

Ultra High Resolution Aerial Surveys in the Atlantic

"Let's Get Digital"

Best Management Practices Workshop for Atlantic Offshore Wind Facilities and Marine Protected Species

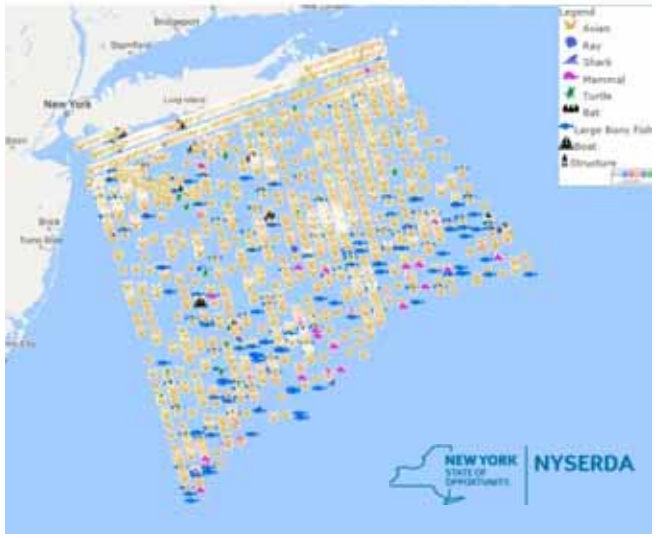
March 8, 2017

Christian Newman

Best Management Practices Need to Address These Questions

Baseline Questions

- What species are out there?
- How many individuals are out there?
- Where are they located?
- When are they there?
- How do they behave?
- Are there inter-annual or seasonal differences?



Basic Questions about Development Activities

- Are there mortality or injury risks and if so, can those risk be quantified?
- Will species composition change within or outside development area?
- Will population levels change within or outside development area?
- Will there be displacement or attraction within or outside development area?
- If there are potential impacts, when do the occur and how long do they last?

High Resolution Digital Aerial Survey Methods and Data Address All Those Questions

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Why Ultra High Resolution Digital Aerial Surveys

- **Operational**
  - Health & Safety; survey altitude
  - Fast to mobilize with fewer weather constraints
  - Pre-Construction, Construction, Post-Construction
- **Statistical**
  - No attraction / repulsion
  - Allows randomized designs
  - Less temporal variation in data
  - Spatially accurate
  - Quantifiable sample area
  - Pre-Construction, Construction, Post-Construction
- **Confidence**
  - Fully auditable permanent record
  - Fully objective; human error reduced; QA/QC
- **Biological**
  - Provides data for **ALL** offshore wildlife
  - No disturbance to wildlife
  - Bird flight height data

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Offshore Wind – Digital methods are established and proven

United Kingdom

- All UK Round 3 Offshore Wind Farm used aerial digital methods
- >30GW of renewable projects have been surveyed since 2008
- Acceptance by UK Statutory Nature Conservation Agencies and Regulators

Germany

- StUK-BSH (regulator) specify digital aerial survey

USA

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- 2013- High-resolution Aerial Imaging Surveys of Marine Birds Mammals, and Turtles on the US Atlantic Outer Continental Shelf—Utility Assessment, Methodology Recommendations, and Implementation Tools
- 2013-Guidelines for Providing Avian Surveys for Development in AOCS
- 2017 (Pending)- Ecological Baseline Studies of the US OCS: Sample Task Order for High Resolution Aerial Wildlife Surveys in the South Atlantic

DOE

- 2015-Mid-Atlantic Baseline Studies: High Resolution digital video aerial surveys

NYSERDA

- 2016-Digital Aerial Baseline Survey of Marine Wildlife in NY Bight

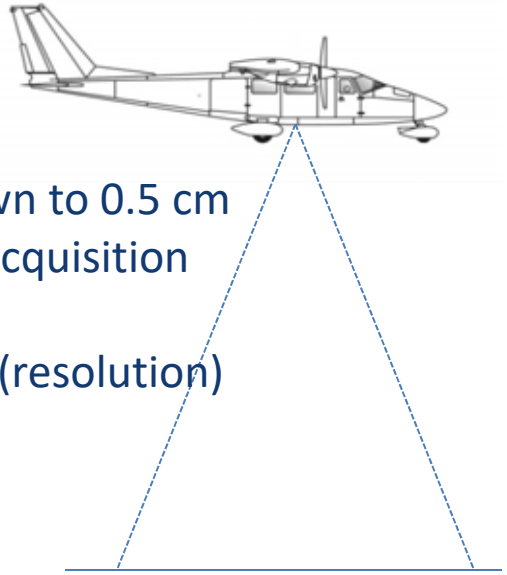
NOAA and Others

- Historical and ongoing marine mammal surveys

Camera systems

Range of Camera Systems

- 40 – 400+ megapixels
- Digital stills, video, thermal and infrared
- Flexible mounting system for deployment in most survey aircraft camera
- Can be flown at different heights, depending project needs, resolution needs and lenses



Ground Resolution Distance (GSD)

- 2 cm GSD is BOEM's standard; various resolutions possible, down to 0.5 cm
- Trade-off between resolution (species ID rates), coverage, and acquisition costs
- Focus should be on the how clear/sharp a pixel is rather its size (resolution)

