Offshore Motus Monitoring Framework

Stakeholder Workshop

June 8, 2022

Project Team

USFWS Migratory Birds: Pam Loring, Scott Johnston

Biodiversity Research Institute: Kate Williams, Andrew Gilbert, Evan Adams, Julia Gulka, Ed Jenkins

Univ. of Rhode Island: Peter Paton, Doug Gobeille, Erik Carlson, Rob Deluca

Birds Canada: Stu Mackenzie, Luc Berrigan

NYSERDA (funding): Kate McClellan Press, Gregory Lampman

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

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Overall project goal:

To develop standardized protocols for using automated radio telemetry to monitor birds and bats in offshore environments

Overall Project Components

- **Monitoring Framework -** tags and study design
- **Guidance Document –** offshore Motus stations
- **Online Study Design Tool –** map detection coverage
- **Simulation Study –** model animal movement data
- **Motus Data Framework –** centralized portal for data management, coordination, and summary reports

Workshop Goals

- Introduce Offshore Motus Monitoring Framework
- Discuss ideas for tag deployment strategies
- Obtain initial feedback from workshop participants
- Discuss opportunities for further engagement

Agenda (times in EDT)

11:00-11:10	Welcome – Kate Williams, BRI
11:10-11:25	Overview of Monitoring Framework – Pam Loring, USFWS
11:25-11:35	Detecting birds at offshore Motus stations – Evan Adams, BRI
11:35-11:50	Motus power analysis to inform tag deployment – Juliet Lamb, TNC
11:50-12:05	RWSC options to centralize tag deployments – Emily Shumchenia, RWSC
12:05-12:40	Breakout groups to discuss tag deployment strategies
12:40-12:50	Full group wrap-up of discussions
12:50-12:55	Anonymous poll – centralized vs. site-specific Motus tag deployments
12:55-13:00	Next Steps

Monitoring Framework for Offshore Motus

Pam Loring
U.S. Fish and Wildlife Service
Division of Migratory Birds, North Atlantic-Appalachian Region

NYSERDA Sponsored

Goals of Monitoring Framework

- Optimize Motus station coverage at site-specific and regional scales
- Coordinate tag and station deployments
- Develop standard workflows and tools using the best available science

Considerations for Tagging Studies

- Invaluable movement data, otherwise unattainable
- Risks of capture & tagging – injury, mortality, stress, extra weight
- Sample sizes limited by funds, field effort, capture logistics
- Bigger sample sizes = better population-level information
- Strategic tag deployment across sites = better regional information
- Important to optimize sample sizes and tag deployment to maximize information gains

Site-specific research questions

- Species presence in a wind project area
- Passage rates through a project area
- Macro-scale avoidance of the project area
- Standardizing site-specific methods will help inform regional assessments

Regional research questions

- Spatial and temporal variability - sites, species, individuals
- Exposure to multiple wind project areas in US Atlantic
- Use of coastal versus offshore migration routes
- Geographic variation in migration routes (e.g. offshore departure points)
- Migratory connectivity and variation in risk to populations

Covariates for site specific and regional questions

- Time of day, day of year, demographic cohorts (age, sex), atmospheric conditions (wind speed, wind direction, precipitation, visibility)
- Wind project characteristics (turbine size, spacing, distance from shore, and lighting)
- Quantifying effects of covariates requires large sample sizes of tagged individuals from a variety of tagging locations

Centralized approach

- Expert stakeholders develop common strategic framework to help identify the greatest regional science needs
- Project proponents contribute funds to centralized entity (e.g. RWSC)
- Proponents either full control of deployment details (e.g. species, sites, # of tags) or direct funding towards greatest regional need
- RWSC centralizes logistics (e.g. purchasing, data workflows, permitting, coordination with resource managers)
- Leveraging expertise lowers barrier to entry for conducting offshore Motus studies

Stakeholder Benefits

- Regulators – consistency in permitting tagging activities
- Species/land managers – centralizing requests and logistics
- Tag project funders – more efficient use of time, funds, outsource logistics, easier to follow technical guidance and protocols
- Scientists – larger sample sizes, standardized data formats, more robust information for analysis
- Agencies – best available science to inform decision making, more timely information, consistent analysis & reporting formats for efficient comparisons of results across projects

Current (decentralized) approach to tagging

- Project proponent initiates tagging study
- Independently consult with subject matter experts
- Apply for permits
- Seek permission from site and species managers
- Funds logistics for tag deployment
- Independently analyze data and report on limited sample size

Hypothetical example of centralized approach

- Three developers intend to tag Roseate Terns
- Each developers has 20 tags (n=60 total)
- Roseate Terns have two main nesting areas: Buzzards Bay, MA and Great Gull Island, NY
- Each developer contracts with RWSC for a set amount to cover all costs associated with tag purchasing, deployment, monitoring, analysis, reporting, and administration
- All data contribute to report that addresses site-specific and regional questions

Overall benefits of centralized approach

- Saves time and money
- Easier to centralize logistics
- Minimizes risks to tagged birds
- Maximizes information gains
- Allows for creative leveraging of resources
- Facilitates coordination with complimentary efforts
- Standardizes and safeguards data

Thank you!

Photo: P. Paton

Detecting Birds at Offshore Motus Stations

Evan Adams, Kate Williams, Andrew Gilbert, Erik Carlson, Doug Gobeille, Stuart Mackenzie, and Pam Loring

QWERL
Quantitative Wildlife Ecology Research Lab

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CWW 2022

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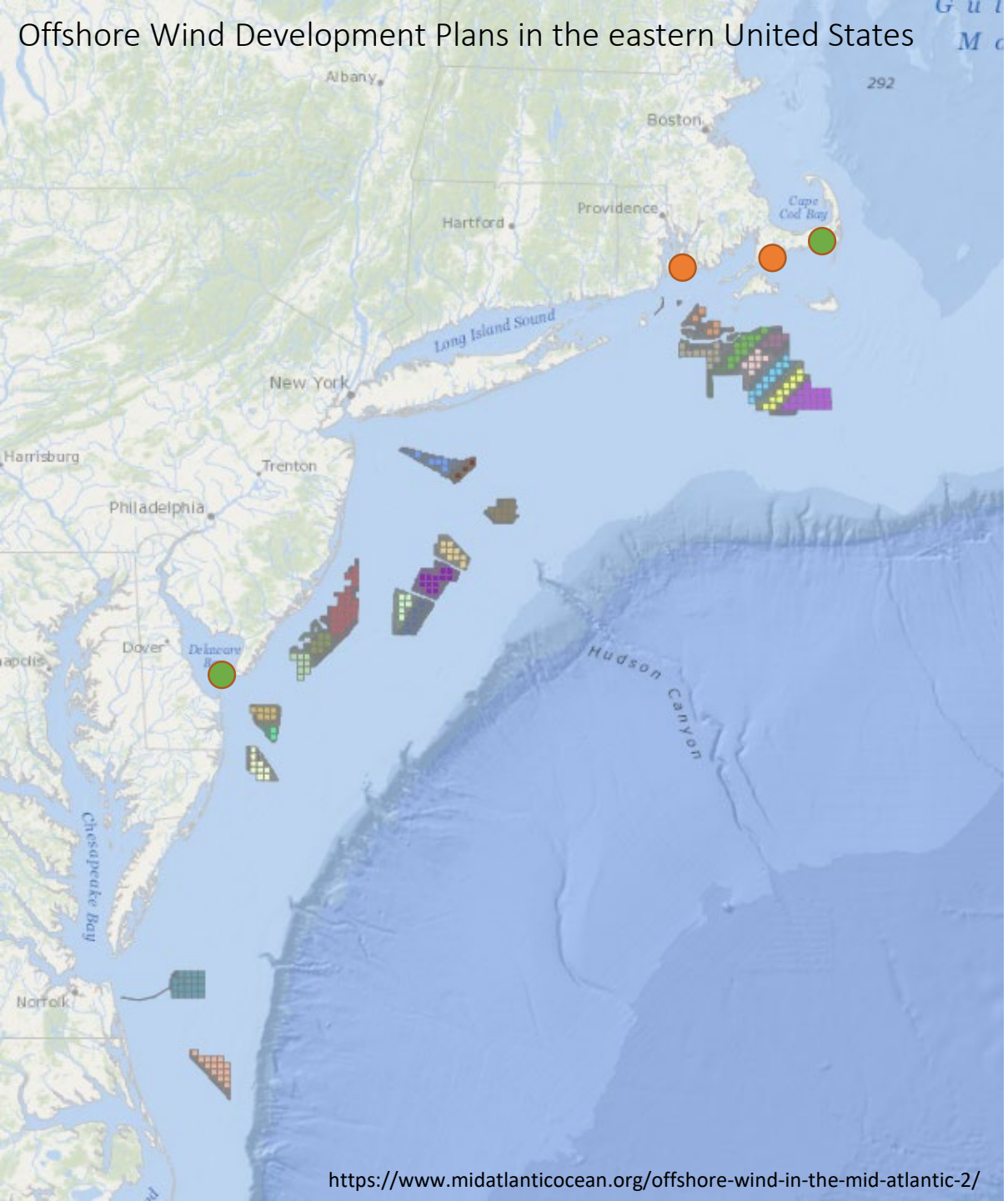
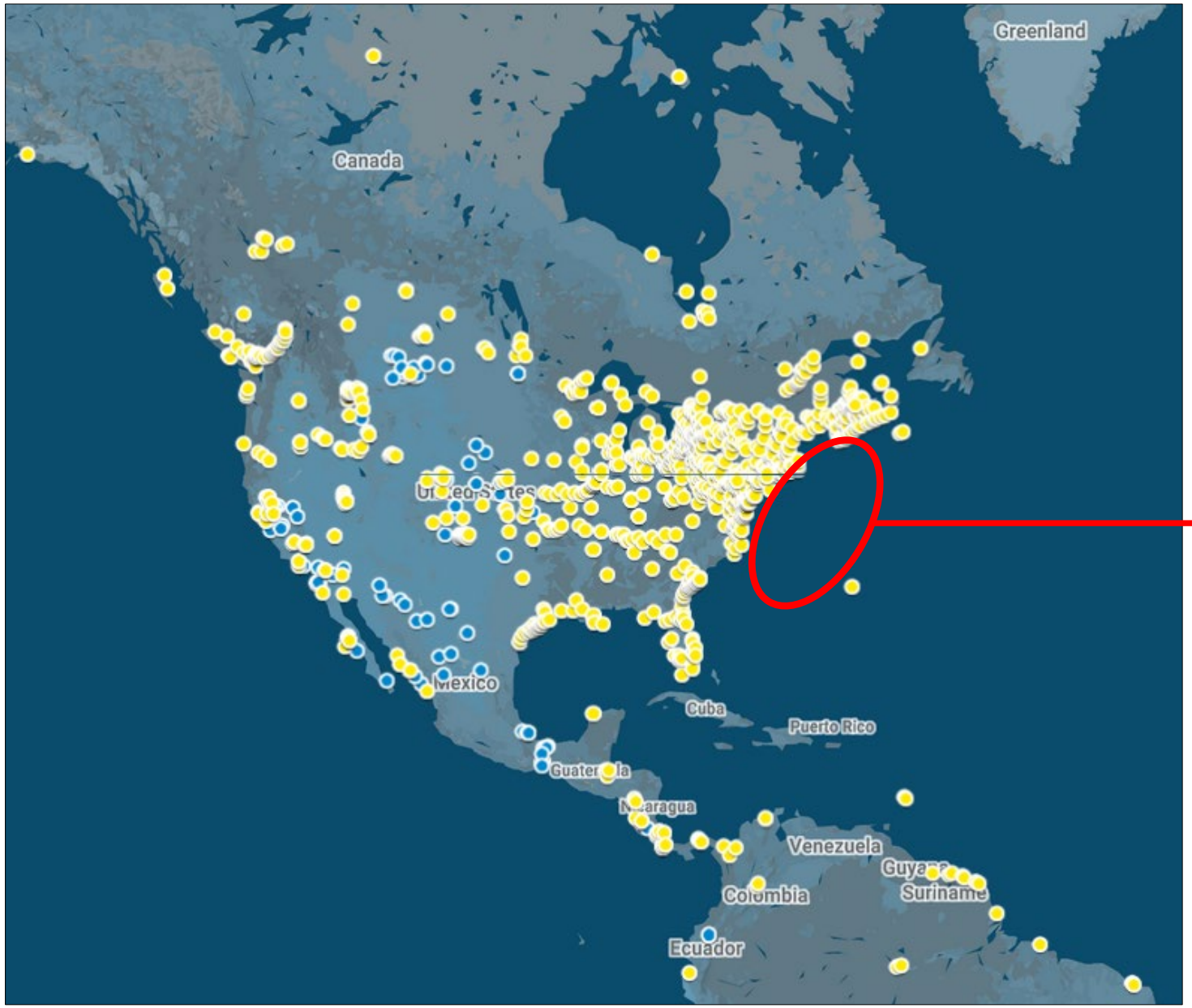
Offshore Wind Development Plans in the eastern United States

