San Francisco Bay Motus Workshop:

October 21, 9:00-12:00







We'd like to honor and acknowledge the original stewards of the lands on which we work and reside. The campuses of San Francisco State University are located within the occupied territories of the Ohlone peoples and the Coastal Miwok (who, along with the Southern Pomo, are organized as the Federated Indians of Graton Rancheria). Our new tower is at our reserve site of Rush Ranch which is Patwin, Yocha Dehe territory. We at the NERR are working to build our capacity to be better stewards and allies to the local communities around our reserve sites and to all frontline communities across the Estuary.

Brought to you today by....









Aimee Good





Catie Thow



Jess Kinsella



Matt King



Nick Wallover





Blake Barbaree





Rodd Kelsey



Jared Feura

Today's Agenda

9:00 am Welcome and Introductions

Introduction to Motus

Current SF Bay Tagging Efforts and Data

Motus Small Scale Studies

Break

Motus Education and Outreach

Motus Tower Site Selection

Participatory Mapping Breakout Room Conversations

Regroup, Recap and next steps

12:00 End

Introduction and Implementation of MOTUS Systems

Nick Wallover Marine Resources Division South Carolina Department of Natural Resources

National Estuarine Research Reserve System Science Collaborative





Declining Population

Percent change among 19 species of North American long-distance migrating shorebirds



Source: Environment and Climate Change Canada

San Francisco Bay

WHSRN Site of Hemispheric Importance

Supports approx. 900,000 shorebirds annually

Most populus wintering and migrating site on West Coast

Supports Arctic, Near Artic, and Prairie Grasslands



Shorebird Research and tools in SC













ACE Basin NERR



"Where do my birds go!?"







MOTUS System

Motus Wildlife Tracking System

Automated Telemetry network

Migratory connectivity and chronology, Stopover ecology local habitat use questions

Helps fill niche for small highly migratory animals

- Too small for satellite tracking along migration
- Recapture/resighting is unlikely
- Can be more cost effective



MOTUS Collaboration

Birds Canada

Coordinate tags, towers, and data

Researchers

Deploying tags, designing studies

Tower hosts

Install and maintain 'listening' towers Free to sign up, no permitting required

"Where do my birds go!?"















Harbor Island, SC









Building out a coastal SC working group







Get your MOTUS runnin....

Why contribute to the network?

Answer migration and chronology questions at your location

When are species arriving, what Is there stopover ecology?

Inform management decisions to allow compatible uses



Get your MOTUS runnin....

Why contribute to the network?

Help fill gaps in MOTUS coverage

Contribute to regional and hemispheric efforts

Identify migratory pathways and bottlenecks



Get your MOTUS runnin....

Why contribute to the network?

Increase capacity for outreach at critical habitats

Educate visitors and residents

Help guide decisionmakers



Components of a MOTUS Tower Antennas Antenna Mount Power source **Receiver** unit



Dongles





Antennas

Antennas are designed to receive Specific frequencies

9 element 10' Yagi VHF antennas 166-174 MHz

UHF antennas also available, should consult with working group



Power options varies from plug-and play to off the grid Low power demand, ~ \$10 per year

Raspeberry Pis can be receive ethernet cable to report records completely autonomously

~.5MB of data/day uploaded overnight

Both tend to be a complicating factor in siting decisions



2.25 MB of

Site specific installations



















Nick Wallover Sportfish Restoration Coordinator Marine Resource Division SC Department of Natural Resources wallovern@dnr.sc.gov

PIF Western Working Group Motus





• The initiative began in 2018

AND GROUP

- Interest in Motus has snowballed
- 30+ stations deployed in California by early 2021





motus.org | A Program of 🔫

PIF WWG







2018

2019

2021 projected



PIF WWG



Projected 2021



Current & future stations

motus.org | A Program of 🔫

Pacific Flyway Shorebirds

- California Shorebird Migration and Response to Drought (TNC/Point Blue + OSt)
- Tomales Bay-Bolinas (Audubon Canyon Ranch)
- Fraser River Delta (*Birds Canada/Env. Canada*)
- Guerrero Nego, Baja Mexico (*ProNatura-Noroeste*)



Pacific Flyway projects

- Central Valley Tricolored Blackbirds (SSRS and Audubon CA)
- Bats and Birds (USG\$)
- Riparian Birds in Bay Area (SFBBO)
- Other?





otus.org | A Program of 🔫 🎫

California Motus Working Group

- New to complement other western working groups
- Email Mary Whitfield (SSRS) to subscribe: <u>mjwhitfield@southernsierraresearch.org</u>





Drought Impacts on Migratory Shorebirds in the Pacific Flyway-A Motus Springboard

<u>Blake Barbaree</u>, Kristin Sesser, Matt Reiter *Point Blue Conservation Science* <u>Rodd Kelsey</u>, Greg Golet *The Nature Conservancy* Khara Strum, *Audubon California*



SAN FRANCISCO BAY MOTUS WORKSHOP

OCTOBER 21, 2021

Migratory Bird Conservation Partnership





Shorphirds and the Central Valley





Steep population declines



COASTAL AND SHOREBIRD INDICATORS



Rosenberg et al. 2019
Lessons learned from the last drought

- Fall habitat limited every year
- Spring habitat especially limited during extreme drought
- Lower abundance in CV PFSS
 - Shifts in distribution
- Longer movements as habitat availability decreases
 - Costs to individuals?





