 2008. Seasonal foods, gonadal maturation, and length-weight relationships for nine fishes commonly captured by shrimp trawl on the northwest Gulf of Mexico continental shelf. Panama City Beach (FL): National Marine Fisheries Service, Southeast Fisheries Science Center. 40 p. Report No.: NOAA Tech. Memo. NMFS-SEFSC-566.

Technical report written by a performing organization and published by a sponsoring organization or agency (e.g., BOEM-funded study):

Barkaszi MJ, Kelly CJ. 2019. Seismic survey mitigation measures and protected species observer reports: synthesis report. New Orleans (LA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 220 p. OCS Study BOEM 2019-012.

APPENDIX H: METHODOLOGY

The full methodology was developed prior to implementation of this report and is available as the Year 1 methodology report (Volume 1). Any necessary updates to the methodology are described in this current document.

U.S. Department of the Interior (DOI)

DOI protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

Bureau of Ocean Energy Management (BOEM)

BOEM's mission is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.

BOEM Environmental Studies Program

The mission of the Environmental Studies Program is to provide the information needed to predict, assess, and manage impacts from offshore energy and marine mineral exploration, development, and production activities on human, marine, and coastal environments. The proposal, selection, research, review, collaboration, production, and dissemination of each of BOEM's environmental studies follows the DOI Code of Scientific and Scholarly Conduct, in support of a culture of scientific and professional integrity, as set out in the DOI Departmental Manual (305 DM 3).