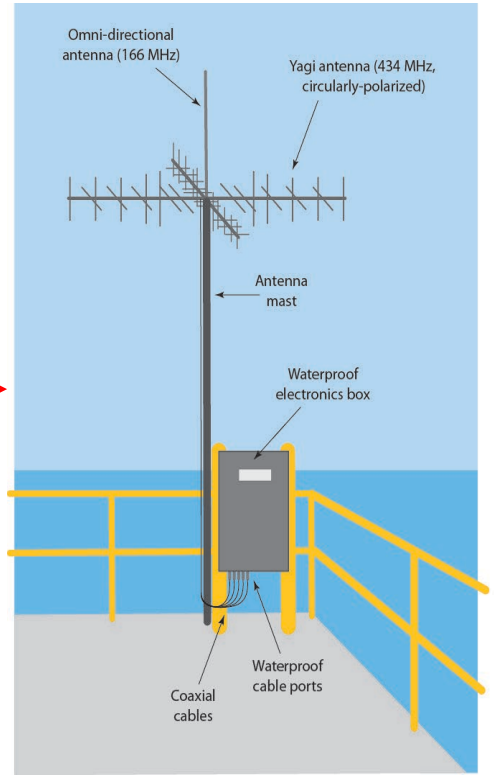


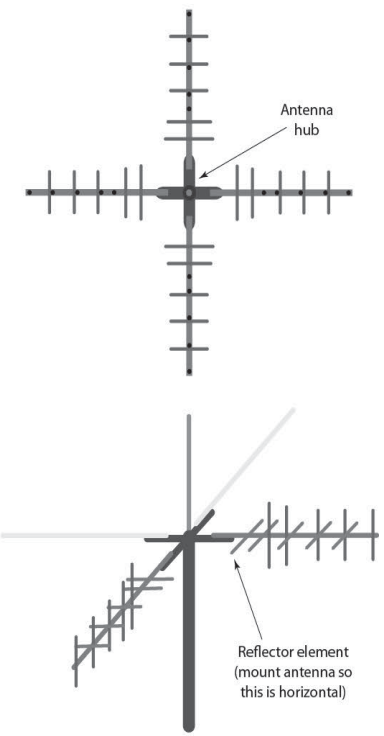
https://www.midatlanticocean.org/offshore-wind-in-the-mid-atlantic-2/

Extent of current Motus network



Offshore Deployments Can Fill This Gap





https://seagrant.gso.uri.edu/wp-content/uploads/2016/09/Block-Island-Wind-Farm-1.jpg

https://seagrant.gso.uri.edu/wp-content/uploads/2016/09/Block-Island-Wind-Farm-1.jpg

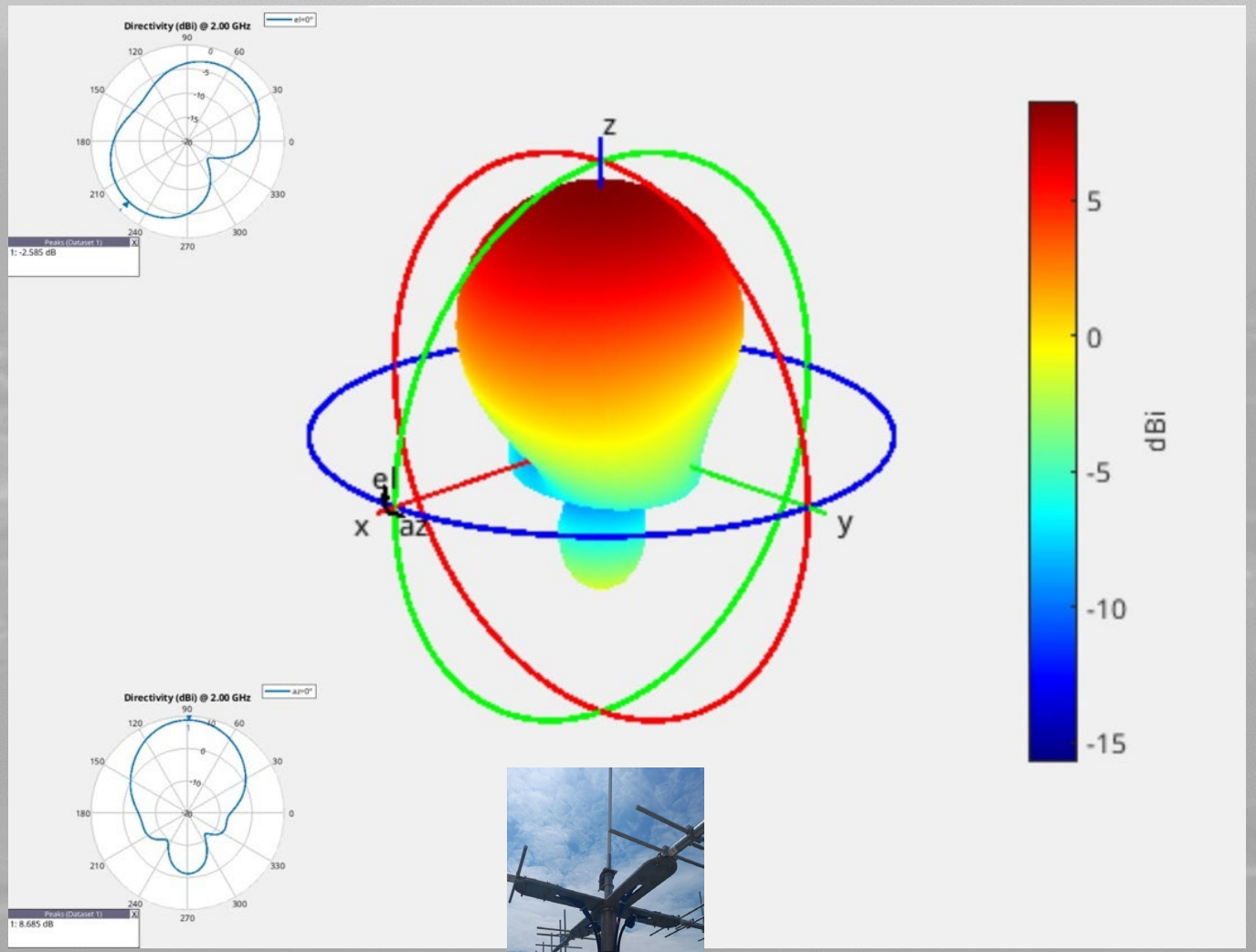
Offshore station calibration

Sea-based methods

Air-based methods

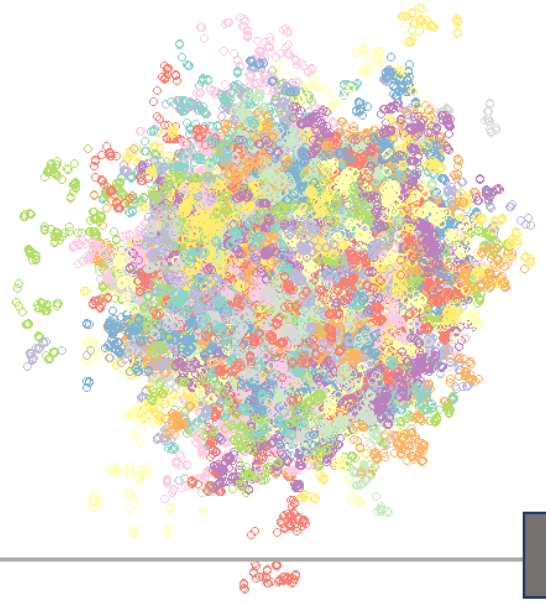
Offshore Station calibration

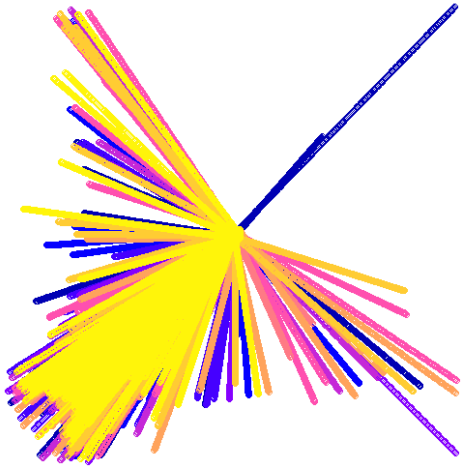
- Detection field is estimated using signal strength values from known position calibration points
- Both omni and directional antennas calibrated
- Used for method evaluation, position estimation and study design assessment

