DoD Natural Resources Program

Enabling the Mission, Defending the Resources

Multi-Species Management Plans and Predictive Range Mapping

October 29, 2019

Please mute your phones.

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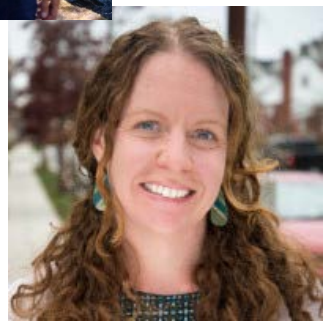


NatureServe

Connecting Science With Conservation

Outcomes and recommendations on multi-species management plans and use of habitat suitability modeling

October 29, 2019

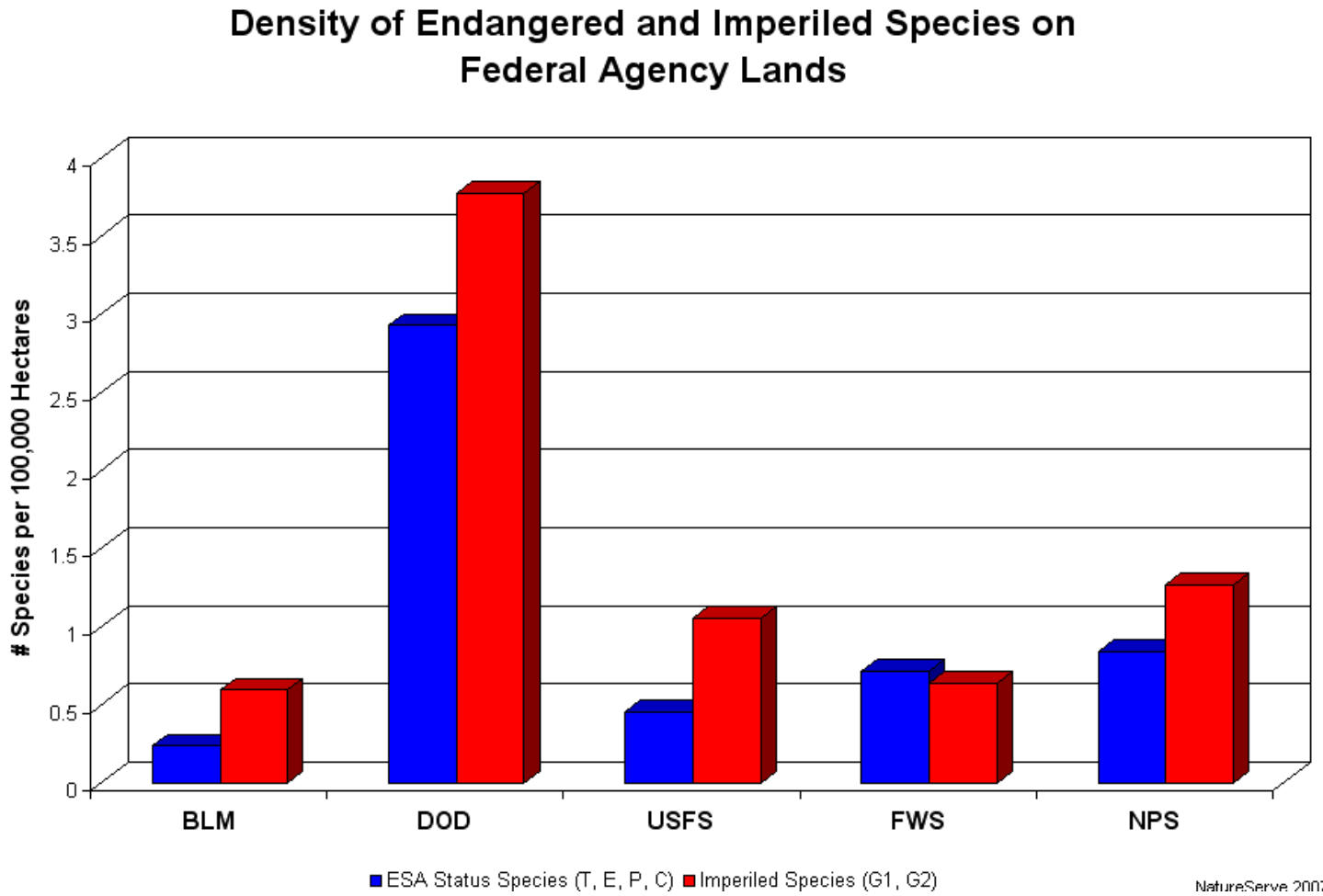
Agenda

Purpose: provide a technical framework for how to reduce species decline on and around DoD lands

- Background & conservation context of military lands
- Multi-species management plans – AZ & NM
  - Outcomes
  - Lessons learned
- Role of habitat suitability modeling
- Q&A, Discussion