Spatial Accuracy

- GPS/GNSS
- IMU

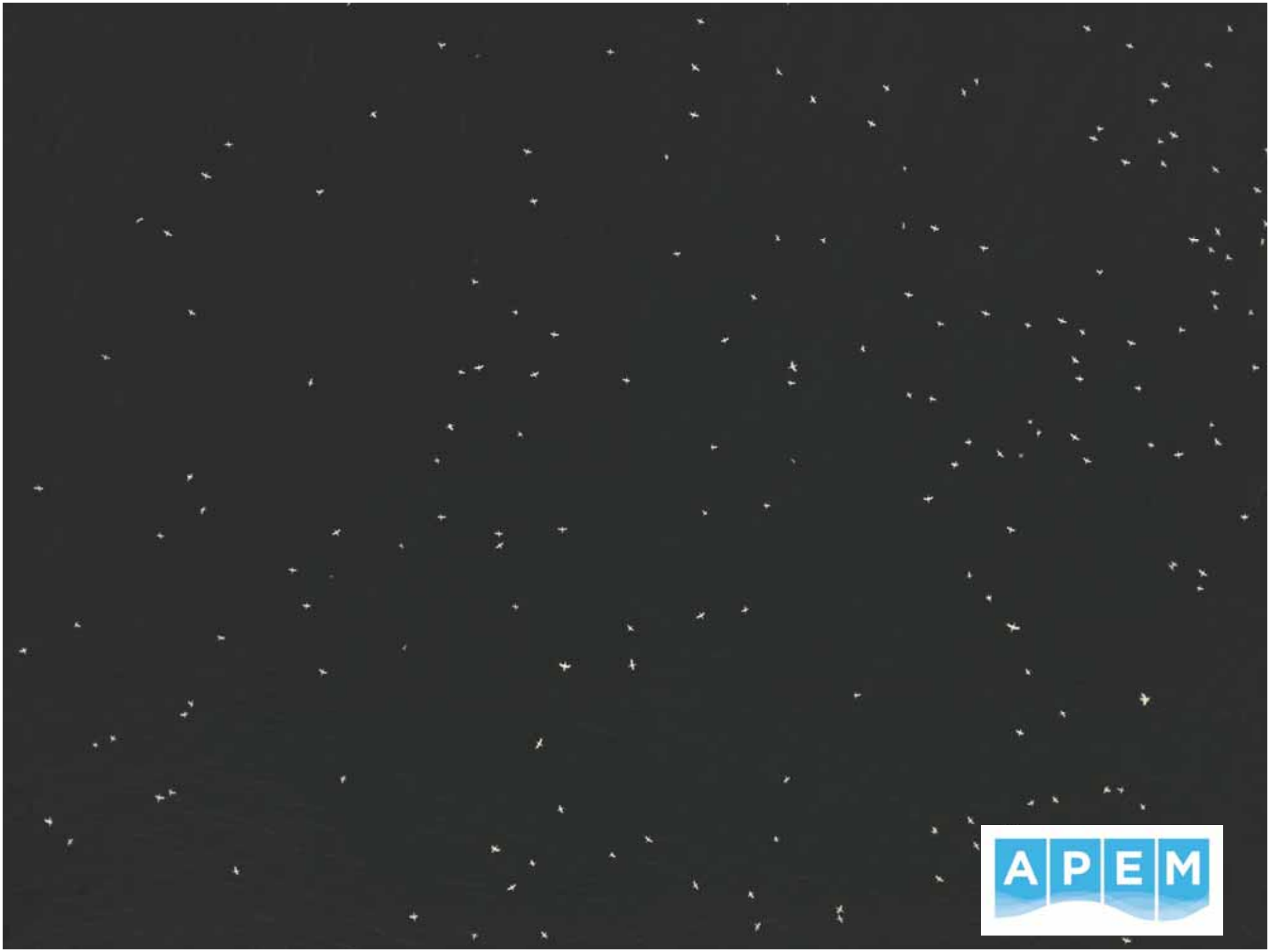

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Image Analysis

- Manual & automated object detection
- Expert species identification
  - Birds, mammals, turtles, rays, fish
- Size & shape
- Direction
- Bird flight height
- Anthropogenic data
  - Boats, buoys, fishing, pollution
- Other spectral and imagery uses

Birds and mammal ID rates achieved in UK/Europe by APEM

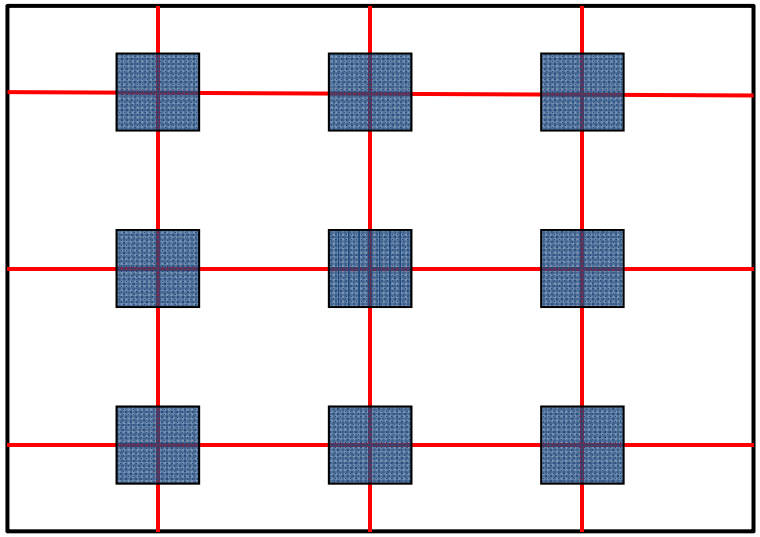
Species Group / Species	% ID (3 cm)	% ID (2 cm)
Large Gulls	100%	100%
Great Black-backed Gull *(Larus marinus)*	>90%	>99%
Lesser Black-backed Gull *(Larus fuscus)*	>90%	>99%
Herring Gull *(Larus argentatus)*	>90%	>99%
Small Gulls	100%	100%
Black-legged Kittiwake *(Rissa tridactyla)*	>90%	>99%
Black-headed Gull *(Chroicocephalus ridibundus)*	>80%	>99%
Common Gull *(Larus canus)*	>80%	>95%
Little Gull *(Larus minutus)*	>80%	>95%
Divers	100%	100%
Red-throated diver *(Gavia stellata)*	>90%	>95%
Black-throated diver *(Gavia arctica)*	>70%	>85%
Great Northern diver *(Gavia immer)*	>90%	>95%
Grebes	<50%	>50%
Seaducks	>85%	>95%
Common Eider *(Somateria mollissima)*	>90%	>99%
Scoter sp *(Melanitta sp.)*	>95%	>99%
Long-tailed Duck *(Clangula hyemalis)*	>85%	>95%
Red-breasted Merganser *(Mergus serrator)*	>75%	>90%
Scaup *(Aythya marila)*	>50%	>85%
Goldeneye *(Bucephala clangula)*	>50%	>85%

