California-Wide Range Map and Habitat Modeling Updates

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Taxon-specific range maps and habitat models are integral tools for conservation and management planning, particularly for rare species. As environmental conditions change over time and as new data collection tools facilitate an increase in species detections, updates to existing maps are needed. The **Range and Distribution Mapping and Analysis Project (RADMAP)** develops and maintains a library of species habitat models (SHM) and range maps, with a focus on imperiled plants and animals.

RADMAP is heading the effort to develop, update, and compile range maps and habitat models for the California Department of Fish and Wildlife (CDFW). Range maps are updated for priority species throughout the state and published on CDFW's online Biogeographic Information and Observation System (BIOS) for immediate use by partner organizations and stakeholders. Simultaneously, RADMAP is compiling species habitat models (SHM) from across their partner network into an accessible library of range maps and SHMs. The library houses one CDFW vetted range map and SHM per taxon, representing its spatial use on the landscape.

https://wildlife.ca.gov/Data/Analysis/RADMAP

Retrieve and explore CDFW range maps and habitat models on BIOS

https://wildlife.ca.gov/Data/BIOS

Range map and species habitat model use case guidance document

https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=222269

RADMAP Project Objectives
- Update and expand official framework for developing and providing CDFW range maps   .
- Rank priority species in California based on select criteria
- Consolidate vetted occurrence datasets across platforms per priority taxa
- Build expert range review application via ArcGIS Online
- Build standardized R workflow for habitat modeling
- Update and/or compile one range map and one SHM per priority taxon to the public

Do you have data to contribute?
Email ConservationAnalysis@wildlife.ca.gov

Range Maps

A species range is the generalized geographic area within which a species occurs without consideration of specific habitat that the species uses.

RADMAP is creating or updating range maps for taxa as needed, incorporating expert review and following a Standards and Guidelines framework to ensure consistency. Range maps are based primarily on species occurrence data, collated from various sources, and a standardized basemap mapping unit.

Great Gray Owl Range (2019)

Yearlong
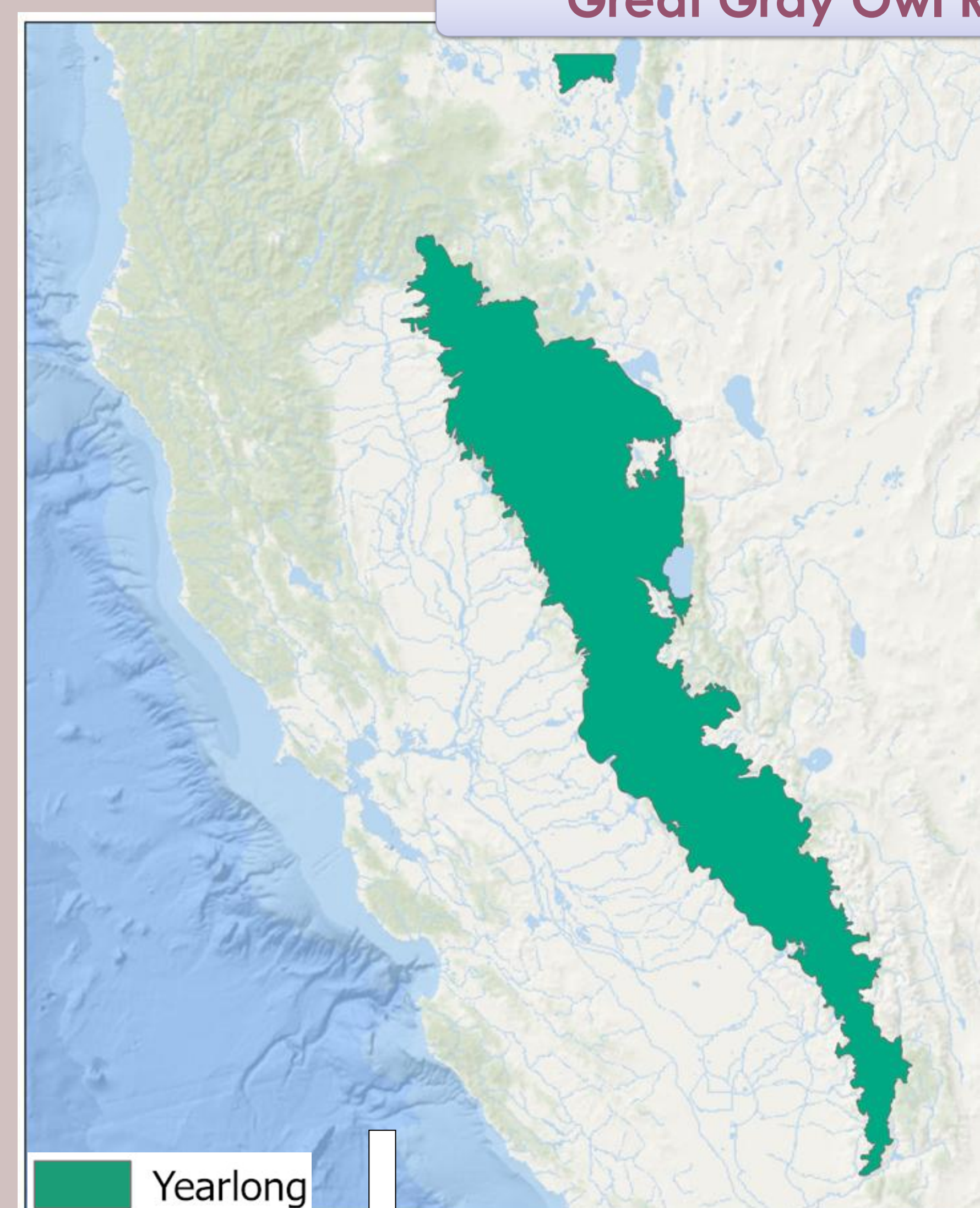
Procedure overview:

1. Collate occurrence data
   - CNDDB, iNaturalist, museum records, and other CDFW datasets
2. Base mapping Unit
   - USDA ecological subregions intersected with HUC12 watersheds (EcoHUCs)

3. Custom range map script
   - Intersect occurrence data with EcoHUCs to highlight general range area

Great Gray Owl Range (2026)

Yearlong
Great Gray Owl Occurrences
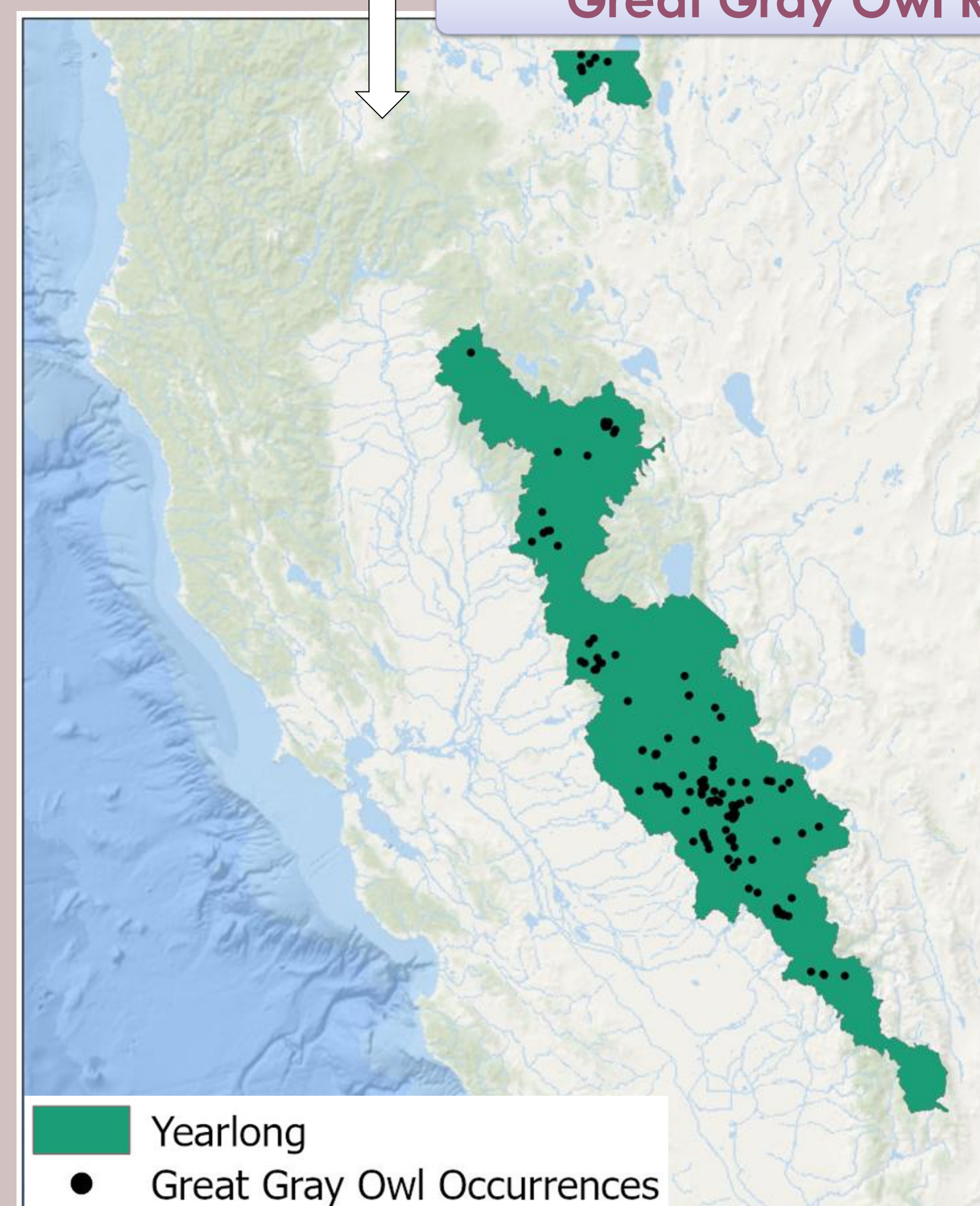
- Optional to include old range maps, USFWS Critical Habitat, or other pertinent layers
- Standardized attribute management
4. Expert review
   - Finalize EcoHUC selection
   - Incorporate integral landscape features to range boundary not represented in EcoHUC layer
5. Post updated range on BIOS