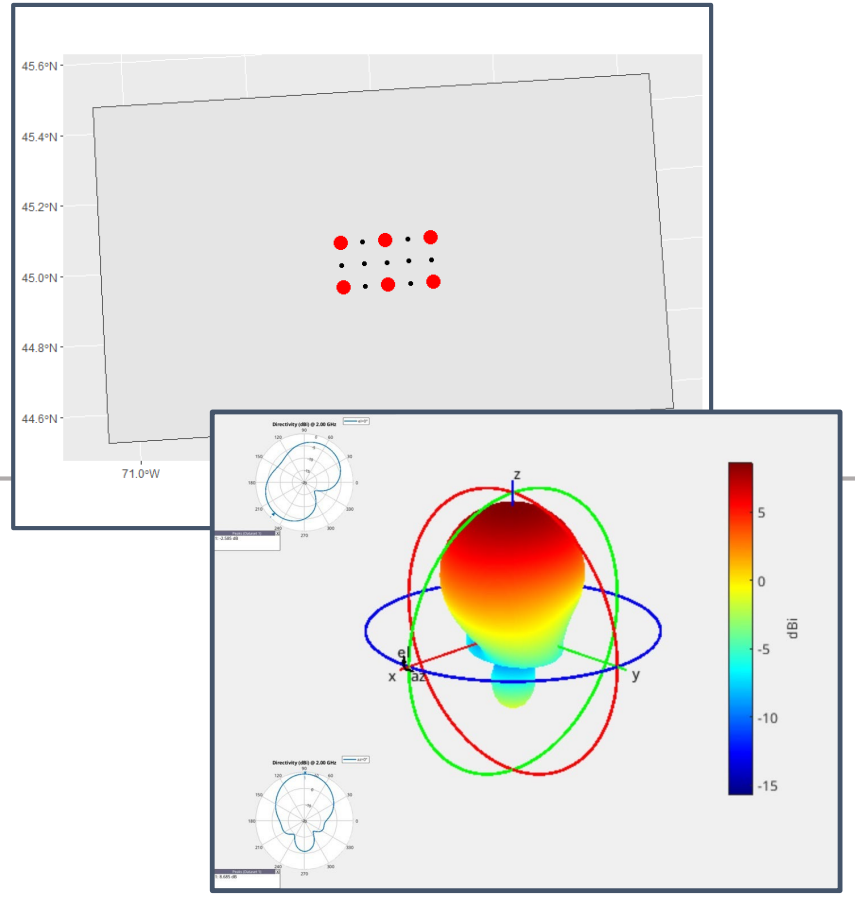


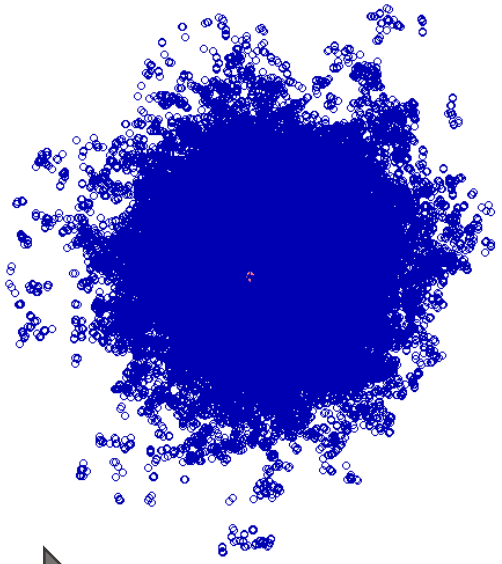
Motus simulation

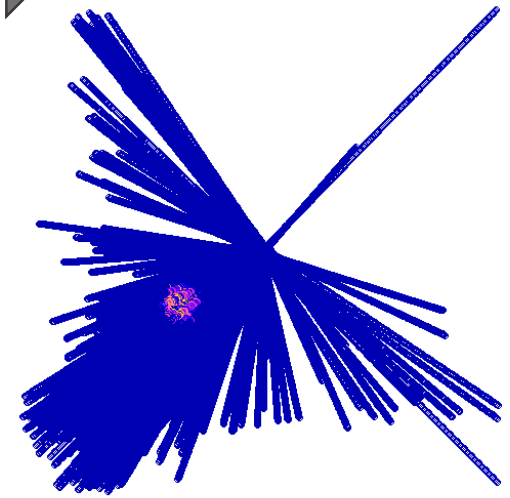
Detection threshold = -100dB±3









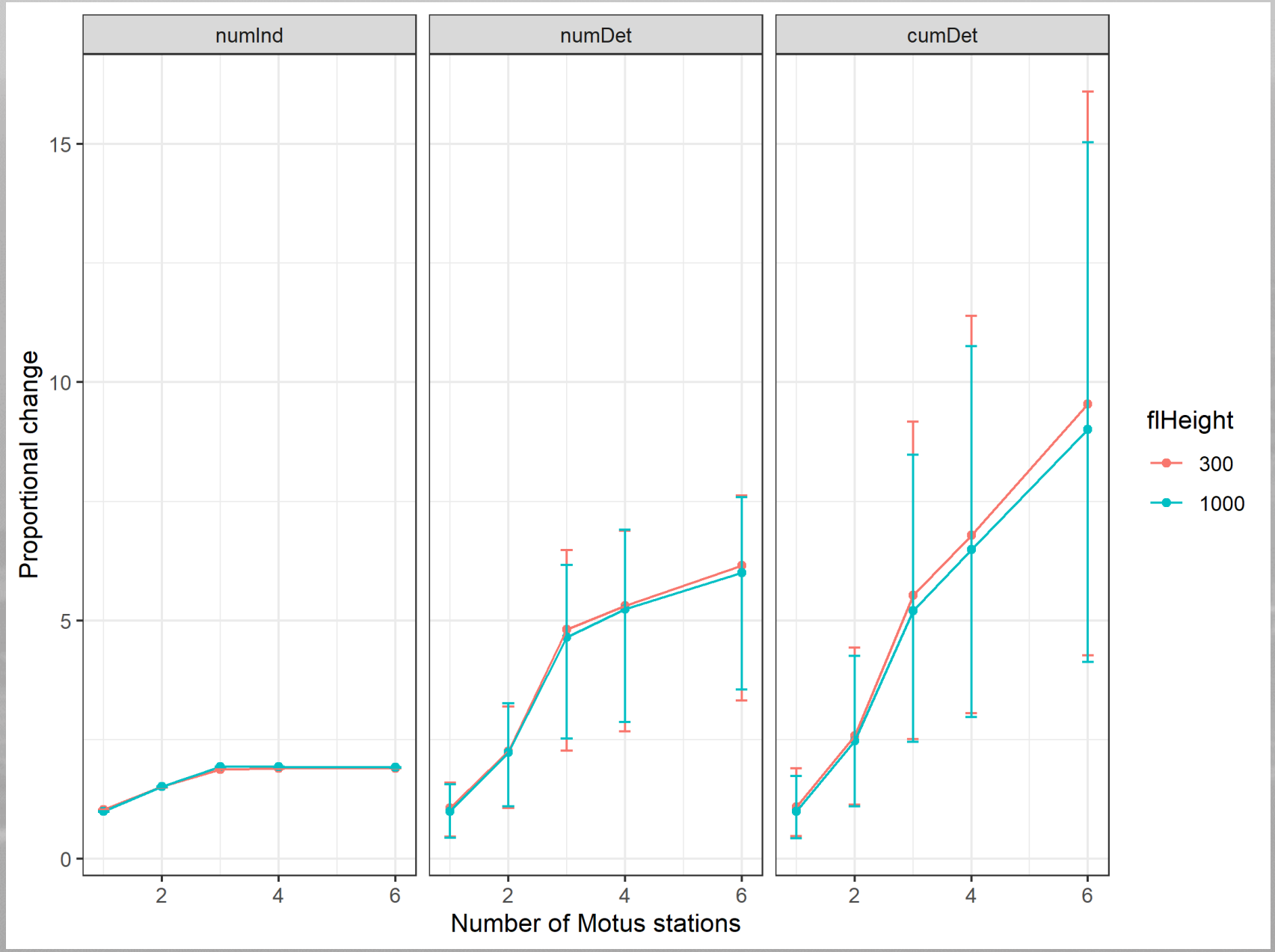


Movement Tracks

Station locations and calibrations

Estimated detections

Results: Shorebirds



Key Takeaways:

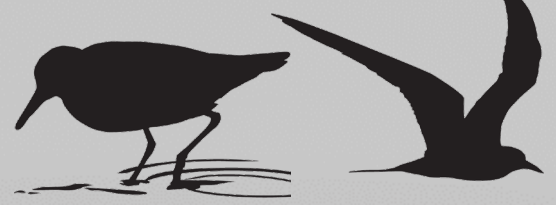
Number of individuals detected plateaus after 3 stations