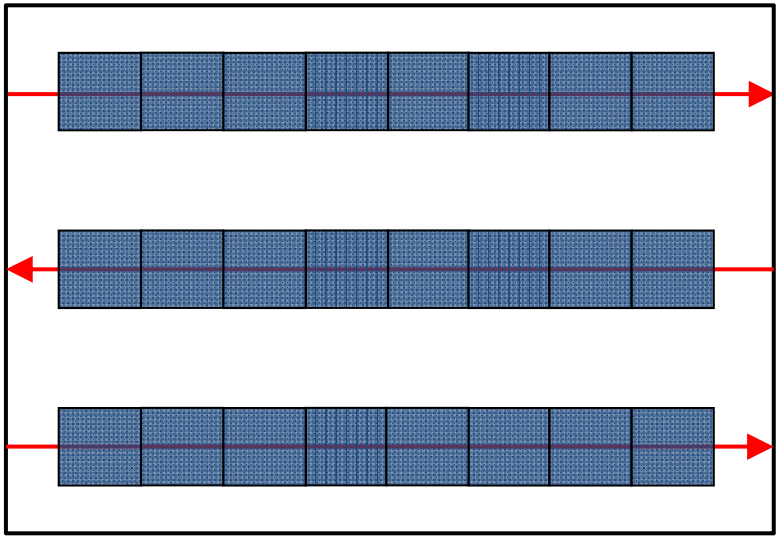
Birds and mammal ID rates achieved in UK/Europe by APEM

Species Group / Species	% ID (3cm)	% ID (2cm)
Seal species	100%	100%
Grey Seal (*Halichoerus grypus*)	<50%	>50%
Harbour Seal (*Phoca vitulina*)	<50%	>50%
Harbour porpoise (*Phocoena phocoena*)	>80%	>90%
Dolphin species	>75%	>95%
Common dolphin (*Delphinus delphis*)	>75%	>90%
Common bottlenose dolphin (*Tursiops truncatus*)	>75%	>90%
White-beaked dolphin (*Lagenorhynchus albirostri*)	>75%	>85%
Whale species	100%	100%
Minke whale (*Balaenoptera acutorostrata*)	>85%	>99%

Flexible Survey Design Methods

- Unique to each survey depending on site, species & questions
- Specialized planning software plots flight lines & nodes
- Choose grid or transect…or other sampling method

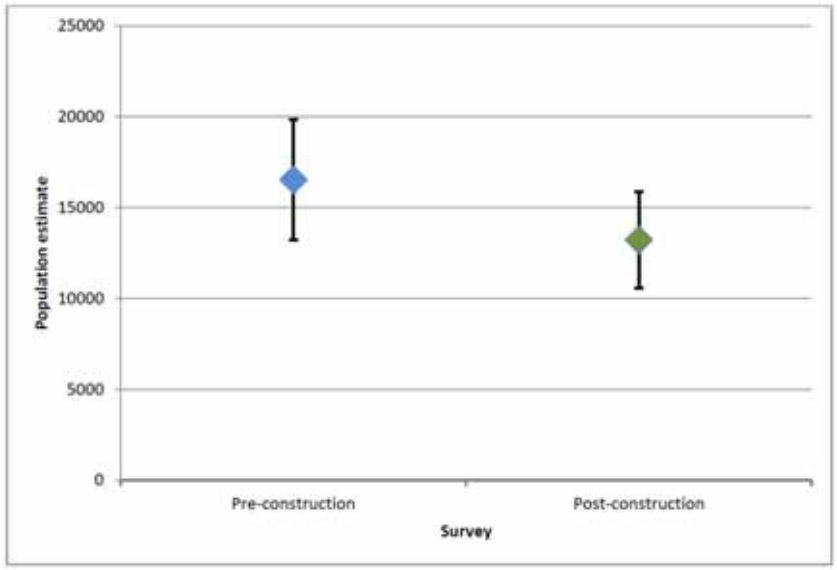




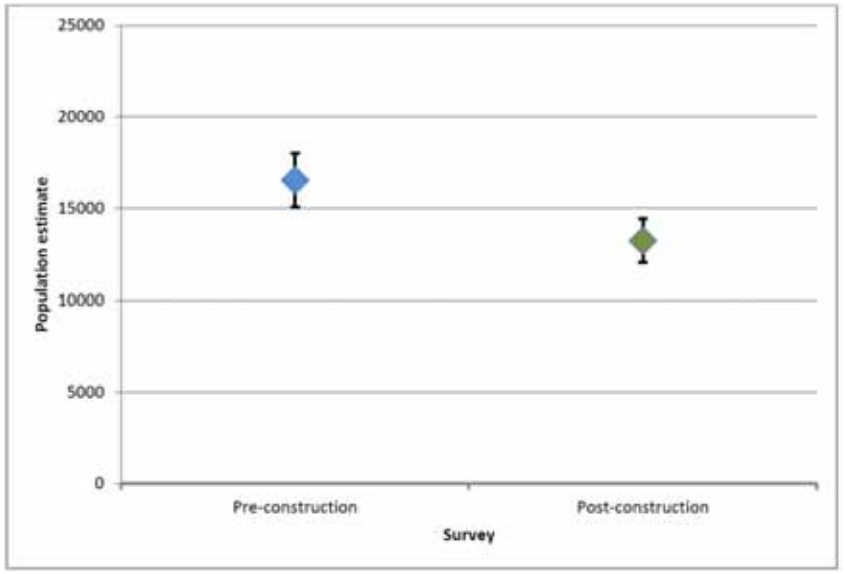
Methods: Confidence in estimates

Without small confidence intervals to detect change

- **High confidence = small confidence intervals**
- **Low confidence = large confidence intervals**

