

## California Ridgway's Rail Range-Wide Surveys

 and Population Estimate

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## Conservation Goals

## Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California



Volume


## Measuring Progress

- How do we know if we're making progress?
- Population size
- Population trends
- Which strategies work best?
- Measuring response to conservation and restoration
- tidal breach restoration
- transition zone restoration
- within-marsh high tide refugia
- predator control



## Previous Population Estimates

Surveyed areas only
All areas


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## Previous Population Estimates

Challenges with multiple protocols

- Difficult to impossible to aggregate data
- Challenging QA/QC
- lengthy data preparation
- Reduced statistical power

Multiple Survey Protocols


## Developing a standard protocol

## Multi-partner Effort



SAN FRANCISCO ESTUARY
INVASIVE SPARTINA PROJECT

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## Developing a standard protocol

- North American Protocol- SF Bay
- 10 min point count
- Broadcast BLRA and RIRA
- 3 visits per season (Jan-Mar)

Site-specific Protocol for Monitoring Marsh Birds Don Edwards San Francisco Bay and San Pablo Bay National Wildlife Refuges

Survey ID Numbers: FF08RSFB00-003 and FF08RSNP00-008

- Since 2017
- 200+ marshes (San Pablo, SF, Suisun)
- All partner data in the AKN



## Population Estimate Update

- Update uses similar methods
- 2019-2021 survey data
- FWS
- ISP
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- CDFW
- 1,314 survey points

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## Population Estimate Update

## Accounting for birds not detected

- Actual number of birds = number detected $\times 1 /$ probability of detection
- Population estimate model has 2 components:
- Detection sub-model
- Abundance sub-model



## Population Estimate Update

- Abundance submodel:

Abundance for each surveyed point within a marsh can vary with:

- Year, specific marsh, bay, and marsh cover



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## Population Estimate Update

- Abundance submodel:

Abundance for each surveyed point within a marsh can vary with:

- Year, specific marsh, bay, hybrid Spartina and marsh cover



## Population Estimate Update

## Landscape model for un-surveyed areas

- Ensemble of machine-learning models
- Use information on landscape-level predictors of rail abundance at surveyed marshes to infer abundance at un-surveyed marshes.
- Potential landscape covariates:
- elevation
- salinity
- marsh size
- location
- proximity to bay, urban
- Landscape covariate challenges
- salinity (limited marsh data)
- elevation (quickly outdated)



## Population Estimate Update

## Previous covariate relationships

Higher salinity $=$ higher rail density


Greater tidal range = higher rail density


## Population Estimate Update

## Previous covariate relationships

Larger marshes = higher density


More compact marshes = higher density


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## Future Steps

- Finalize population estimate
- Revise protocol document
- updated data entry and management procedures
- Describe multi-partner effort
- Tools for data visualization and reporting
- Measure response to conservation actions
- Time course of restoration
- Marsh mounds (high tide refuge islands)
- Native plant enhancement
- Predator control
- Expand analysis to Black Rails



## Thank you

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