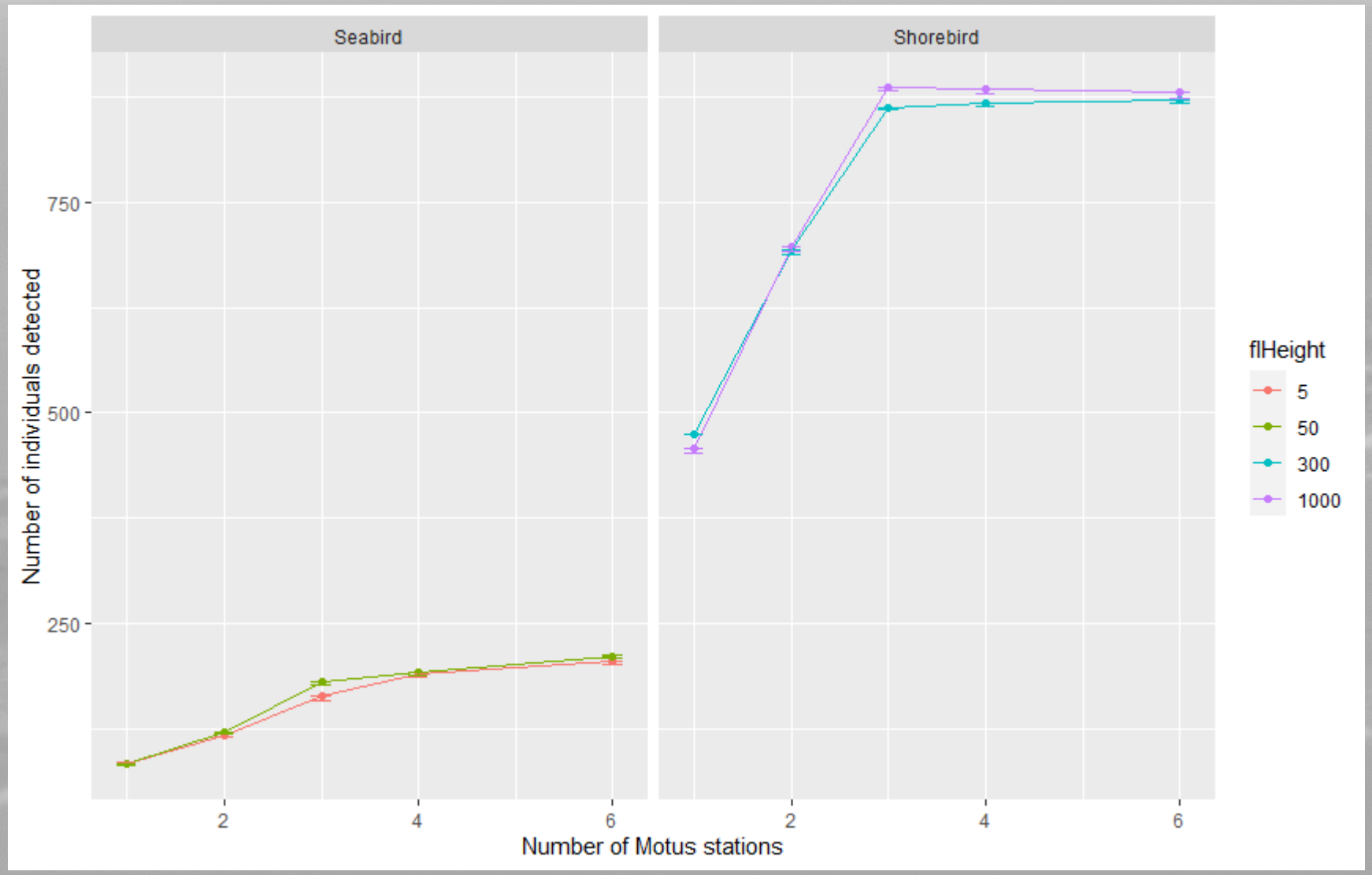
Effort translates into more positions detected and cumulative detection probability

Flight height increases detection probability by a small amount

Uncertainty in detection can significantly alter outcomes

Results: Individuals Detected





Key Takeaways:

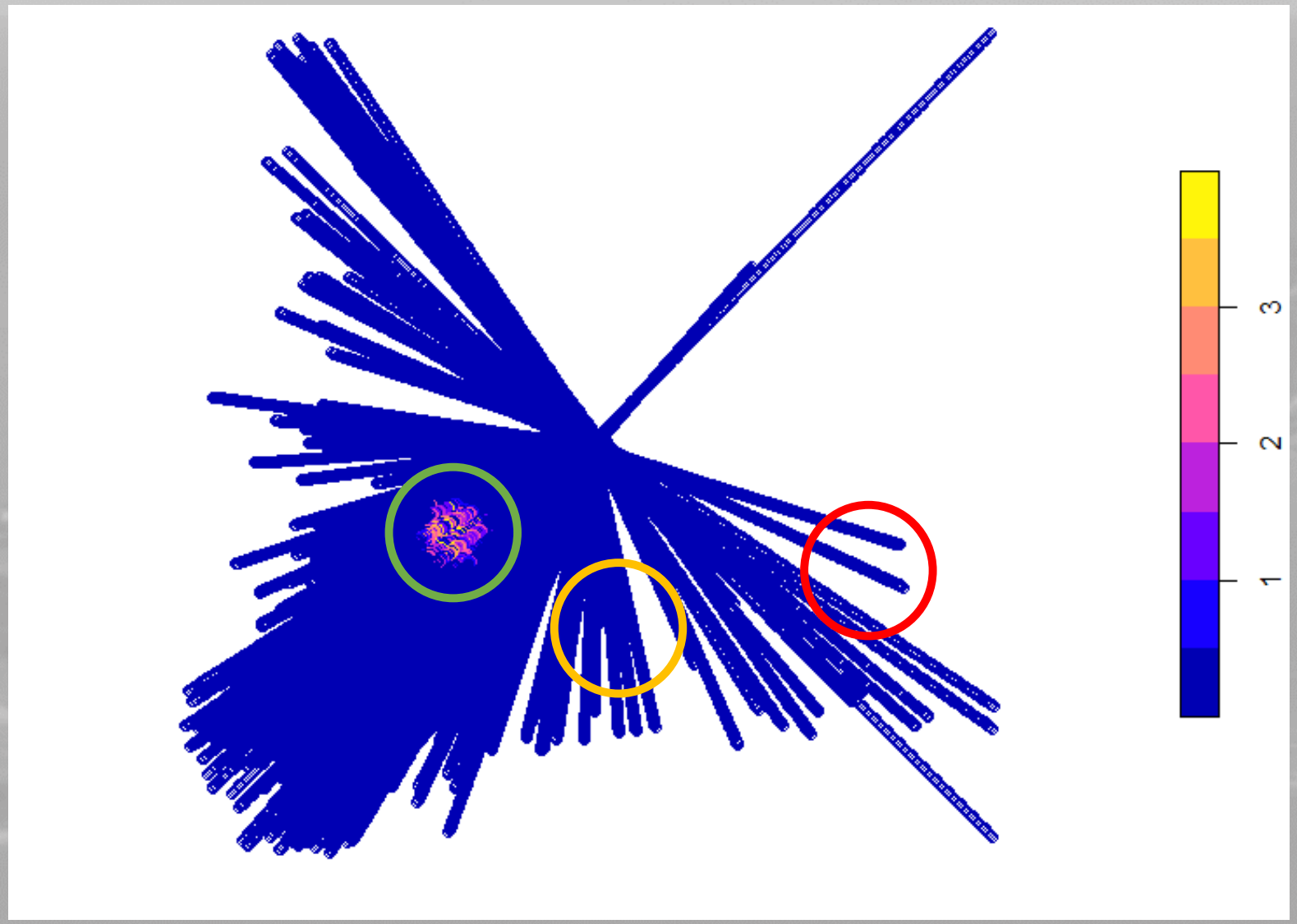
Deployed 1000 individuals for each scenario

Number of individuals detected plateaus after 3-4 stations

Flight height doesn't seem to matter too much

Detection uncertainty does not strongly influence the number individuals detected

Results: Individuals Detected



Key Takeaways:

Our simulation was designed to maximize the detections of migrating shorebirds

If your offshore Motus stations are in different locations, then you can expect much worse results

Think about your migration directions and your offshore infrastructure is when thinking about transmitter deployment

Summary

- Not all deployed birds are going to be detected at an offshore Motus station
- With good Motus coverage you can expect to detect a high proportion of the animals that approach the project area
- Determining how many animals will approach the project area will be the greatest difficulty, as such:
  - Use all sources of information to help determine how often an individual will visit the area of interest
  - Build expected visitation rates into your study design approach (or %population that will visit)
  - Account for movement behaviors and research goals in your Motus study design

Ask your questions in the chat (I'll answer there)

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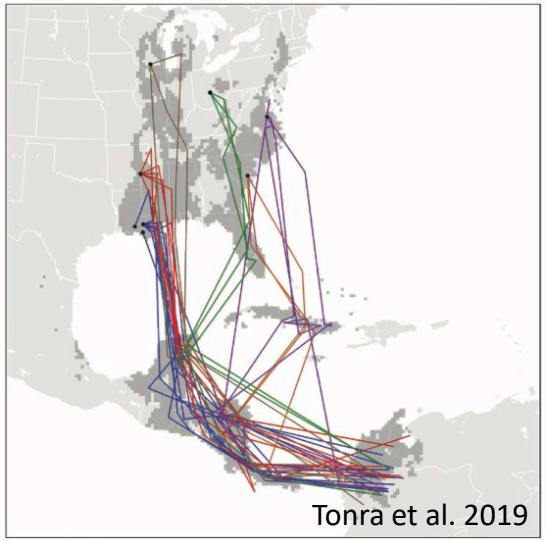
Motus Power analysis to inform tag deployment

Juliet Lamb
The Nature Conservancy
Offshore Motus Monitoring Framing Workshop | 8 June 2022

Individual tracking

- Multiple applications to offshore energy
  - **Describe linkages** between locations and life stages
  - **Detect presence** of difficult-to-observe species
  - **Monitor displacement** and habitat use changes


Tonra et al. 2019


Brock Fenton via Motus


Neil / CC BY 2.0

Individual tracking

HOWEVER…

- Requires population-level inference from **small samples**
- **Target populations** need to be correctly identified
- **Initial biases** can limit applicability, skew final results

Designing Motus studies

- Sensitive to both antenna array and tagging
- Efforts underway to inform antenna configuration and placement (USFWS, BRI)
- **Need to evaluate appropriate sample sizes and distributions for transmitters**
  - Basis for funding recommendations/requirements
  - Sample design may vary by species and question