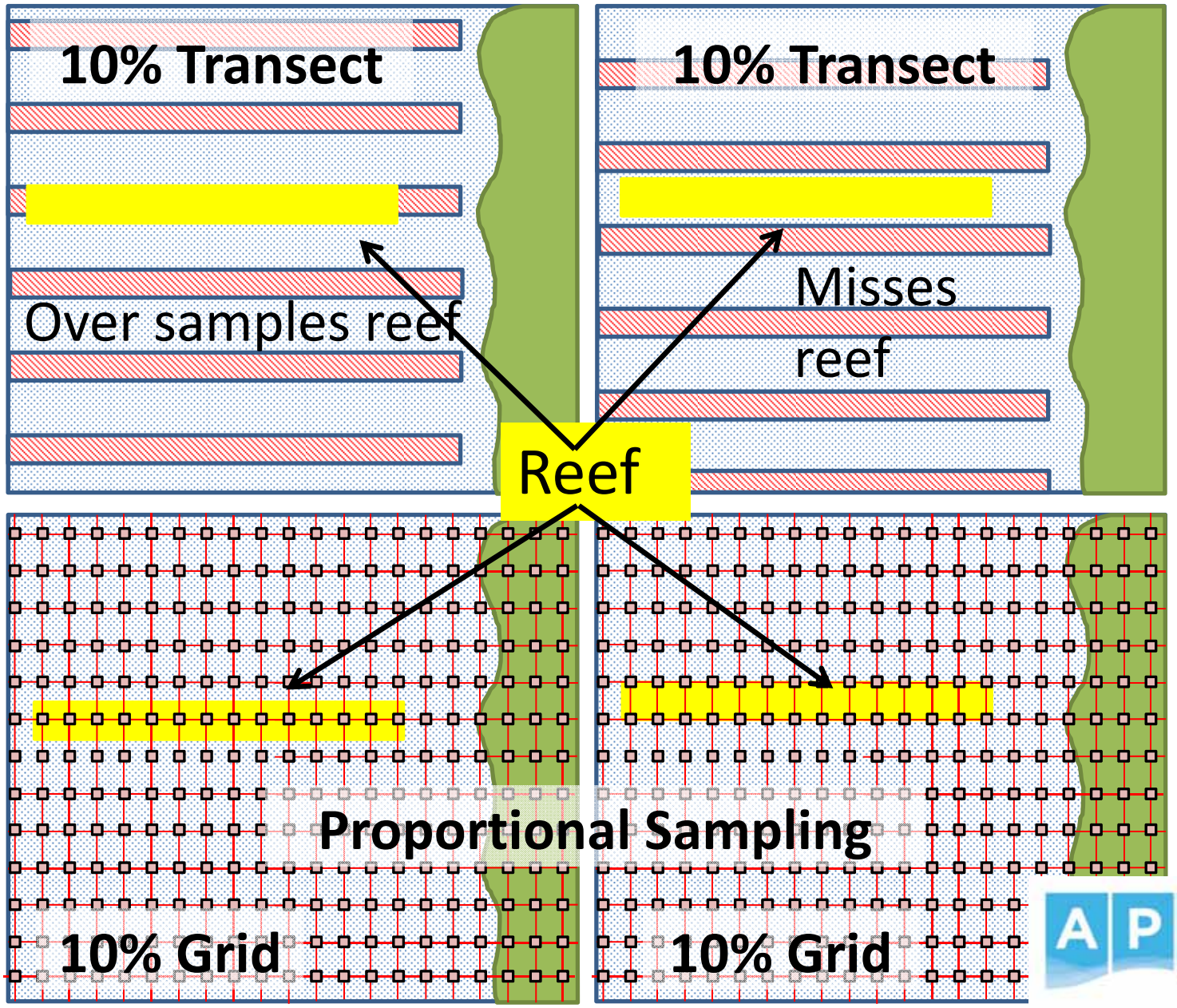


Low confidence – overlapping confidence intervals

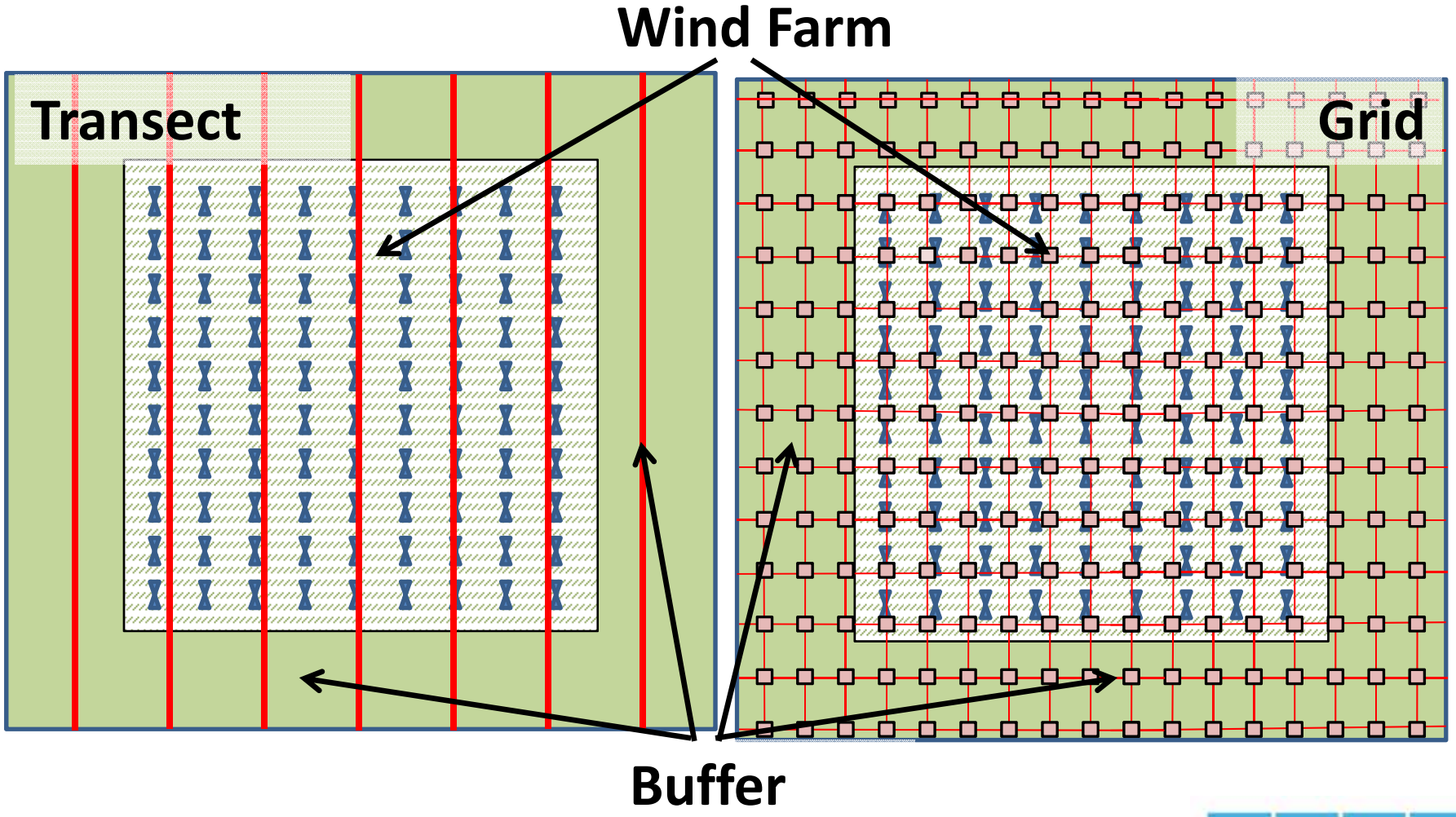


High confidence – non-overlapping confidence intervals

Habitat coverage - Grids



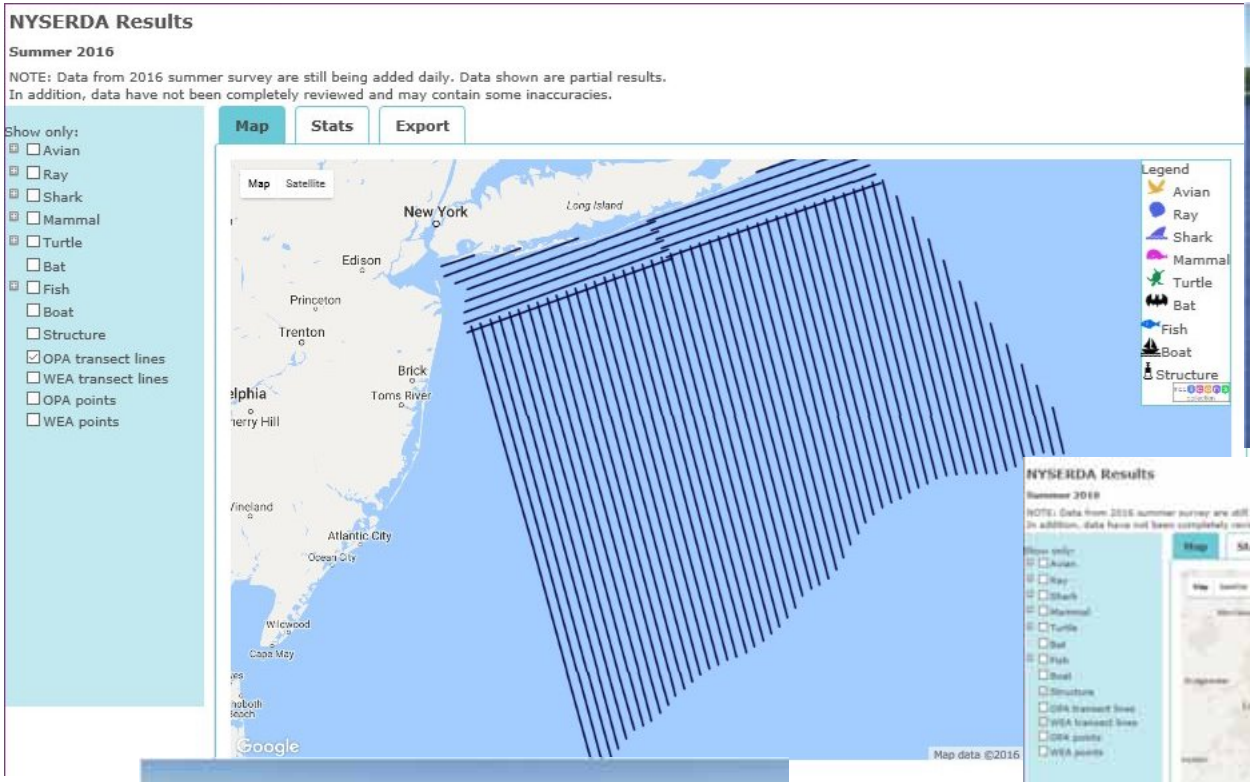
Buffer- Grids