Species Habitat Models

SHMs are statistical models that indicate a species' likely distribution, predicting the relative probability that habitat conditions that support the species are present in the landscape. SHMs may be represented by a continuous surface (values between 0 and 1) or as a categorical map (low, medium, high).

Occurrence data:
- Collated by RADMAP during range map process

Environmental predictor library:
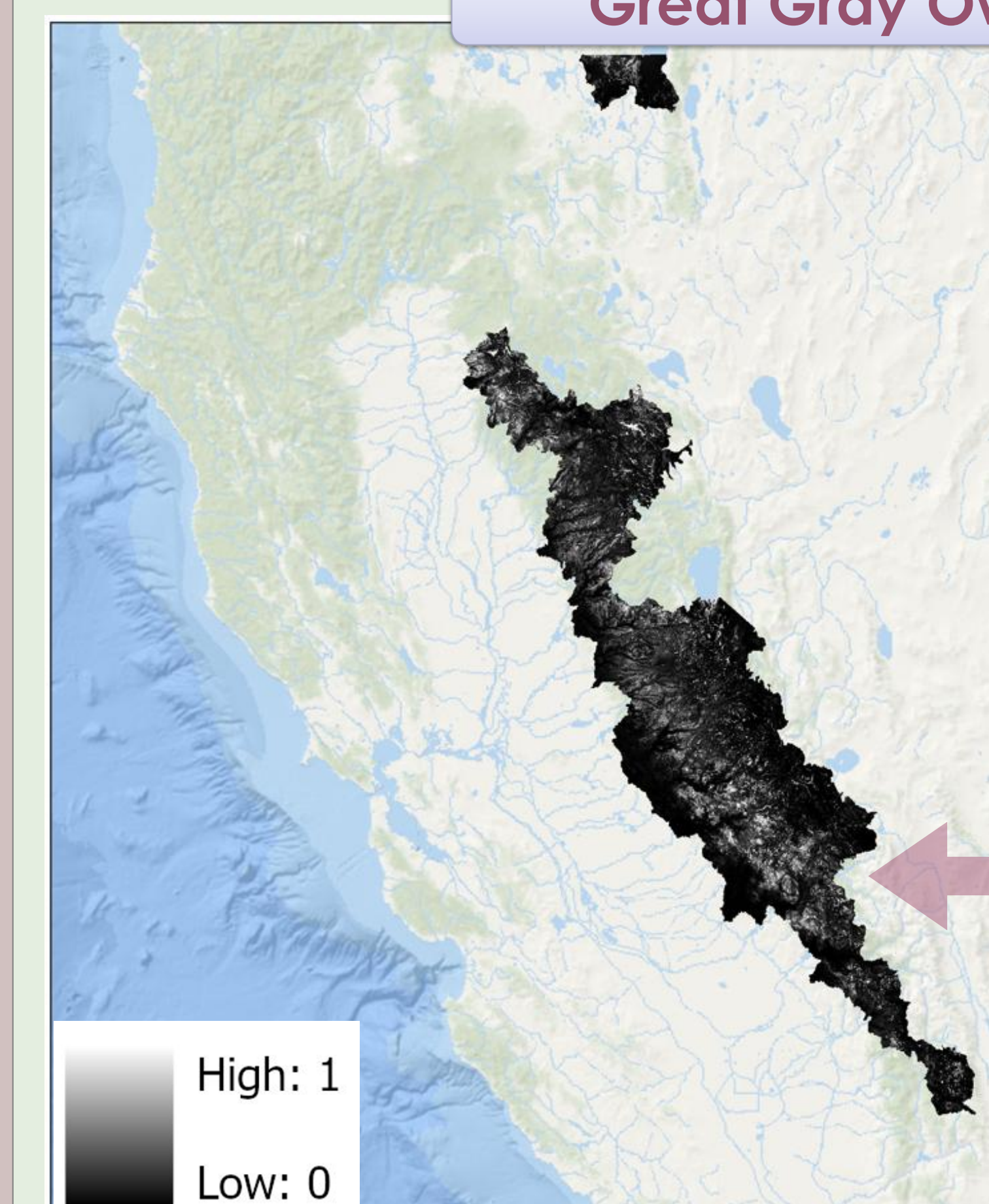- 330 statewide covariates processed at 30 meters