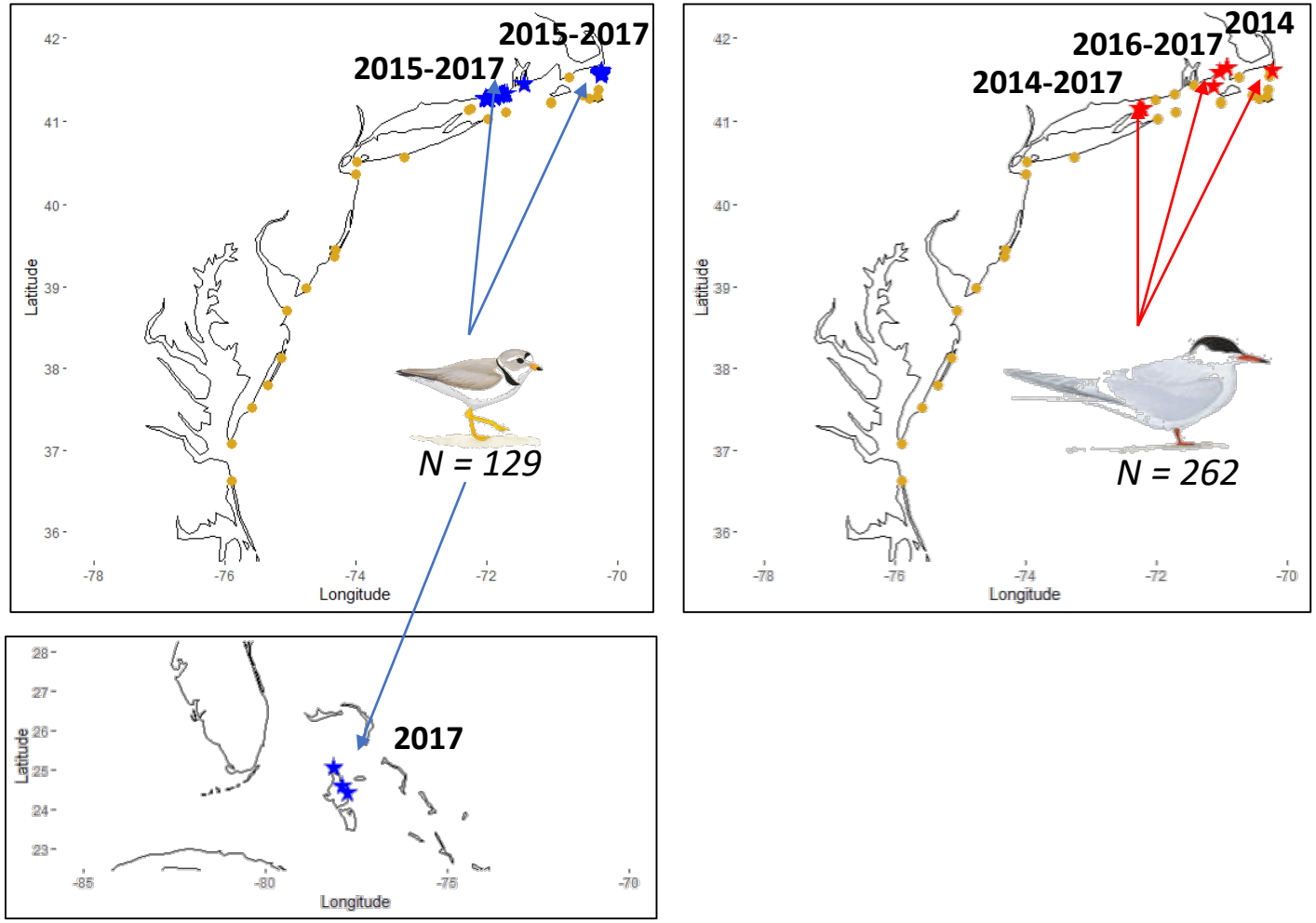
Power analysis

1. Determine the **number of tagged individuals** required to represent population-level occupancy patterns
2. Assess the **number of tagging sites and years** required to maximize detection of occupied sites
3. Evaluate how **layout of receiving stations relative to tagging sites** affects detection probability

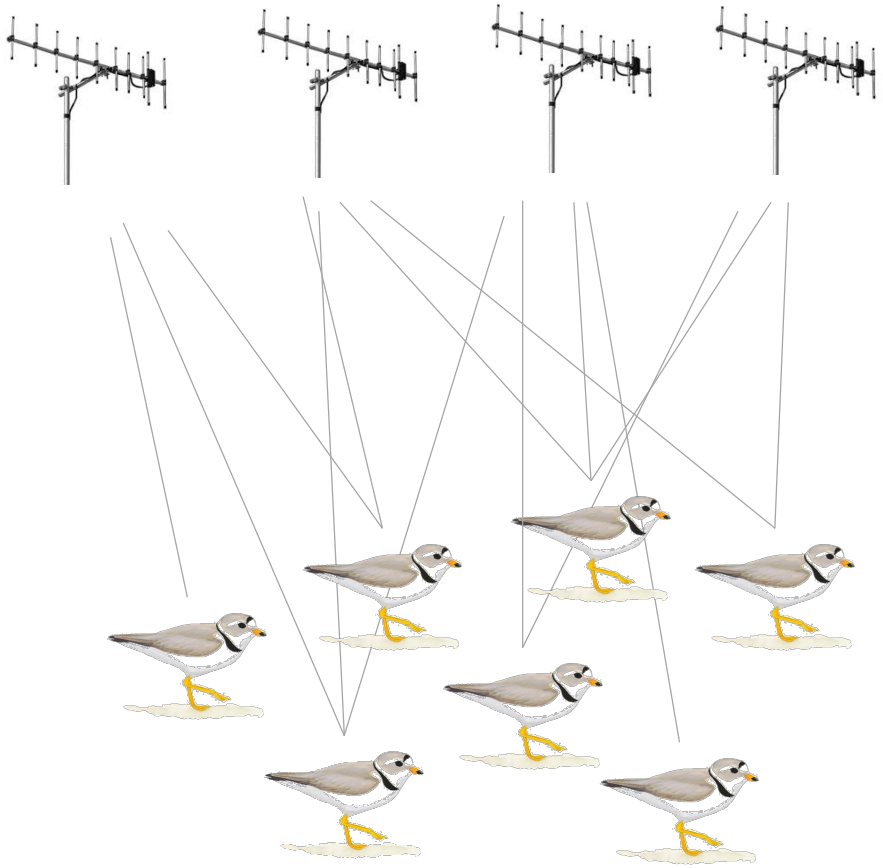
Two focal species:

Piping plover (PIPL)	**Common tern (COTE)**
Shorebird	Nearshore seabird
Solitary	Gregarious
Beach nester	Colony nester
Migrates along coastline	Migrates offshore (>50 km)