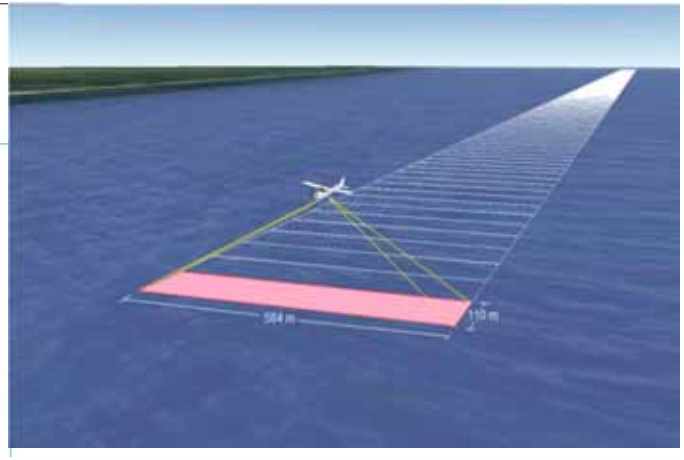


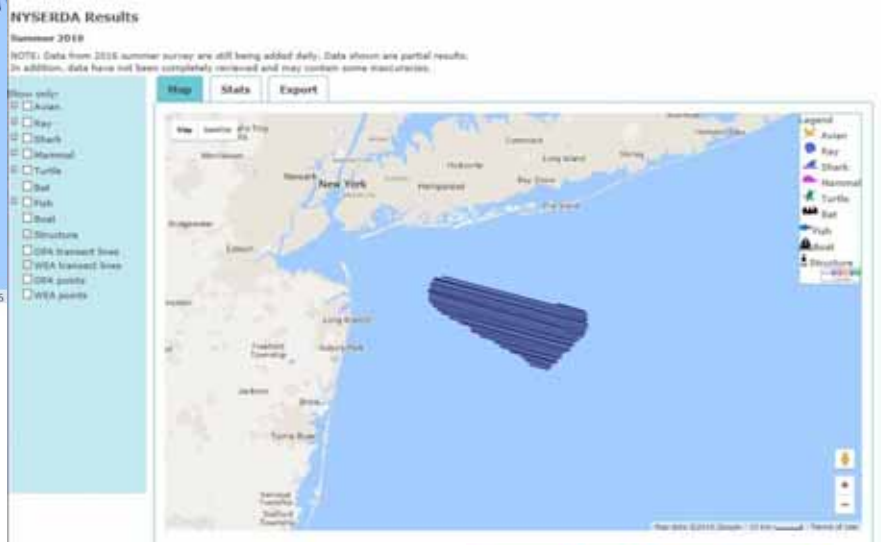
NYSERDA- NY Bight Example

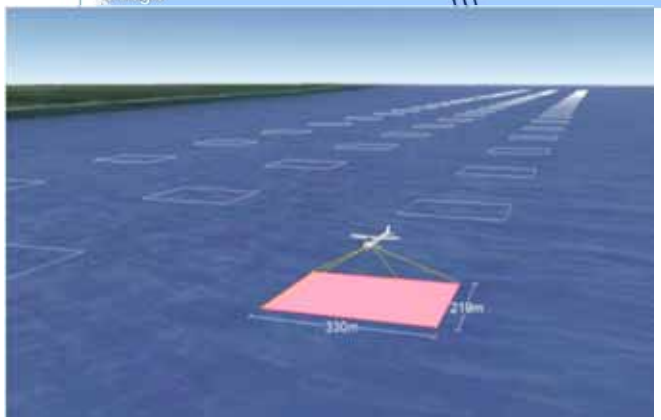
www.remote.normandeau.com/public_data.php

NEW YORK STATE OF OPPORTUNITY. | NYSERDA









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