Research priorities for this drought

- Drought impacts on body condition?
 - Physiological changes?

 Impacts on movement patterns during winter and migration?

Interior vs coastal sites?





Drought Impacts on Migratory Shorebirds



Objective

Quantify impacts of habitat availability and drought on winter movements, migration and physiological stress

- 1. Body Condition and Stress- Oregon State U.
- 2. Regional Movements and Migration-Motus
- 3. Abundance Across Wetland Complexes (PFSS)

Methods

- Capture, radio tag and sample blood
- Dunlin (Least sandpiper and Longbilled Dowitcher)
- Central Valley + Baja, Coastal CA, British Columbia
- 3 consecutive winters

The Motus Network

- Automated, flyway-scale research on migratory birds
- Broad-scale deployment-> local studies on many taxa
- Consider conservation outcomes
- Migration & Movements = Inspiration



Long-billed Curlew and Sanderling. Credit: Laird Henkel.





Acknowledgements

Funding:

- S. D. Bechtel, Jr. Foundation
- California Department of Fish and Wildlife
- The Nature Conservancy

California Rice Commission Sacramento Valley rice farmers

Staff of the Migratory Bird Conservation Partnership

Thank You!

Rodd Kelsey- rkelsey@tnc.org Blake Barbaree - bbarbaree@pointblue.org

Lotek, Inc

Coded VHF NanoTag66MHz

- Developed technology from salmon pit tags
- All tags on the same frequency = 24 hour • monitoring
- No more cycling through frequencies during ٠ tracking!
- Solar options ٠



AVIAN

VHF)



Cellular Tracking Technologies (CTT)

Digital ID Radio (UHF) tag<u>\$34MHz</u>

- Solar only Life Tag (as low as 0.45g)
- Battery-powered PowerTag (<lg)
- Solar + battery Hybrid Tag (<lg)



Red-winged Blackbird outfitted with a LifeTag transmitter



- Transmits every 2 seconds
- Globally unique ID
- Many attachment methods (backpack, collar, glue-on, leg loop harness, etc.)
- Can be received by certain CTT transmitters on larger animals like mammals, eagles and vultures.

CTT also has:

- Motus receiving stations SensorStation
- Short-distance Motus station Node





Local scale applications for automated radio-telemetry (MOTUS)



Jared Feura and Mark Woodrey

What do your towers get you?

Individual Identification
Time of detection
Signal Strength
Antenna direction (when properly recorded)



Potential Applications

Survival Estimates

Location and movement

- Broad and finer scale
 - Stopover
 - Nest site activity
- Site preferences
 - Poraging
 - Roosting
 - Loafing



Survivorship

- Assessing if a bird is alive or dead
 - Patterns in signal strength over time
- Periods of increase or decrease
- Site specific
- Condition specific



Clapper Rails (Rallus crepitans) in coastal Mississippi

Location and Movement

- Stopover sites
 - Duration
 - Preferences within site of interest
 - Departure
 - Location
 - Direction
- Loafing and roosting
- Foraging
- Nest site behavior

Rusty Blackbird (Euphagus carolinus) staging behavior

- Fall and spring staging /lasted ~1 month
- Spring migrants in heavy molt and poor body condition had increased stopover time
- Tailwinds predicted departures
- 10-35km relocations while stopping over

Wright et al. Automated telemetry reveals staging behavior in a declining migratory passerine. The Auk, Volume 135, Issue 3, 1 July 2018, Pages 461–476, https://doi.org/10.1642/AUK-17-219.1

Roosting behavior of nesting Bank Swallow (Riparia riparia)

- Nest-tending swallows will roost away from the nest
- Males are more likely to roost away from the nest site
- Roosting occurred roughly 30km from the nesting site

Falconer et al. Prevalence of Disjunct Roosting in Nesting Bank Swallows (Riparia riparia). The Wilson Journal of Ornithology (2016) 128 (2): 429–434. https://doi.org/10.1676/1559-4491-128.2.429

Considerations for local scale studies

- Year-round tower locations vs. migration only towers
 - Using migration only tower equipment in the breeding or wintering season
- What you expect your data to look like vs. what you get
- Get creative!
- Not just for the birds
 - P Bats
 - Perps
 - Snakes
 - ? Turtles

MOTUS: EDUCATION & OUTREACH

Jessica Kinsella, Stewardship Coordinator SCDNR/ACE Basin NERR

MOTUS TELLS A STORY

From Cattle Field to Pollinator Plot

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Framing Your Message Why does this matter to society?
Values

- How does it work?
 - Explanatory chain
 - Social Math

2

3

- How do we improve the situation?
 - Community level solution

WHY DOES IT MATTER? VALUES

reducing risks.

people from harm.