Modeling:
- Customizable MaxEnt workflow implemented in R
- Compute suite of 25 models per taxon, with best model validated via AUC, TSS, and expert review
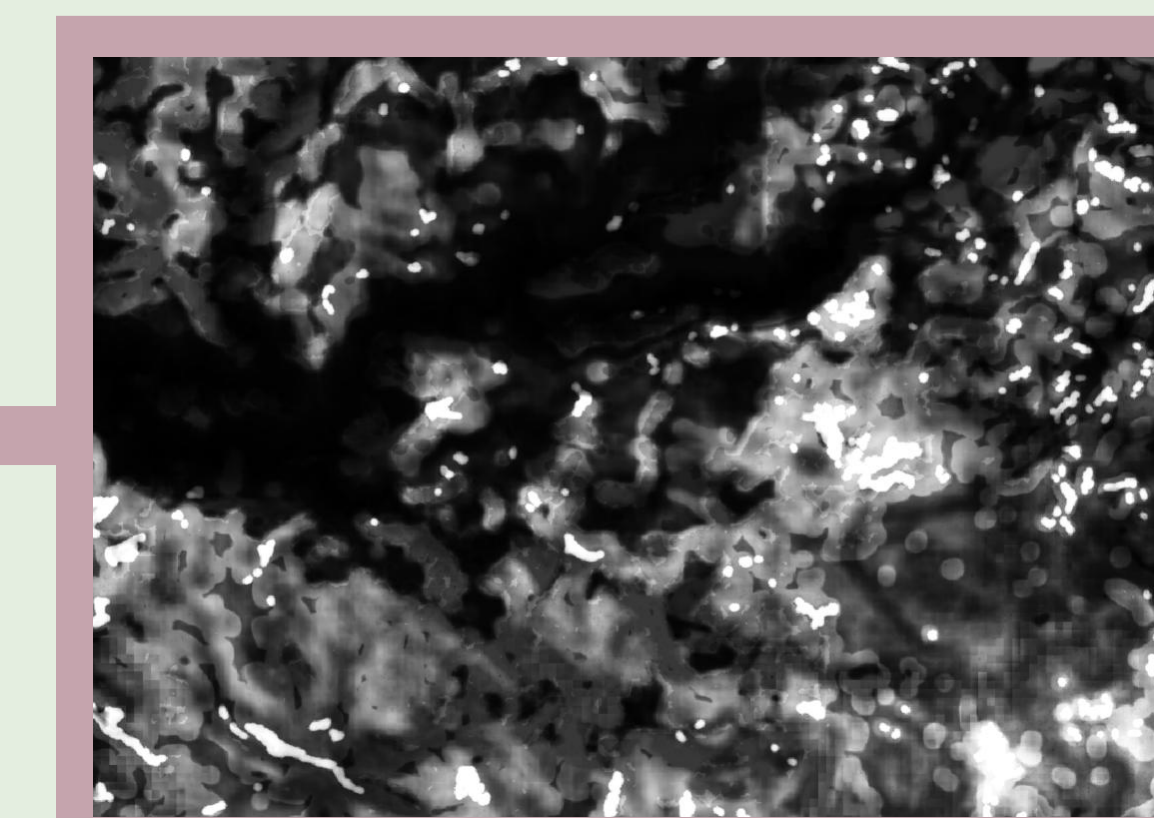
Model extent:
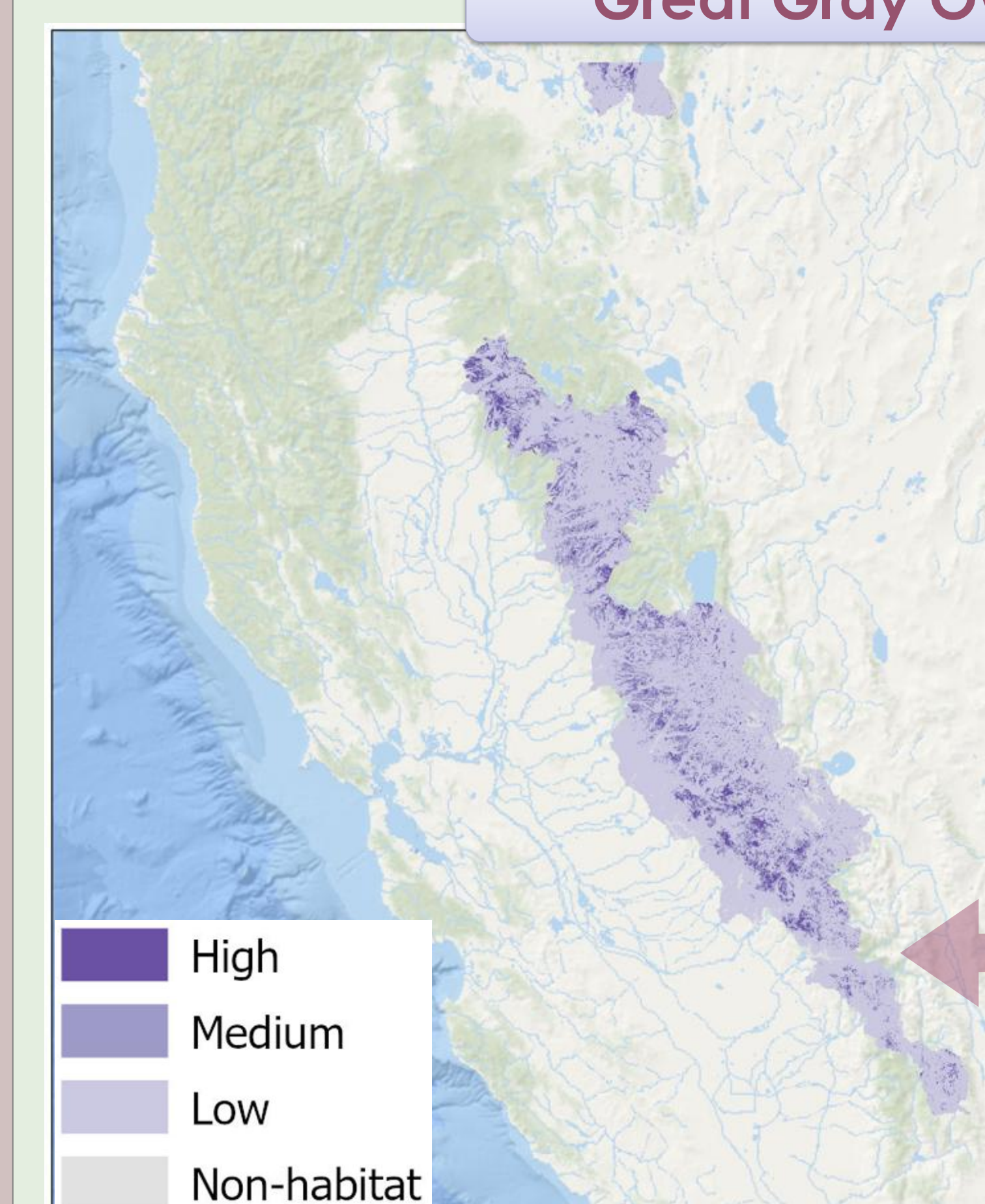- CDFW range maps define the final, published extent of the SHMs

Great Gray Owl Continuous SHM

- 30-m high-resolution continuous habitat models
- Areas predicted with higher suitability values may be prioritized for locating survey or monitoring sites

High: 1
Low: 0

Great Gray Owl Categorical SHM

- Simplified categorical models for public use
- Categorical thresholds:
   - Low – minimum training presence
   - Medium – maximum sensitivity plus specificity
   - High – top 25% of habitat probability values above medium threshold

High
Medium
Low
Non-habitat