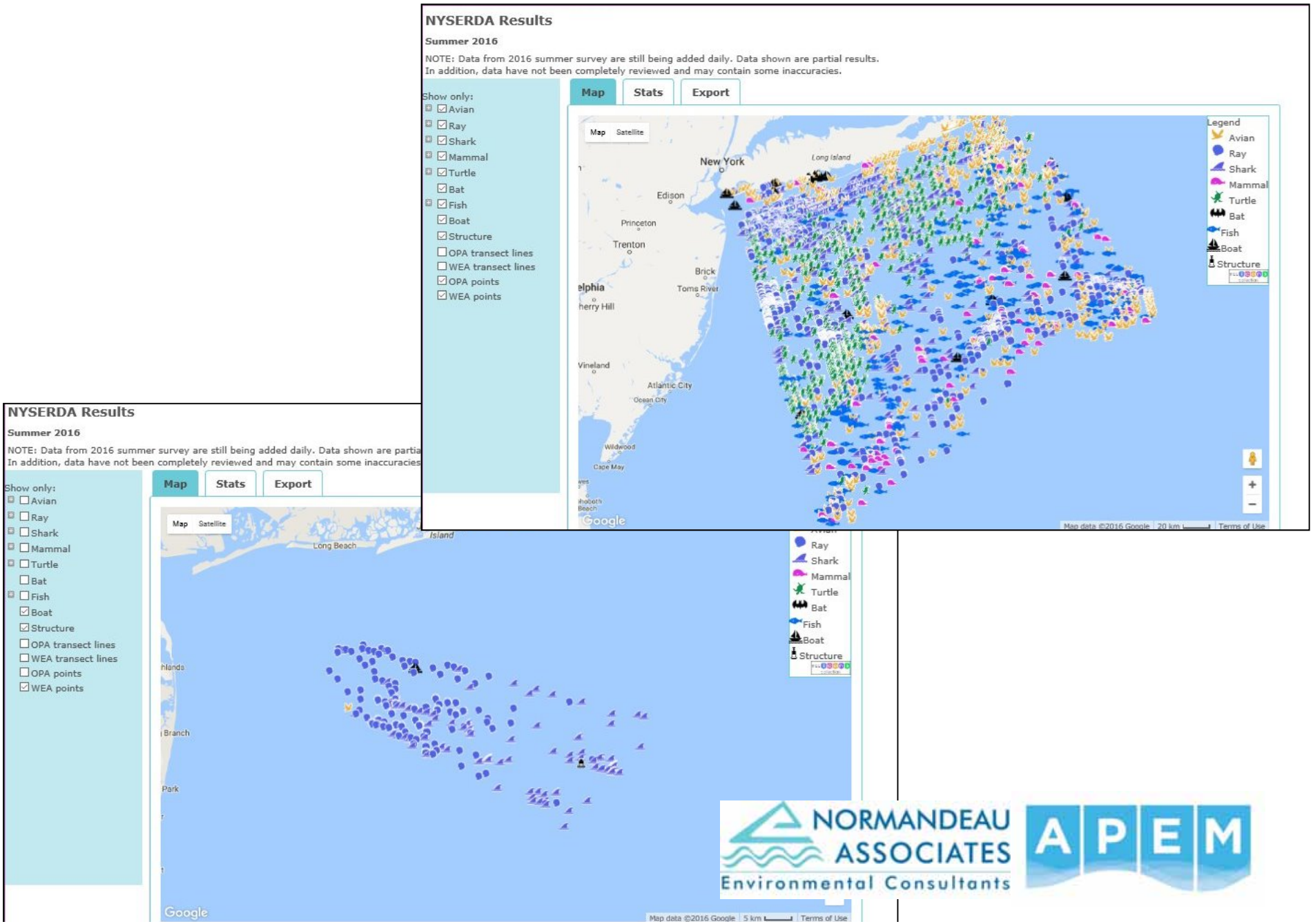
NYSERDA- NY Bight Example



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NYSERDA- NY Bight Example

ımer survey are still being added daily. Data shown are partial results.
ɐeen completely reviewed and may contain some inaccuracies.