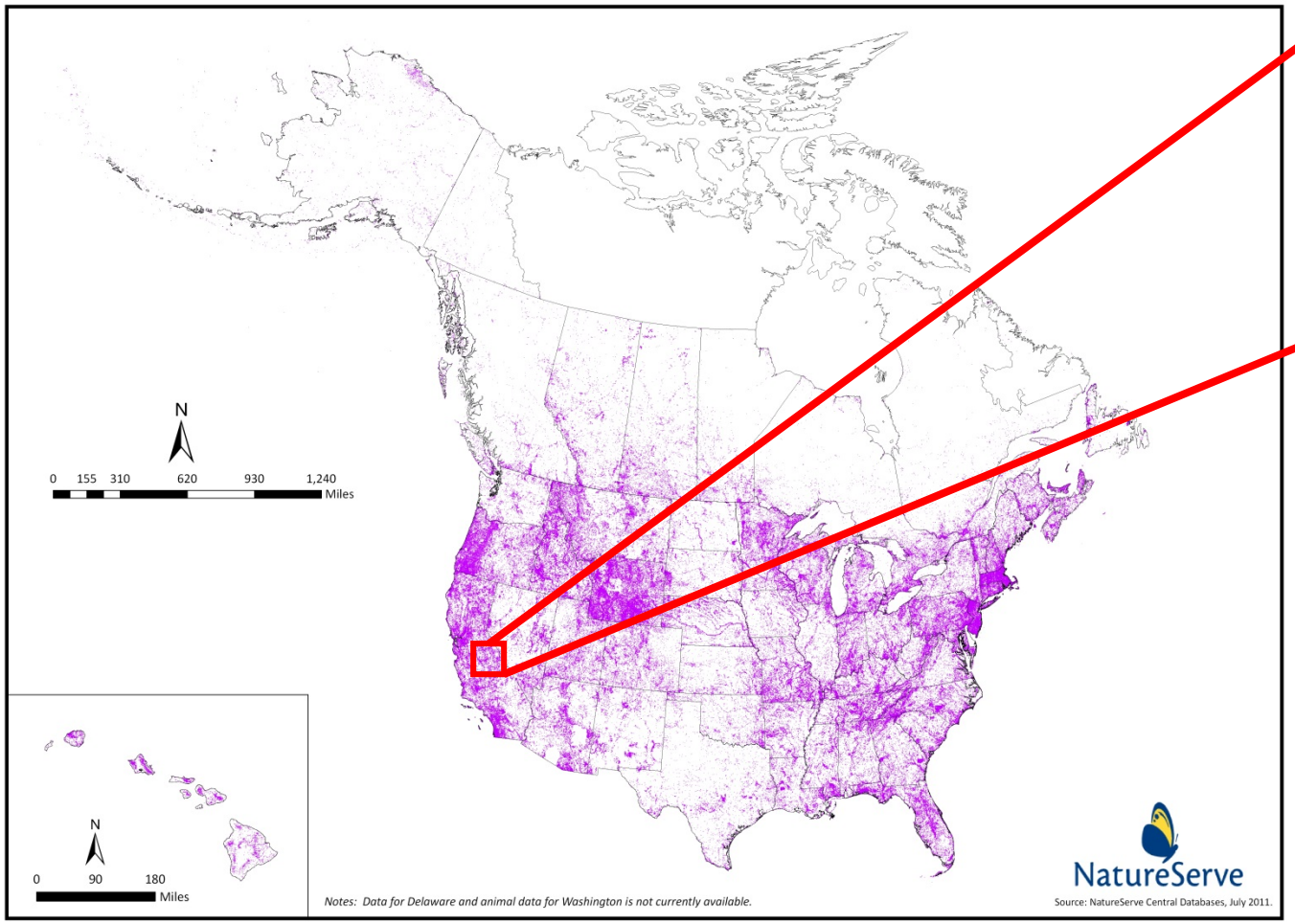
Importance of Military Lands

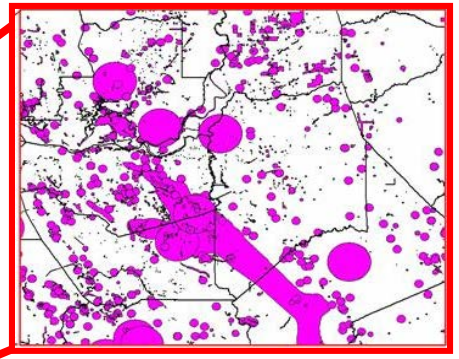
- High concentration of imperiled and listed species on military lands
- Military lands are critical to the persistence of many rare and endangered species



Use of Biodiversity Location Data & Expertise

Element Occurrence Point Data For All Tracked Species





One-stop access to over 1 million mapped locations for at-risk species

Use of Biodiversity Assessments

Eastern Prairie White-Fringed Orchid, G2G3 Listed Threatened under USESA

Global (G) Ranks

GX - Extinct

GH - Possibly extinct

G1 - Critically imperiled

G2 – Imperiled

G3 – Vulnerable

G4 – Uncommon but secure

G5 - Widespread, abundant, and secure

Taylor's Checkerspot, G5, S1 in British Columbia, Endangered under SARA

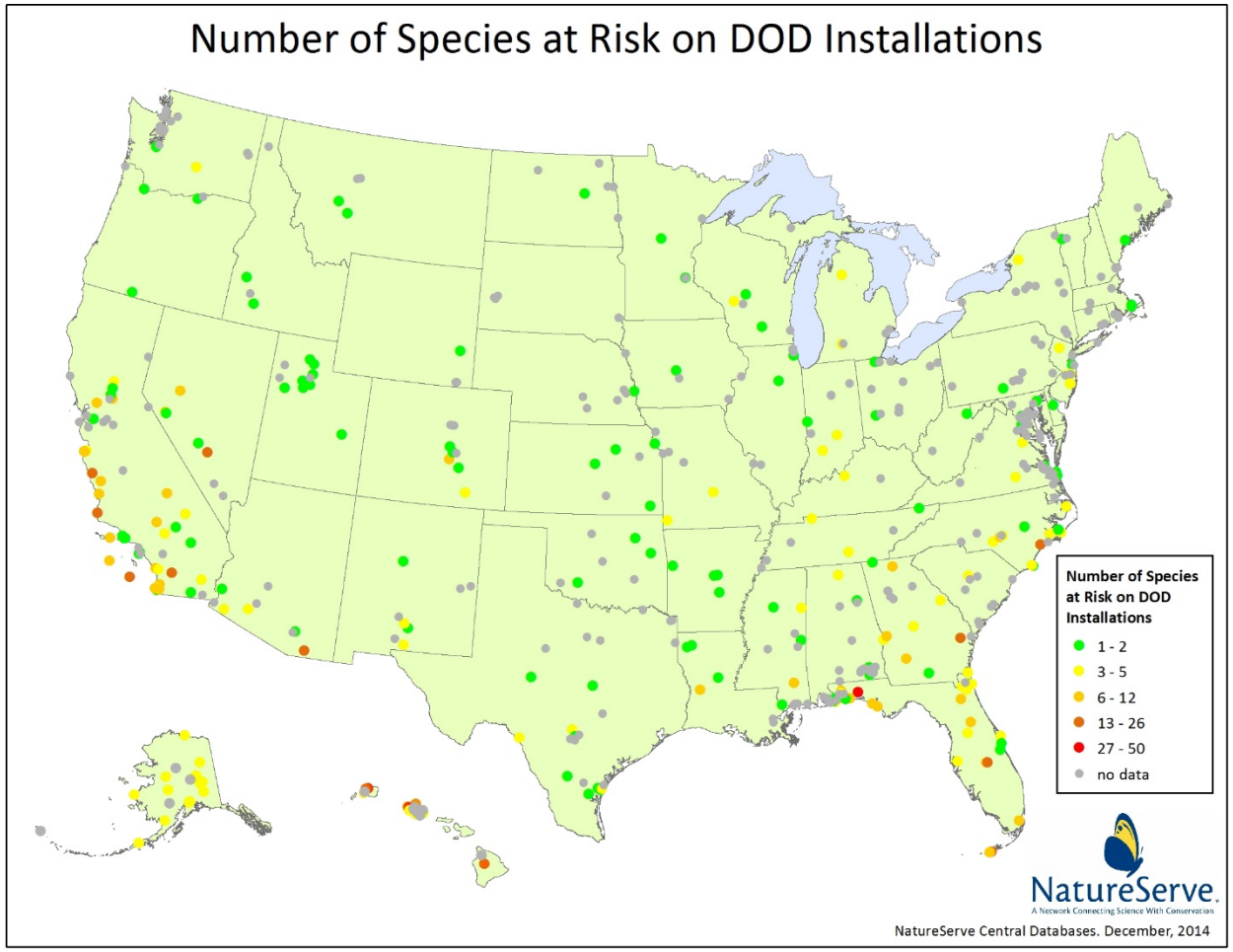
Focus on Species at Risk

What?