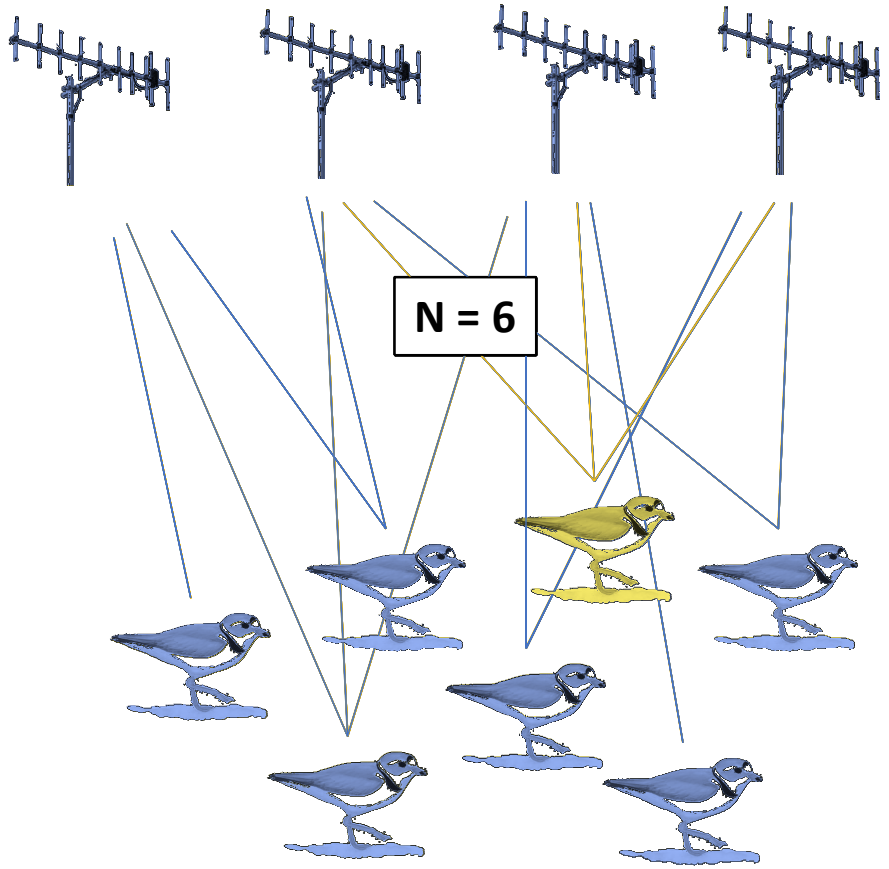
Tagging locations



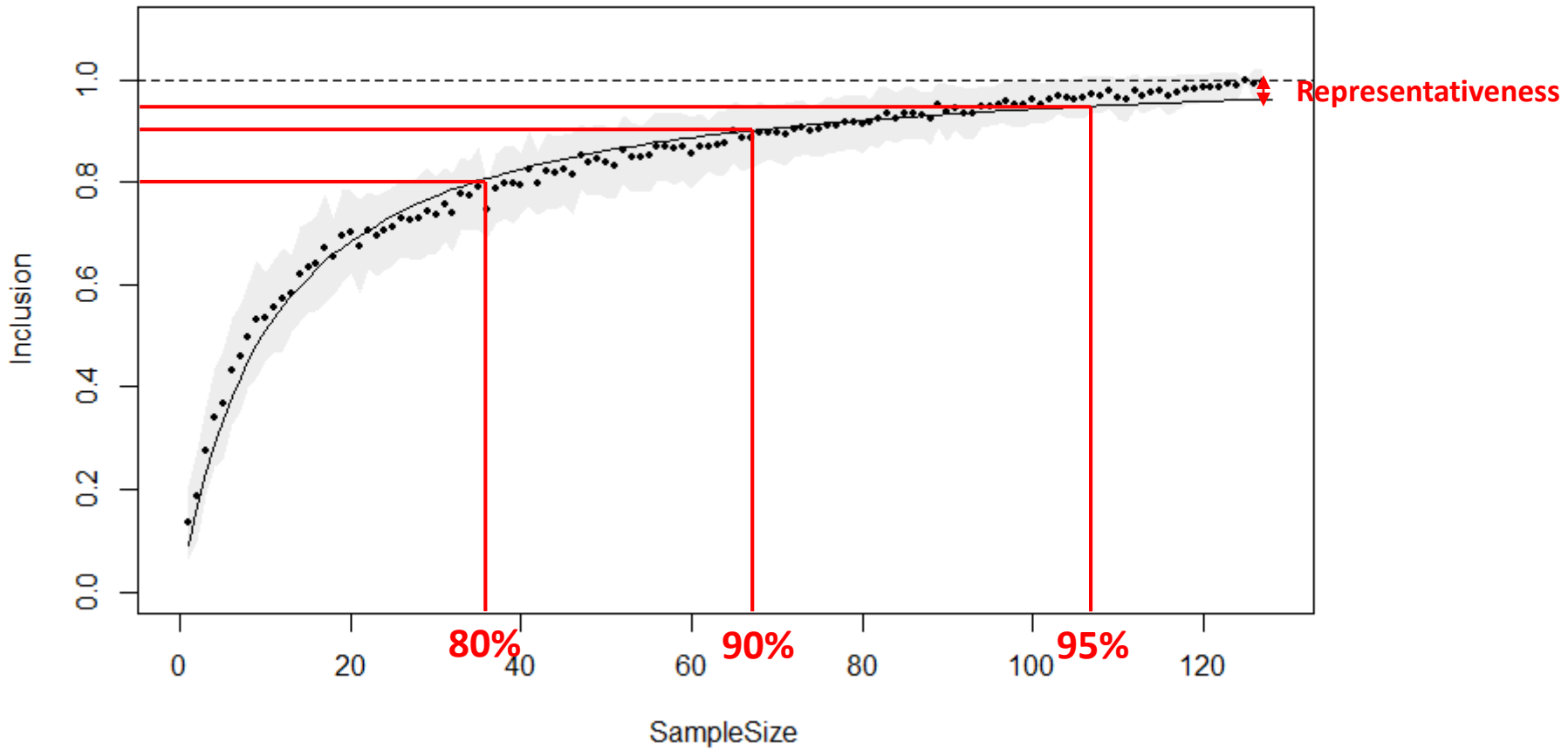
Bootstrapping analysis



Bootstrapping analysis



Inclusion


Inclusion
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
120
SampleSize
80%
90%
95%
Representativeness

Sample sizes: single-site

- ~40 individuals required to detect 80% of used sites
- ~80 individuals required to detect 90% of used sites
- Single-site representativeness varied

	Piping plover	Common tern
80%	35-50	25-40
90%	75-125	45-50
95%	?	85
Representativenes	21-65%	47-80%

Sample sizes: population

- 90-145 individuals required to detect 90% of used sites

	Piping plover	Common tern
80%	42	76
90%	90	145
95%	125	208

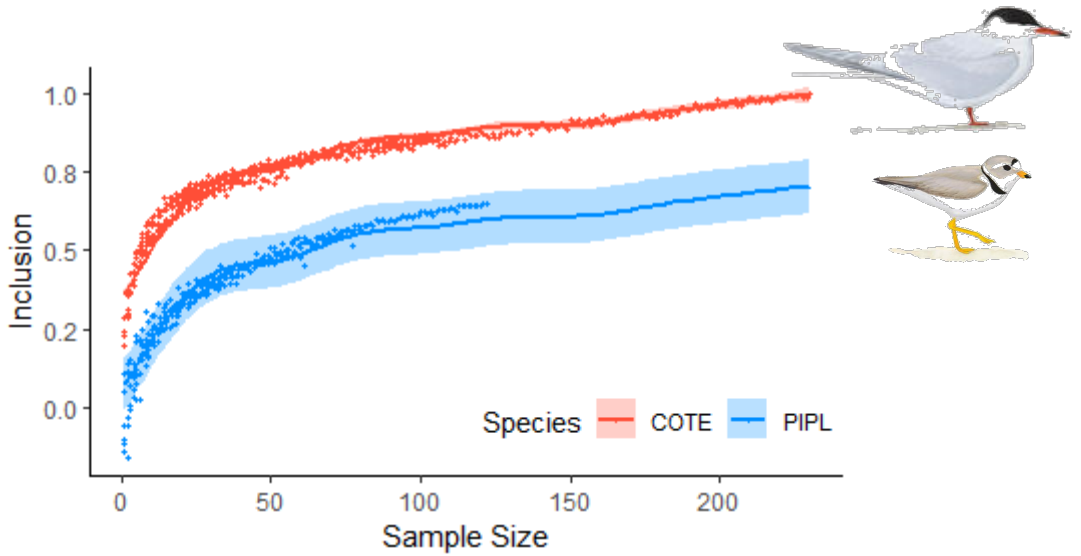
Sample sizes: population

- 90-145 individuals required to detect 90% of used sites 110
- Higher non-detection rates in PIPL (20%) vs. COTE (2%)
  - COTE strongly grouped on the landscape
  - Delayed detection of PIPL post-breeding: dropped transmitters?
- **Important to factor non-detections into target sample sizes**



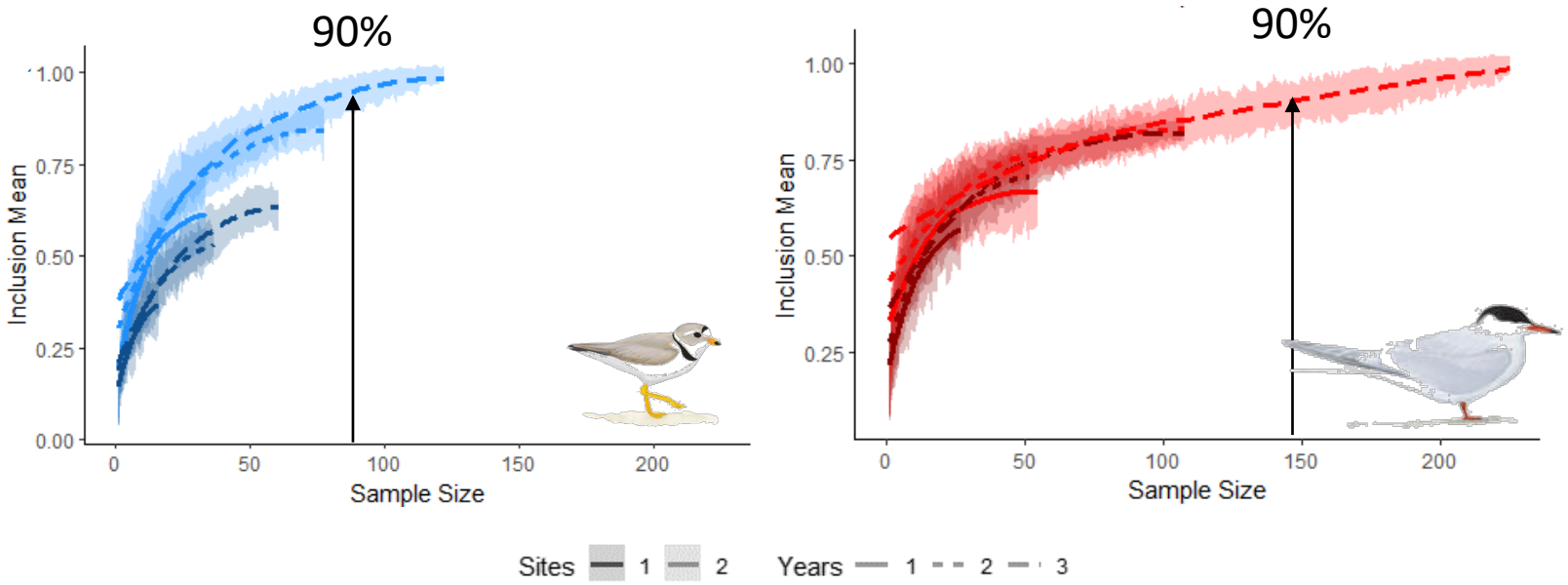
	Piping plover	Piping plover (adjusted)	Common tern
80%	42	50	76
90%	90	108	145
95%	125	150	208

Tag distribution



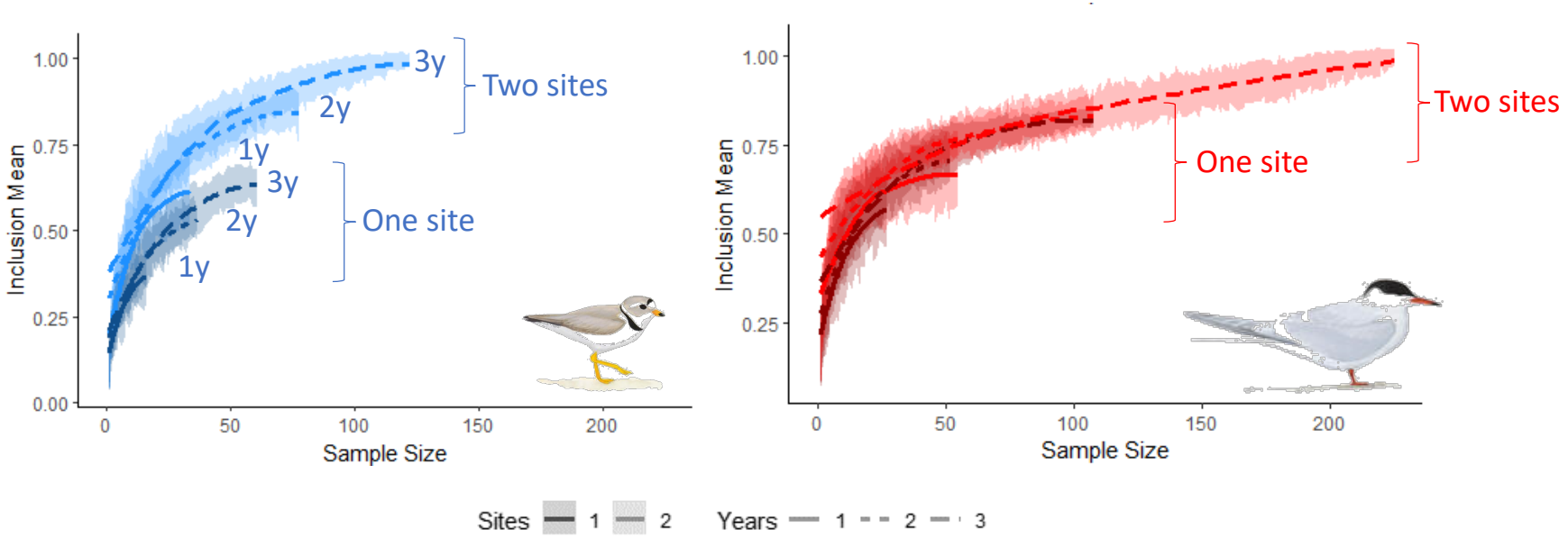
- **For one site and year**, greater representation for COTE (vs. PIPL)