Map | Stats | Export

	All	OPA	WEA
Avian	**2043**	**2034**	**7**
Cormorant	6	6	0
Double-crested Cormorant	6	6	0
Gull	126	126	0
Great Black-backed Gull	57	57	0
Herring Gull	32	32	0
Laughing Gull	13	13	0
Ring-billed Gull	9	9	0
species unknown	4	4	0
species unknown - Large	6	6	0
species unknown - Small	5	5	0
Loon	3	3	0
Common Loon	3	3	0
Petrel	12	12	0
Black-capped Petrel	8	8	0
species unknown	4	4	0
Raptor	5	5	0
Bald Eagle	2	2	0
Osprey	3	3	0
Shearwater	744	744	0
Audubon's Shearwater	8	8	0
Cory's Shearwater	473	473	0
Great Shearwater	72	72	0
Sooty Shearwater	2	2	0
species unknown-Large	174	174	0
species unknown-Small	15	15	0
Shorebird	13	13	0
Piping Plover	13	13	0
Storm-petrel	868	868	0
Wilson's Storm-Petrel	868	868	0
Tern	252	250	0
Common/Roseate Tern	189	187	0
Least Tern	43	43	0
Royal Tern	9	9	0
species unknown	11	11	0
Wader	14	7	7
species unknown	14	7	7
Ray	**1860**	**1624**	**234**
Shark	**6**	**6**	**0**
Mammal	**282**	**280**	**2**
Turtle	**281**	**268**	**13**
Fish	**426**	**423**	**3**
Boat	**46**	**45**	**1**
Structure	**5**	**4**	**1**
Unknown/Other	**135**	**131**	**4**

Needs ID:

Ray	**6547**	**6547**	**0**
Shark	**1093**	**785**	**308**
Mammal	**761**	**761**	**0**
Turtle	**317**	**317**	**0**
Fish	**389**	**389**	**0**

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	All	OPA	WEA
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Bluntnose Stingray	2	1	1
Bullnose Ray	6	6	0
Cownose Ray	134	123	11
Cownose/Bullnose Ray	3	3	0
Giant Manta Ray	149	149	0
species unknown	1566	1342	222
Shark	**6**	**6**	**0**
Great Hammerhead	1	1	0
Oceanic Whitetip Shark	1	1	0
Scalloped Hammerhead	1	1	0
Smooth Hammerhead	1	1	0
Thresher Shark	1	1	0
Tiger Shark	1	1	0
Mammal	**282**	**280**	**2**
Dolphin	266	264	2
Common Bottlenose Dolphin	73	73	0
Harbor Porpoise	2	2	0
Risso's Dolphin	42	42	0
Short-beaked Common Dolphin	33	33	0
species unknown	116	114	2
Whale	16	16	0
Beaked Whale (unid.)	3	3	0
Fin Whale	9	9	0
Humpback Whale	1	1	0
Pilot Whale (unid.)	2	2	0
species unknown	1	1	0
Turtle	**281**	**268**	**13**
Green Turtle	1	1	0
Kemp's ridley turtle	14	13	1
Leatherback	2	2	0
Loggerhead Turtle	175	171	4
species unknown	89	81	8
Fish	**426**	**423**	**3**
Boat	**46**	**45**	**1**
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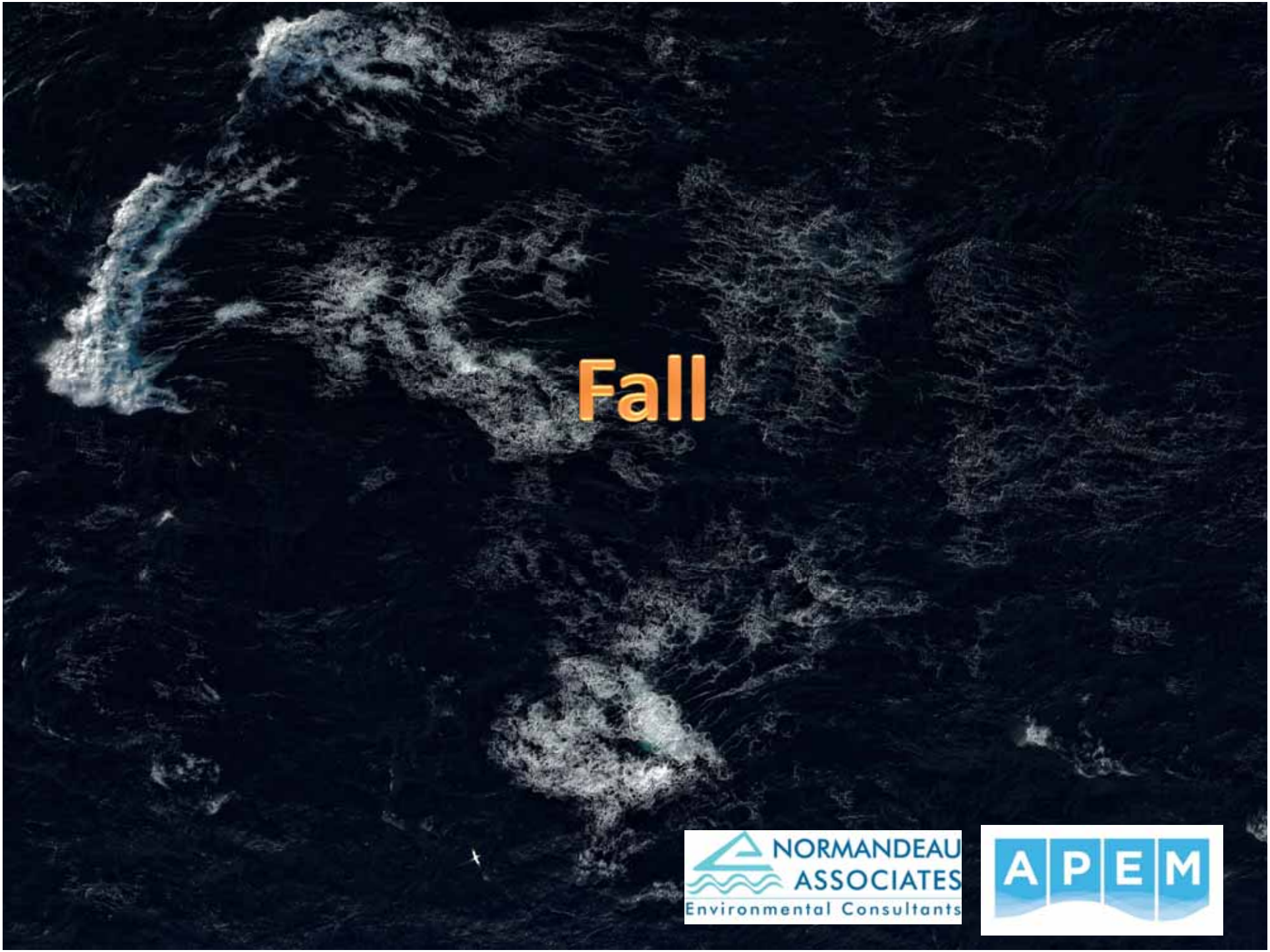
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NYSERDA- NY Bight Example Imagery