- Not yet federally listed, but are proposed or candidates for listing
- Regarded by NatureServe as critically imperiled or imperiled (G1 or G2), or vulnerable (G3) and have an IUCN status

Why?

- Proactive conservation of species at risk can preclude the need for species listings and avoid restrictions that can impact use of military lands



White Sands Missile Range – New Mexico

- Multi-species management plan developed
- Pinyon Jays and both subspecies of Colorado chipmunks use persistent piñon-juniper woodland habitats
- Distributions overlap in the old growth piñon woodland of the Oscura Mountains
- Piñon seeds provide food for Pinyon Jays and both chipmunks

Pinyon Jay (Gymnorhinus cyanocephalus)

NatureServe Global Status: Vulnerable (G3)

Photo | Cole Wolf

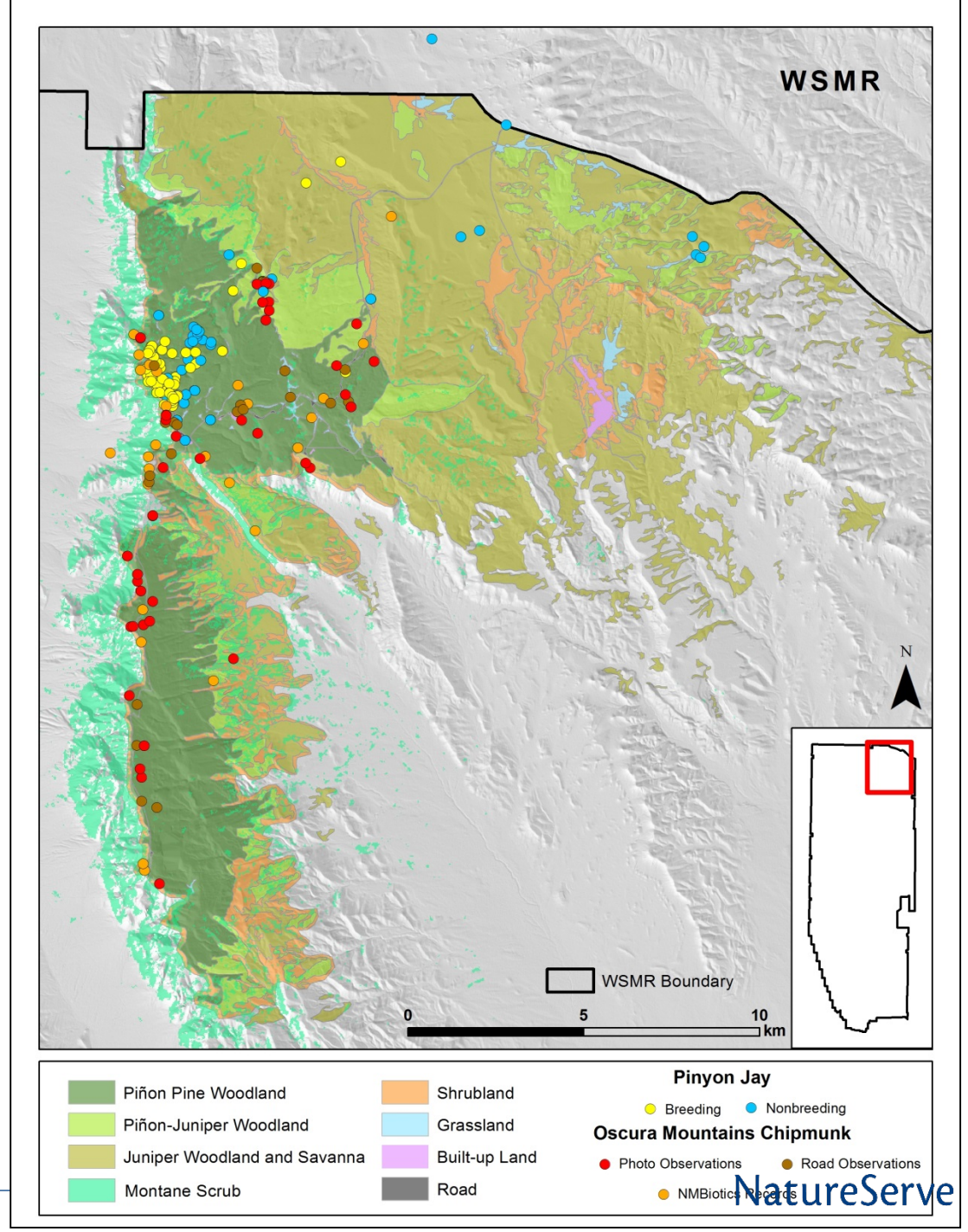
Oscura Mountains Colorado Chipmunk (Neotamias quadrivittatus oscuraensis)

NatureServe Global Status: Critically Imperiled (T1)

Photo | J. N. Stuart

White Sands Management Plan Recommendations

- Retain the large piñon trees
- Avoid thinning persistent piñon-juniper woodland
- Design firebreaks around the most fire-vulnerable military infrastructure in lieu of thinning the woodland
- Avoid ground training and other military activities in chipmunk or Pinyon Jay breeding areas
- Both species threatened by climate change so conserve the most climate-resilient areas of habitat
- Continue to monitor both species



Fort Huachuca - Arizona

- Management plans completed for Arizona treefrog, Huachuca Springsnail, Giant Skipper, and Huachuca Lupine
- Despite similar location, species had different management needs requiring distinct management plans
- Species habitats were scattered along sky islands (isolated mountains surrounded by desert or grasslands)
- Lesson learned: how critical it is for species to have very similar habitats if the objective is to have a single multi-species management plan