Creating safe and healthy communities.

Protection is actively eliminating or <u>reducing risks</u>.

people from harm.

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Protection is actively eliminating or <u>reducing risks</u>.

Shielding and <u>safeguarding habitats and</u> people from harm.

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Tracking Migratory Fliers

This tower tracks the migration of imperiled and mysterious species such as the monarch butterfly and the painted bunting. By mapping the migration of these species, we can work to protect key habitats and prevent harmful human disturbance for these vulnerable animals

This tower belongs to a network of towers capable of recognizing small radio transmitters that are temporarily attached to birds, bats, butterflies and even dragonflies preparing to migrate. When a tagged animal flies within a several miles of this tower, their location is captured and shared back to the researchers studying these species. These transmitters are inexpensive and lightweight and one of the easiest ways for scientists to study small migratory species.

EPIC JOURNEYS

There are over 22,000 species being tracked by towers such as this one as of 2021. Some of these animals travel distances greater than 10,000 miles in a single year. For example, red knots, small shorebirds, make astounding migrations each year from wintering grounds at the southernmost tip of South America to nesting grounds north of the Arctic Circle, stopping at beaches along the way to rest and refuel.

Ruddy Turnstone

Red Knot

Taking <u>practical</u>, <u>common sense steps</u> to address problems facing our environment today is in the best interest of future generations.

Looking to evidence and focusing on the best ways to solve the problem.

approaches allow us to make real progress.

Practical Management Taking <u>practical</u>, <u>common sense steps</u> to address problems facing our environment today is in the best interest of future generations.

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<u>Practical feasible, step-by step</u> approaches allow us to make real progress. Practical Management

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Ruddy Turnstone

Framing Your Message

 Why does this matter to society? Values • How does it work? Explanatory chain Social Math How do we improve the situation? 3 Community level solution

Explanatory chain

Initial Factor: What is the original cause of the problem? Mediating Factor: What is set in motion by the initial factor?

Final Consequence: What are the final effects?

Explanatory chain: Motus

Social Math

Between \$235 and \$577 billion (U.S.) worth of annual global food production relies on pollinator contribution

1 out of every 3 bites of food is contributed by a pollinator



Why does this matter to society?
Values

- How does it work?
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Help Protect Our Beach-Nesting Birds



DEVEAUX BANK SEABIRD SANCTUARY is home to many nesting seabird and shorebird species. Disturbance from people and dogs can cause nest abandonment and the death of chicks, so please follow these regulations:

- NO DOGS ALLOWED
- RESPECT CLOSED OFF AREAS
- NO CAMPING
- AVOID CAUSING BIRDS TO FLY



Report violations to 1-800-922-5431

COMMUNITY LEVEL SOLUTIONS



"HOT SPOTS"

experience · discover · explore · connect

Open Tuesday-Saturday, 10am to 5pm FREE ADMISSION portrojalsoundfoundation org

THEY HAVE EXISTING INFRA-STRUCTURE





THEY HAVE STAFF & ON-SITE INFORMATION



THEY HAVE STAFF & ON-SITE INFORMATION



What do they get in return?

9CU

Opportunities with schools

DIRECT STUDENT ENGAGEMENT

Place-based

real world research

Meaningful connection to curriculum









The Motus Wildlife Tracking System is a program by













About Motus **Educator Resources Student Activities Find Your Station Host a Motus Station**



Migration Education Presentation



Virtual Field Trip: Long Point Bird Observatory

Case Studies



Explore Motus



Explore Data Science

Thank you to our generous funders for supporting the development of Motus Education:





In organisme du gouvernement de l'Onte





The Harold Crabtree Foundation

Approval for infrastructure

Accessibility

Station caretakers

Funding and set-up support

Trouble-shooting installs

Considerations

QUESTIONS?



Site Selection

Matthew King, Stewardship Biologist ACE Basin NERR



Initial Planning



Initial Planning



Initial Planning



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Biological Considerations



Foraging

Access



Remote Sites





Solar Power





Pre-existing Infrastructure





Commercial Towers









Partnerships



OF THE

U.S. FISH & WILDLIFE SERVICE



Partnership, access, and biological significance in one!

Questions?