Tag distribution



- **For one site and year**, greater representation for COTE (vs. PIPL)
- **Across full sample**, greater representation for PIPL (vs. COTE)

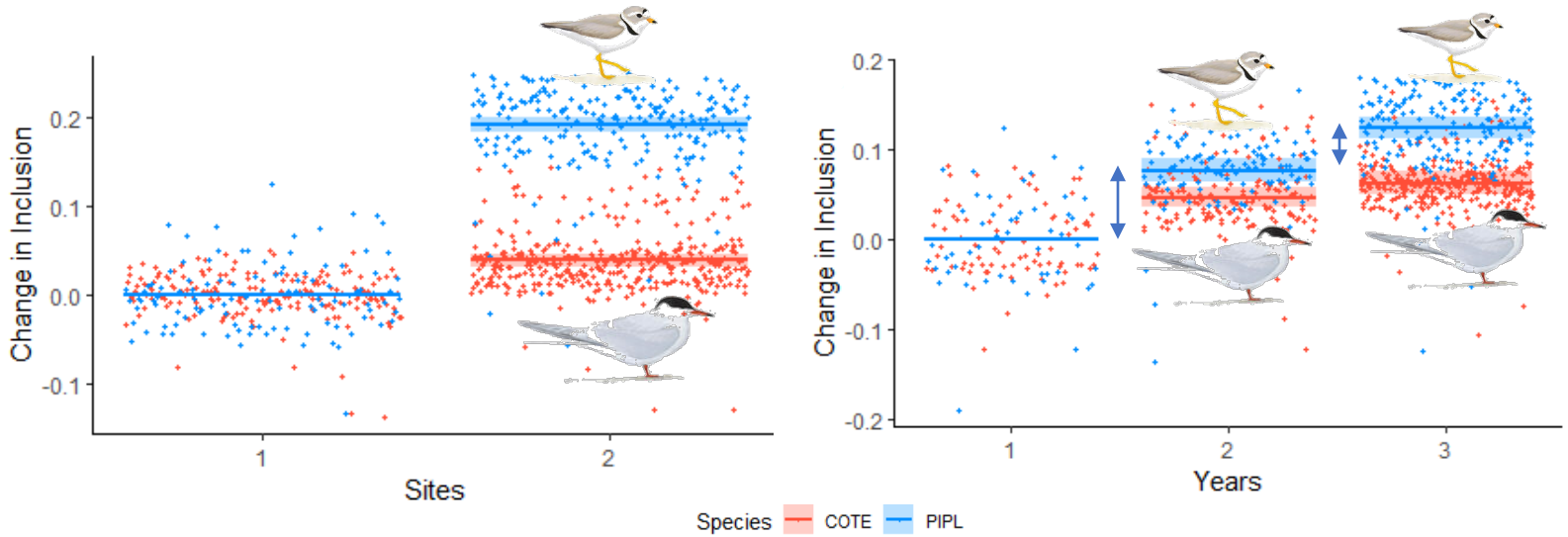
Tag distribution



- Improvements from adding a site/year for piping plover
- Limited effects for common terns

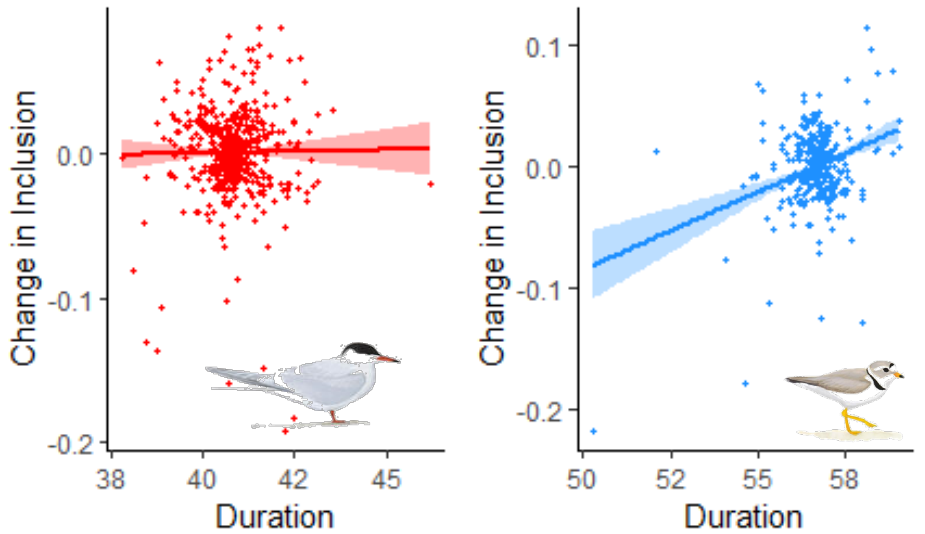
Tag distribution

- PIPL: Adding a site > adding a year
- COTE: Limited effects of additional sites and years
- Adding a second year > adding a third year



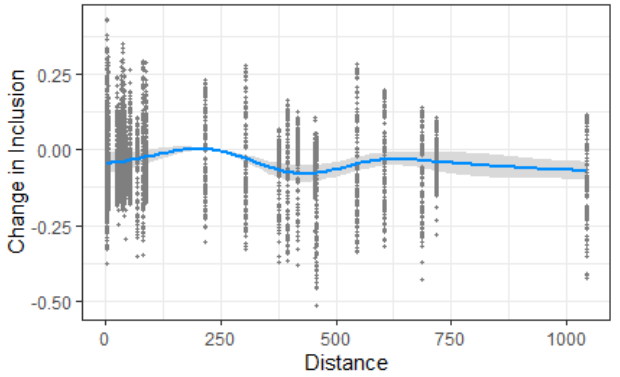
Transmission duration

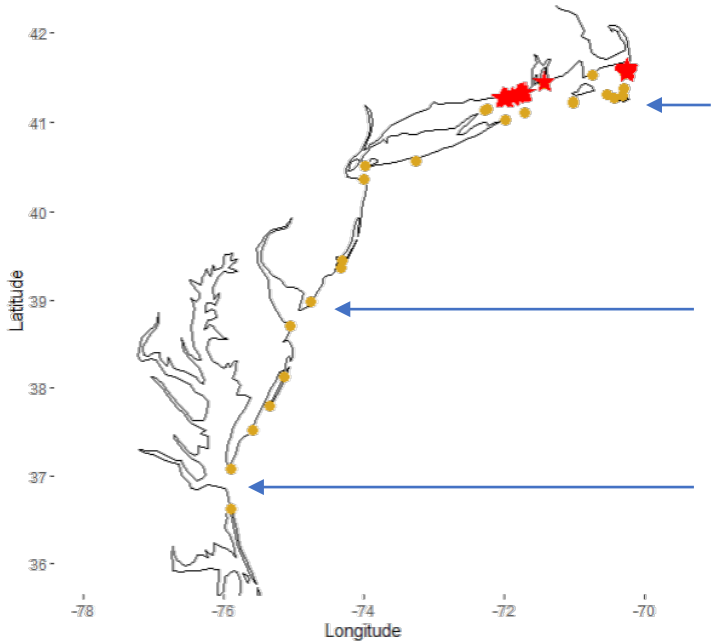
- Species-specific effects
  - COTE: Shorter duration, no effect
  - PIPL: Longer duration, positive effect
- Different migration strategies
- Different causes: transmitter loss (PIPL) vs signal loss (COTE)

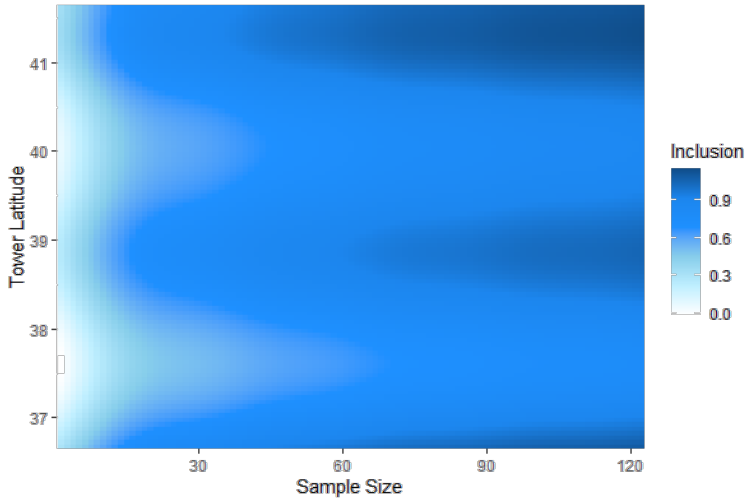


Tower characteristics

- Distance from tagging site: non-linear effect

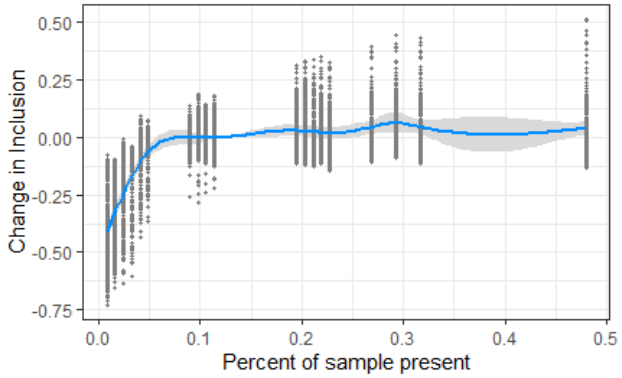






Tower characteristics

- Distance from tagging site: non-linear effect
- Percent of sample present: positive effect up to 10%
- Number of antennas: positive effect
- Station height, number of locations: no effect



Conclusions

- At least 100-150 individuals needed to represent site use of regional metapopulation
- Actual sample needs may be higher
  - Large geographic ranges
  - High connectivity
  - Species clumped on the landscape
  - More complex questions
- Prioritize multi-site studies, esp. for dispersed species
- Diminishing returns after two years
- Account for transmitter duration and network layout

Thank you!