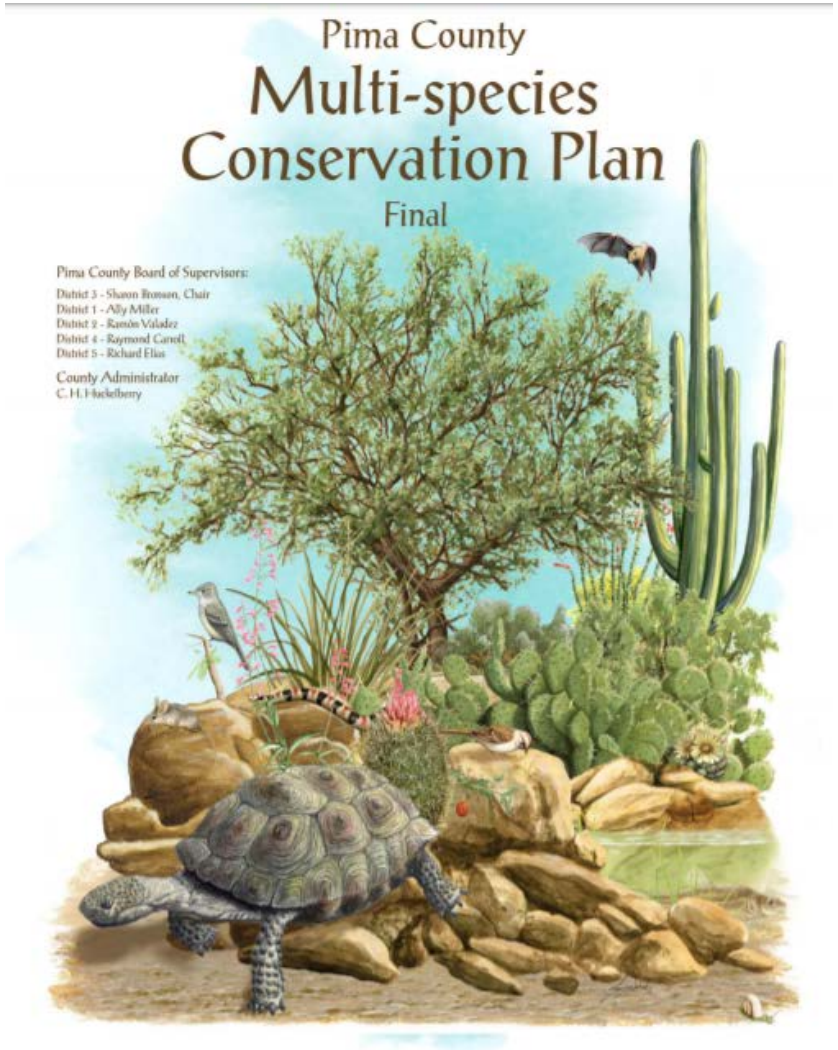
Arizona Tree Frog (Hyla wrightorum)

NatureServe Global Status: Vulnerable (G3)

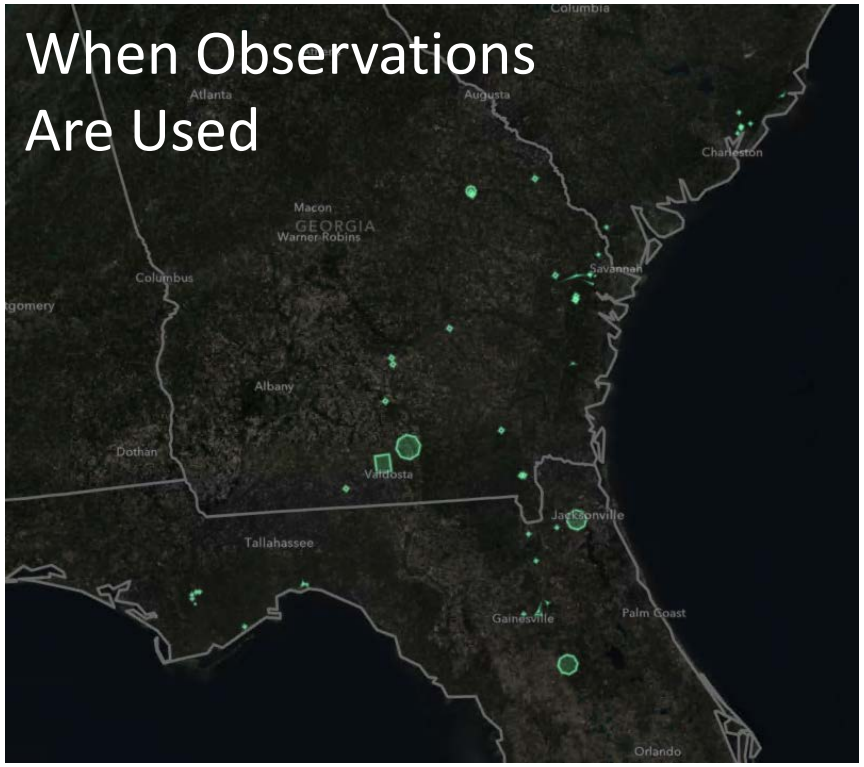
Photo | Jeff Servoss

Elements of Successful Multi-Species Management Plan

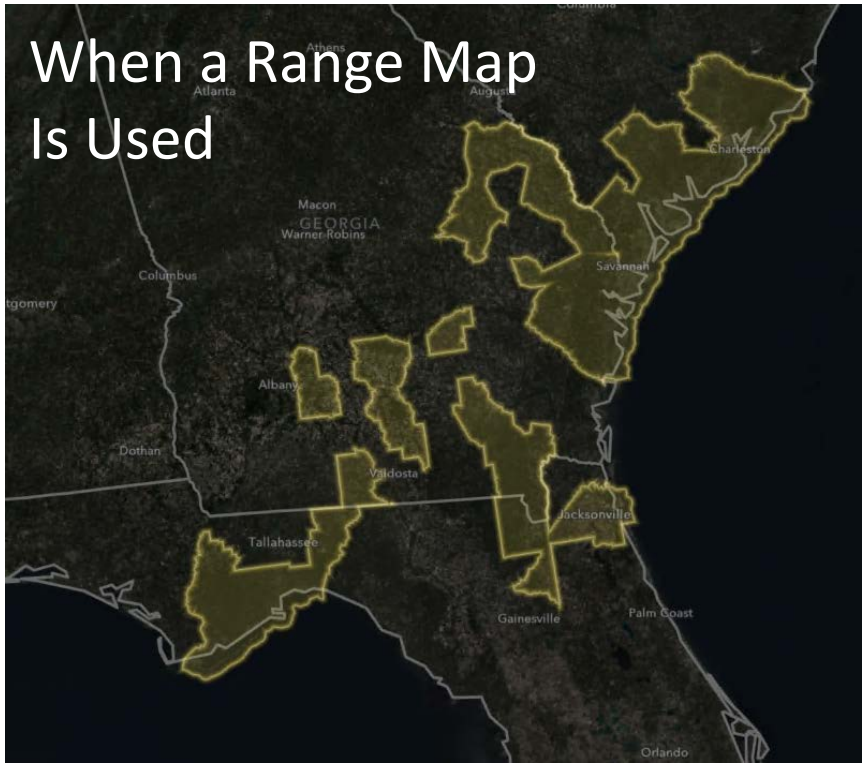
- Pima County and Lower Colorado River
  - Goals of plan well defined
  - Plans are multi-species, multi-habitat, multi-agency, and multi-scale
  - Include any species or habitats that are imperiled (not just species at risk)
  - Include land acquisition and mitigation
  - Balance the use of the land and water resources with the conservation of native species and their habitats