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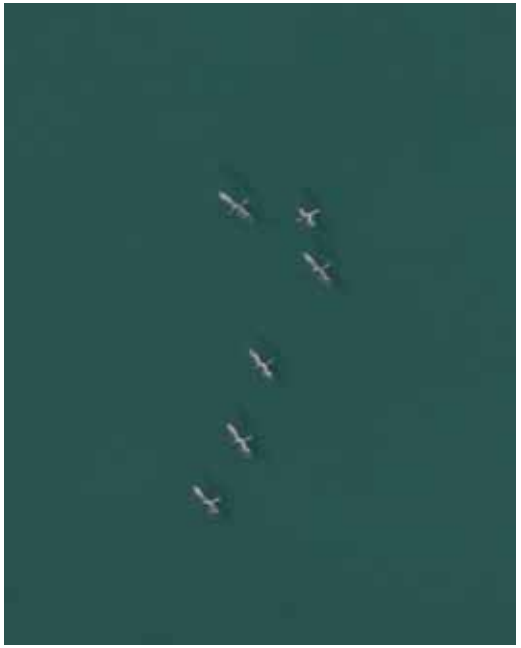

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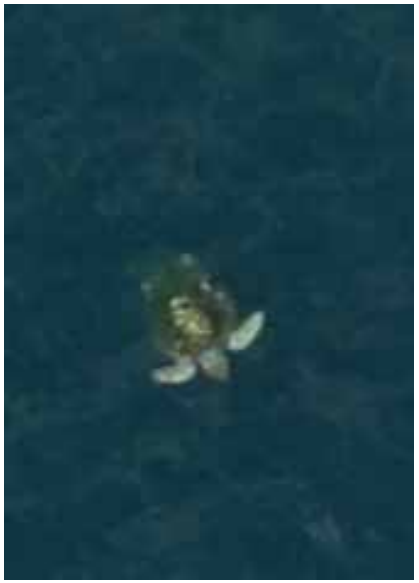

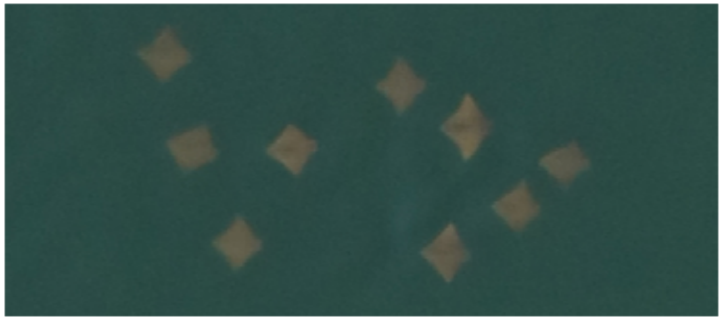

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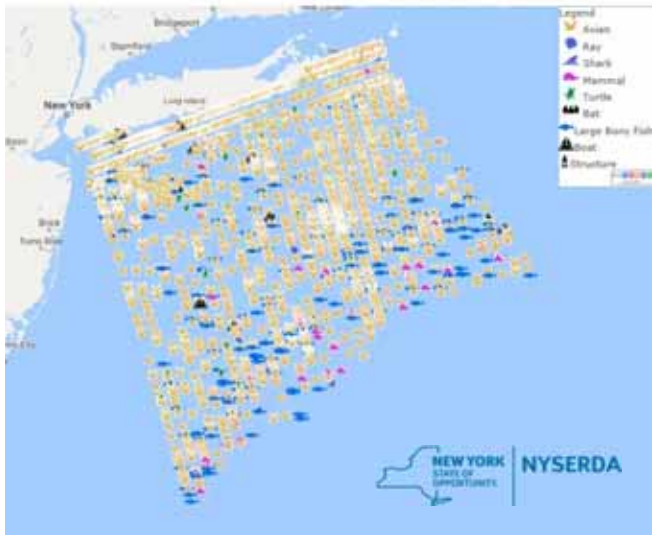

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"Let's Get Digital…Let Me Here the Data Talk"

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Contact

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