Questions, comments, suggestions?

juliet.lamb@tnc.org

- Co-authors: Pam Loring, Peter Paton
- Additional feedback: Evan Adams, Andrew Gilbert, Kate Williams

RWSC

Regional Wildlife Science Collaborative for Offshore Wind

Options for centralizing tag deployments

June 8, 2022

RWSC

Regional Wildlife Science Collaborative
for Offshore Wind

Cooperatively established, led, and funded

by federal agencies, states, offshore wind companies, eNGOs

Mission: To collaboratively and effectively conduct and coordinate relevant, credible, and efficient regional monitoring and research of wildlife and marine ecosystems that supports the advancement of environmentally responsible and cost-efficient offshore wind power development activities in U.S. Atlantic waters

RWSC Roles

Science Plans

- Reflect research needs of the four RWSC Sectors (federal, state, industry, eNGO) with input from experts and research community
- Informed by RWSC database of ongoing and pending research and 6 taxa-based Subcommittees
- Will include best practices for:
  - Select methods and/or analyses
  - Data and metadata standards
  - Data management, storage, and sharing

RWSC
Regional Wildlife Science Collaborative for Offshore Wind

RWSC Roles

Research Support

- Convene experts and stakeholders to advise on project approaches, methods, analyses, uses in decision-making
- Ensure projects are consistent with ongoing research in the region/on the topic
- Ensure projects have access to and follow RWSC best practices

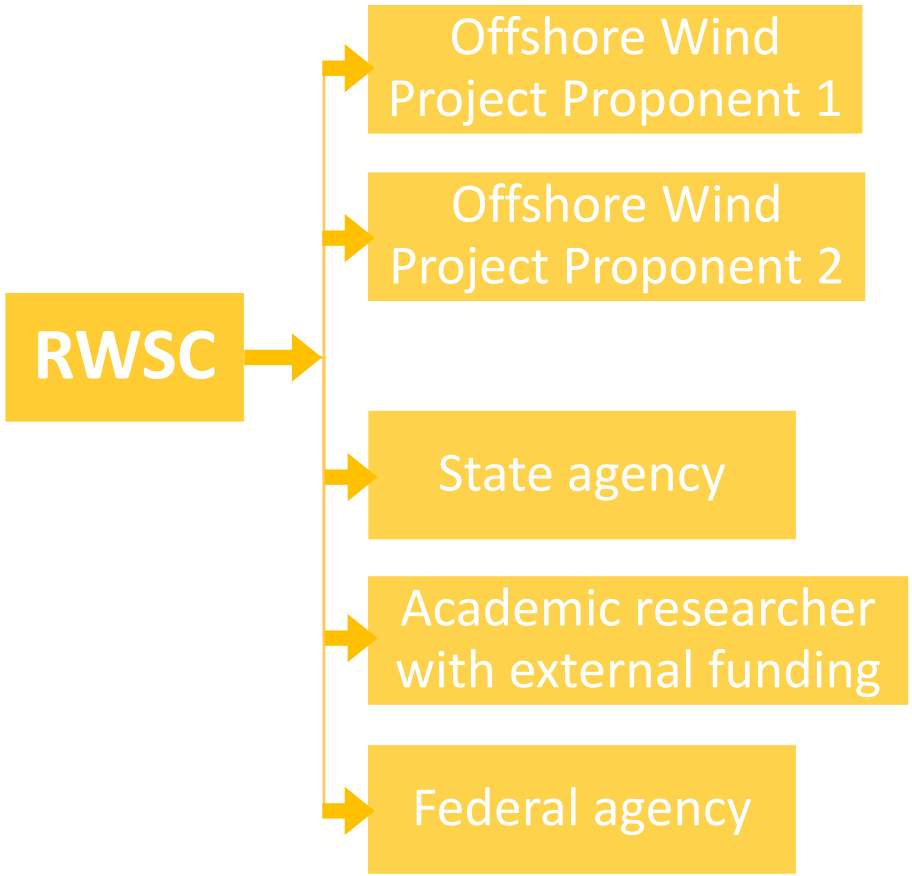
RWSC
Regional Wildlife Science Collaborative for Offshore Wind

Centralizing tag deployments

Phase 1 – underway now

- Build off the results of this NYSERDA Project
- RWSC Bird & Bat Subcommittee develops regional tagging strategy (as part of Science Plan development)
  - Incorporates the Monitoring Framework for Offshore Motus
  - Highlights subregions/sites and species of interest
  - Proposes a design or framework for optimal or strategic tag deployment
  - Lists key participants (tag project funders, species and land managers, etc.)
  - Describes data management/storage/sharing best practices

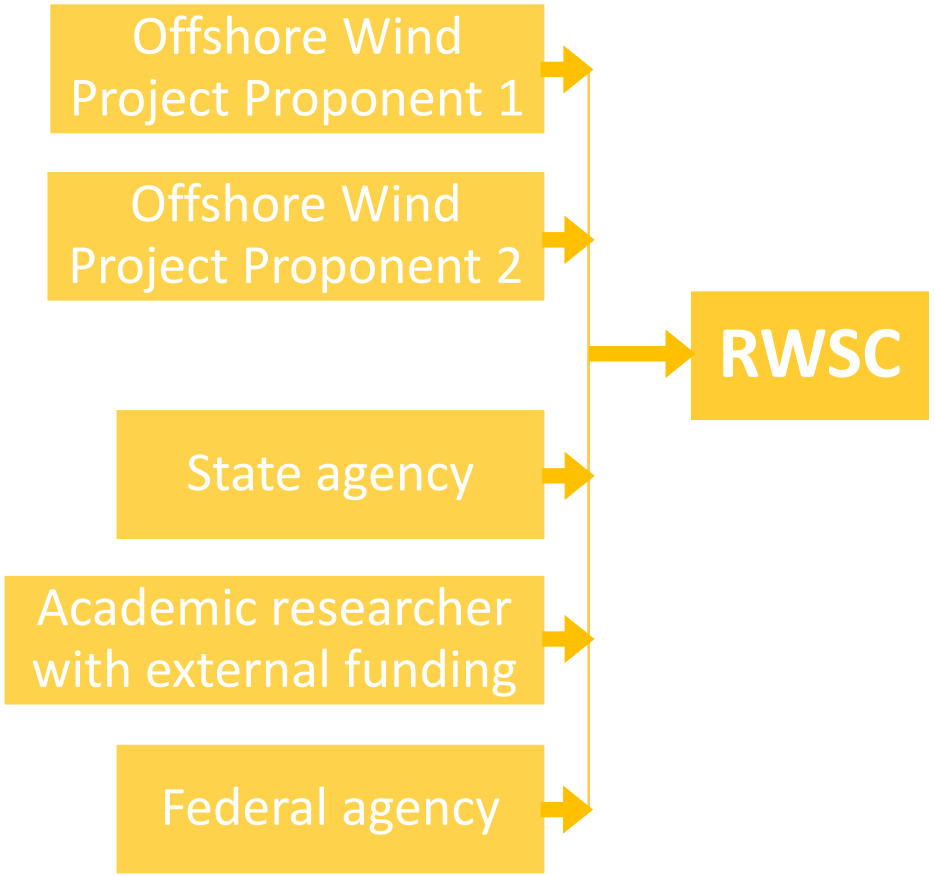
Centralizing tag deployments



Phase 1-A

- RWSC develops agreements with **each project** that needs to deploy tags
- RWSC with the Bird & Bat Subcommittee **ensures consistency and coordination** among tagging projects by:
  - Developing plans to deploy tags that are consistent with the Science Plan tagging strategy
  - Assisting with permits
  - Coordinating with colony managers
  - Contracting with field/deployment teams
  - Procurement of supplies
  - Managing data storage and sharing

Centralizing tag deployments



Phase 2

- Each year, project proponents **contribute to a "tagging strategy fund"** held and managed by RWSC
- RWSC with the Bird & Bat Subcommittee **uses pooled funds** to:
  - Implement the holistic Science Plan tagging strategy
  - Assist with permits
  - Coordinate with colony managers
  - Contract with field/deployment teams
  - Procure supplies
  - Manage data storage and sharing

Next BB Subcommittee meeting June 16, 1-3pm ET

Latest news, information, documents will be posted here:

https://neoceanplanning.org/rwse

Contact information

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Nick Napoli, RWSC Senior Advisor
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RWSC
Regional Wildlife Science Collaborative for Offshore Wind

Breakout Groups

- Goal: generate ideas for strategic tag deployment
  - We've outlined multiple strategies for deploying Motus tags (centralized vs. decentralized). What are the advantages and disadvantages to each?
  - Additional breakout-group questions (if time):
    - What do you see as the biggest species or geographic data gaps to address using Motus tagging?
    - Do you have any suggestions on ways to address those data gaps through adding tags to existing capture and banding efforts for these species and geographic areas?
- Reconvene at 12:40 ET for brief group discussion (no formal report-outs)
- Groups assigned randomly, with note-taking by a co-lead on project or one of today's speakers

Full Group Discussion

- Any ideas to emphasize from breakout group discussions?
- Anything else to add?

We will summarize all breakout group input in the meeting summary document, which we'll share once it's complete


Peter Paton, URI

Anonymous Poll

- https://forms.office.com/r/JbW16pB9Zs
- 7 questions
- Looking for anonymous feedback on people's interest in centralized vs. site-specific Motus tag deployments in relation to OSW development
- Will leave poll open 24 hours

Next steps

- Opportunities for more detailed feedback - contact Pam if you would like to review full document during next couple of weeks (pamela_loring@fws.gov)
- BRI will produce a summary report from workshop and post on project website at https://briwildlife.org/offshore-motus-guidance/
- Upcoming workshop and symposium at State of the Science Workshop in July – register until June 13 at www.nyetwg.com/2022-workshop
- Anticipate release of final study products in fall 2022

Thank you!

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