Improving Distribution Data for At-Risk Species



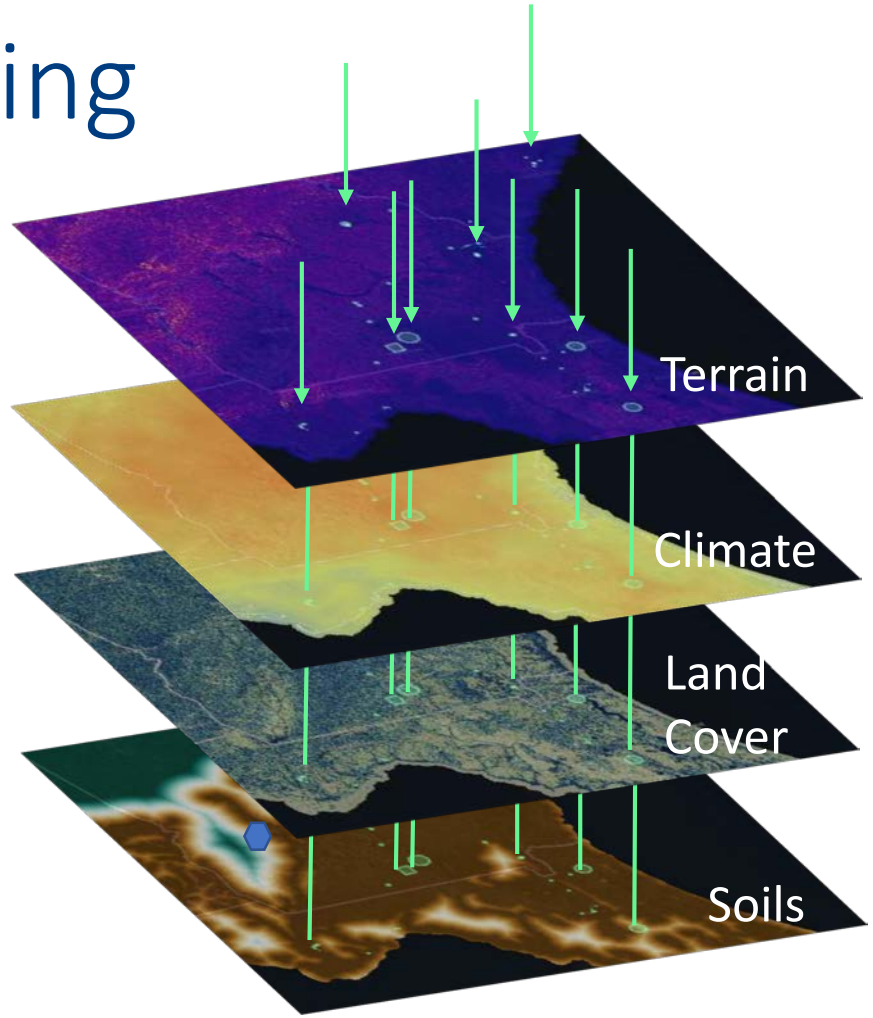
- Underpredicts occupied area
- Overpredicts unoccupied area
- Accuracy depends on intensity & distribution of sampling effort



- Overpredicts occupied area
- Underpredicts unoccupied area
- Can be difficult to replicate; often subjective

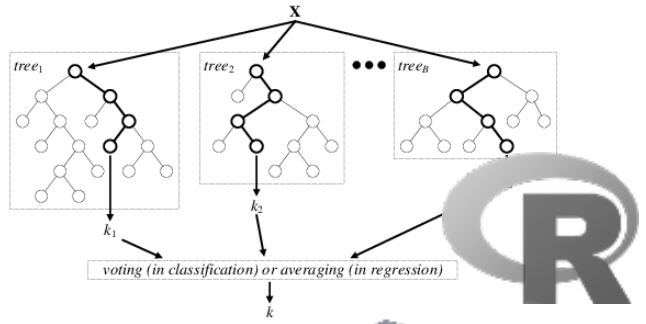
Building Better Distribution Data with Predictive Modeling

Network Training Data



Environmental Predictor Library

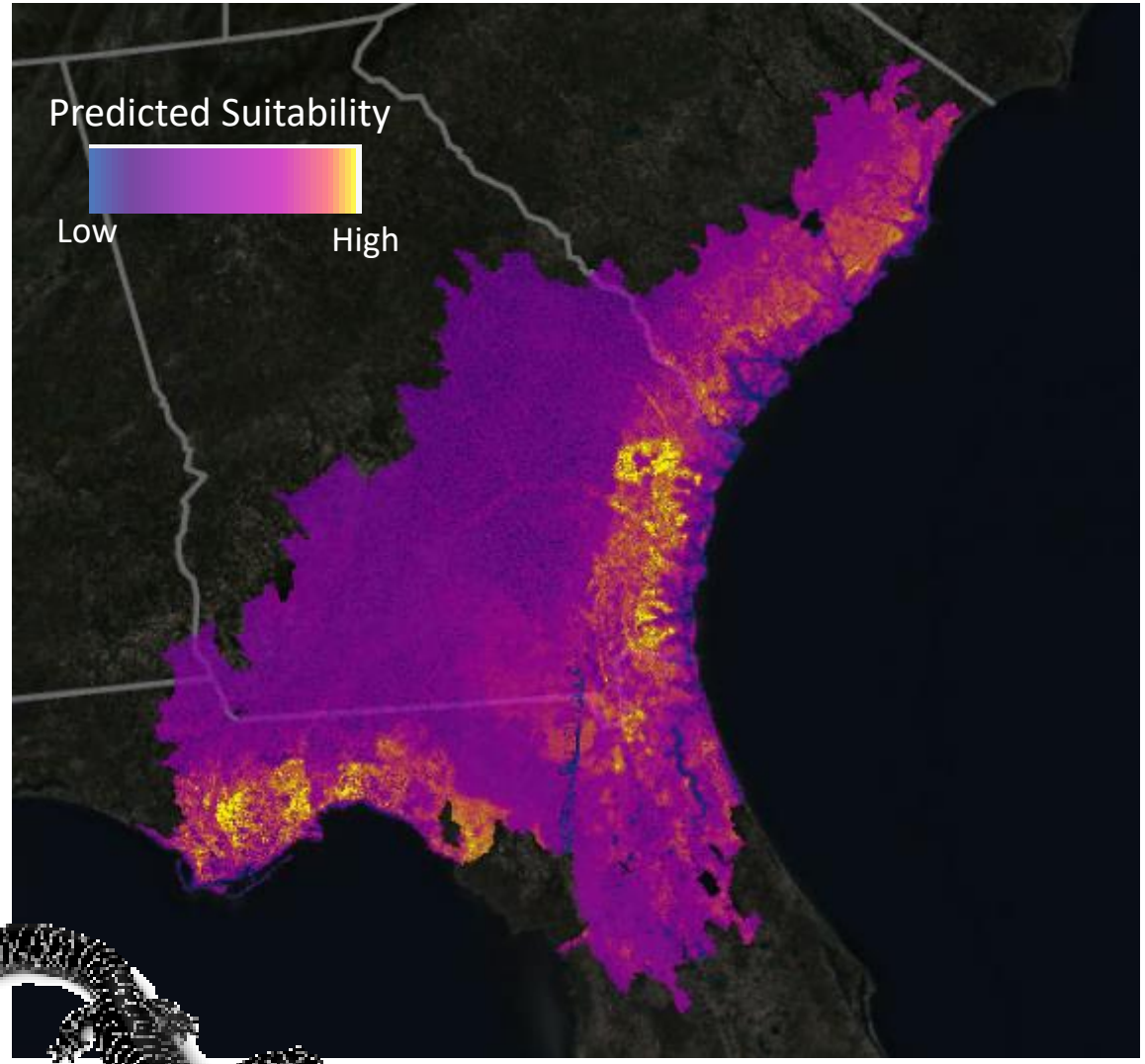
Microsoft Azure

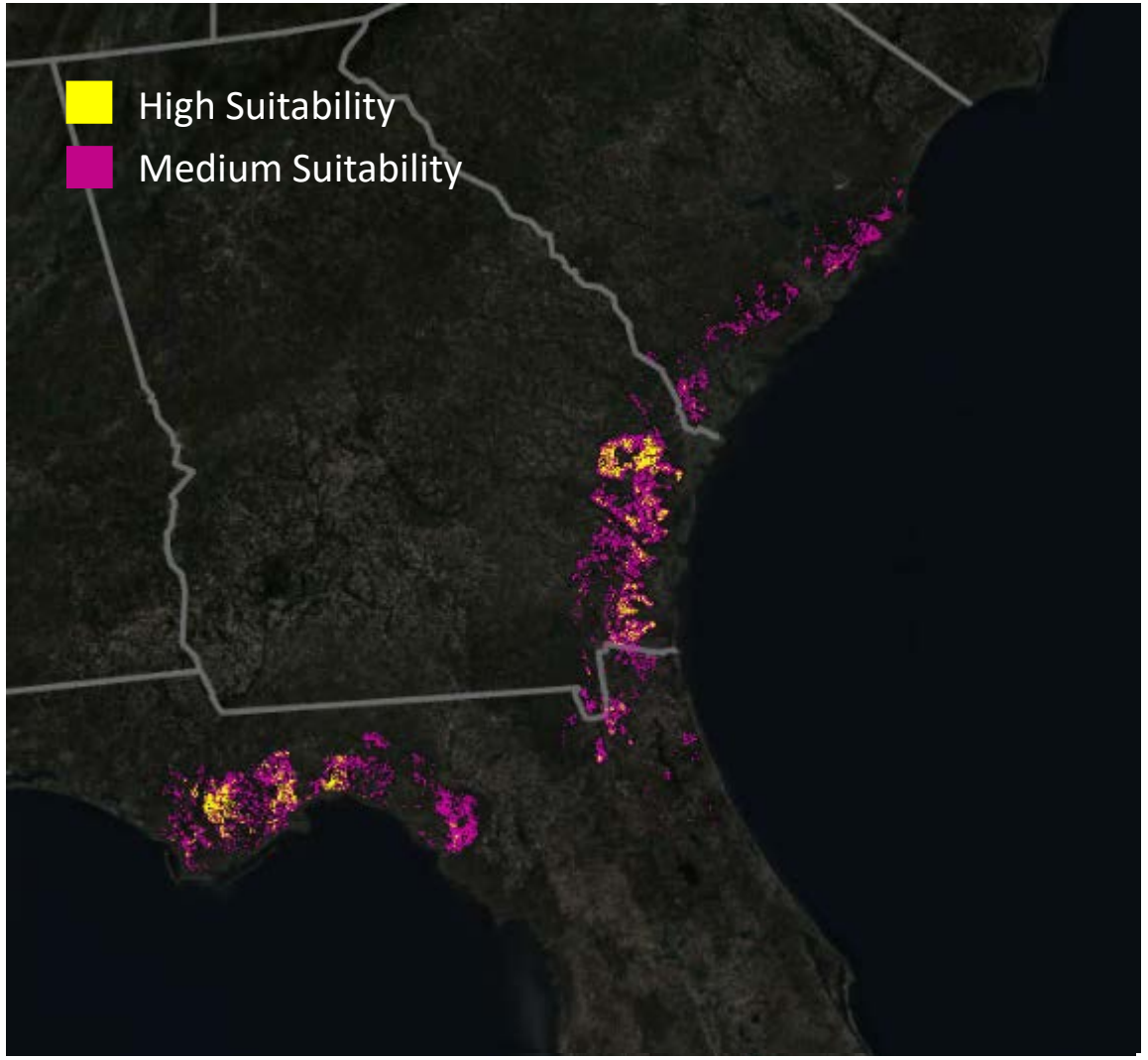


ArcGIS Online

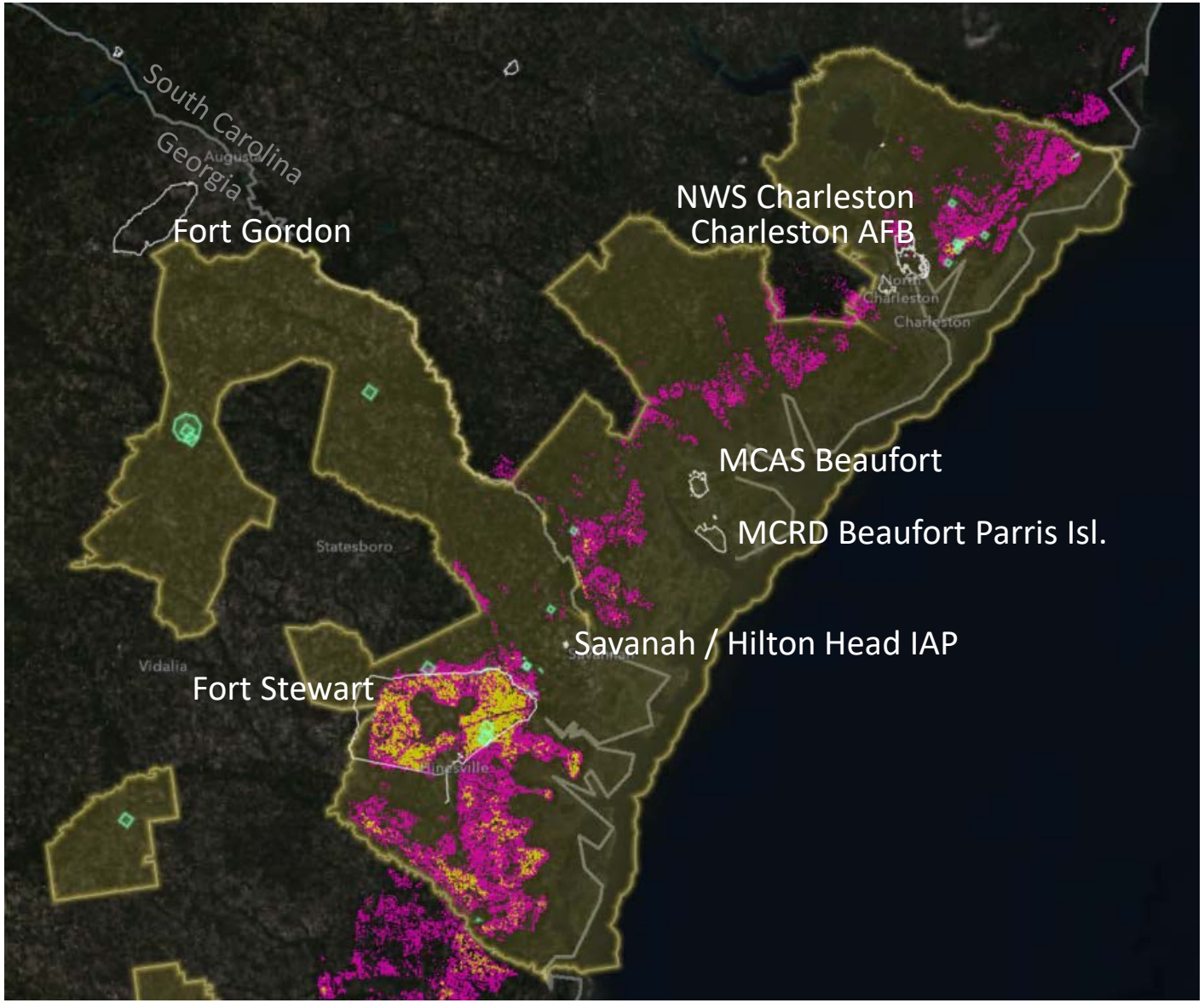
Machine Learning

Results


Predicted Suitability
Low
High


High Suitability
Medium Suitability

Implications for Military Installations on the Southeast Coastal Plain



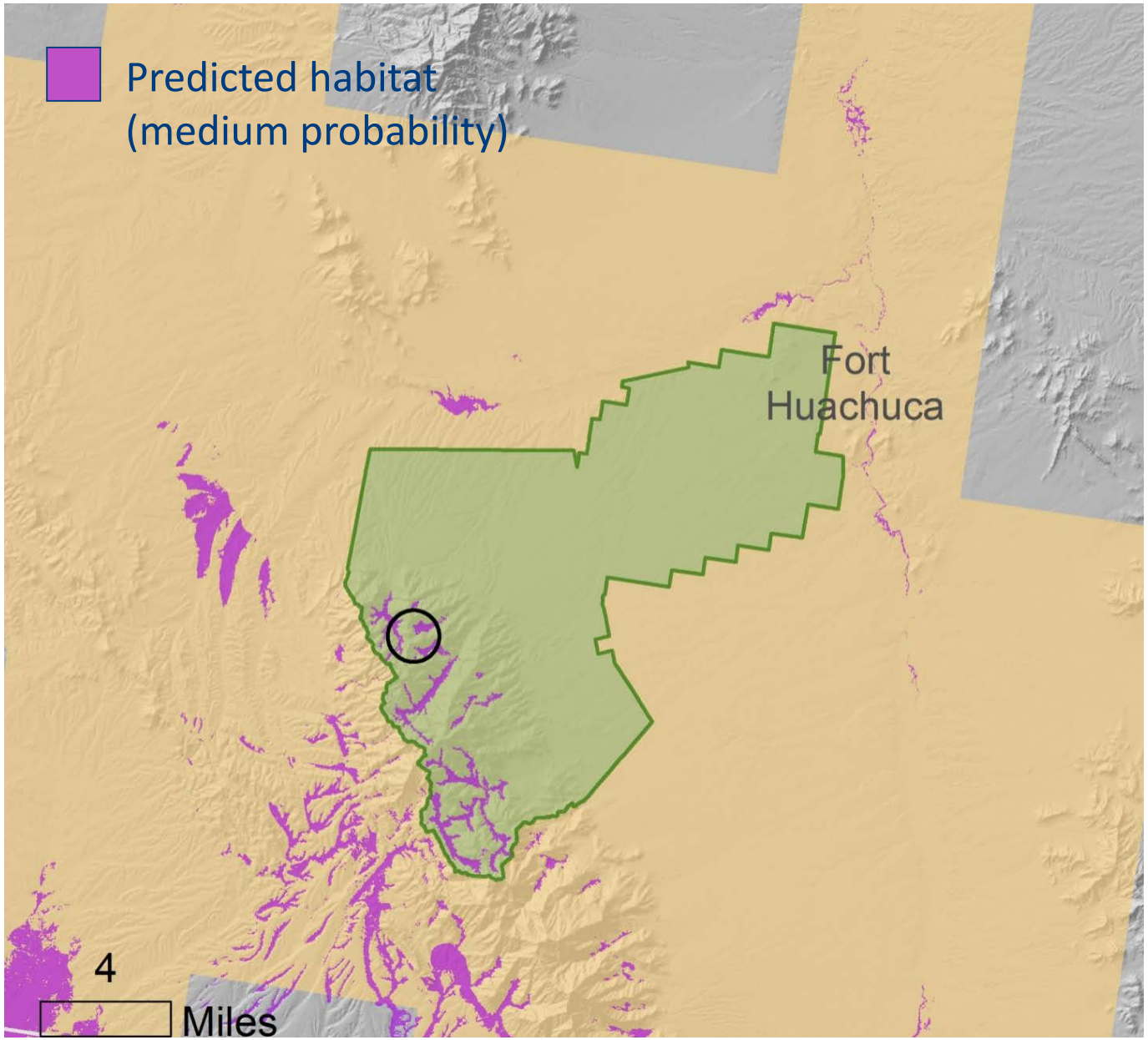
Frosted Flatwood Salamander
listed Threatened

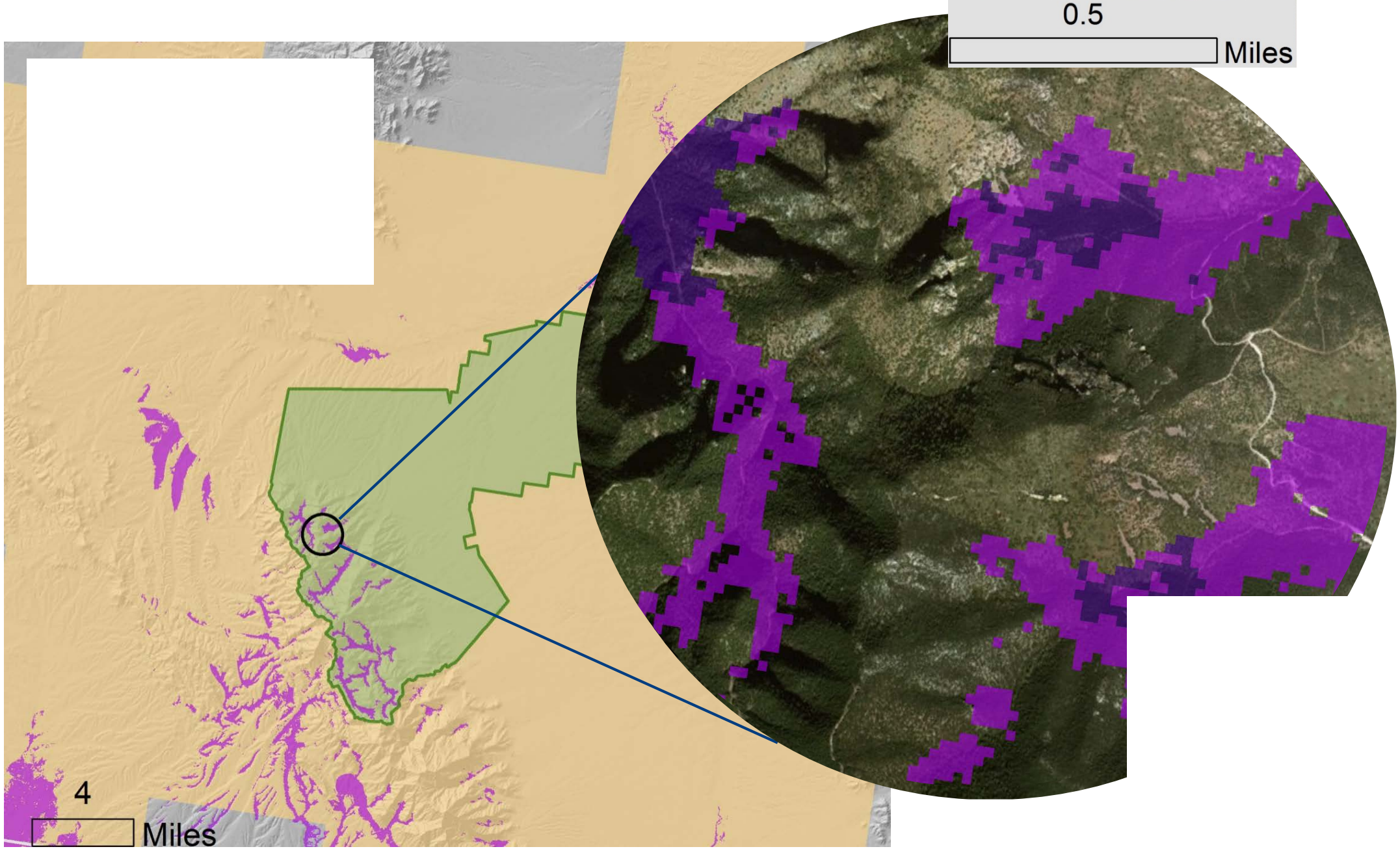
Modeling to Refine Suitable Habitat

Huachuca Water-Umbel

Lilaeopsis schaffneriana

listed endangered



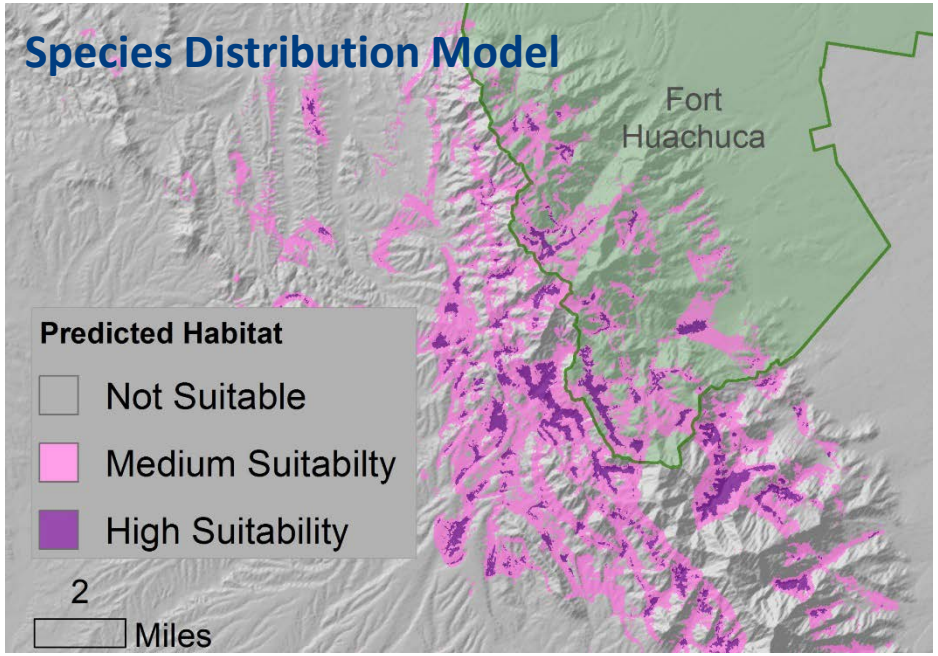

0.5
Miles
4
Miles

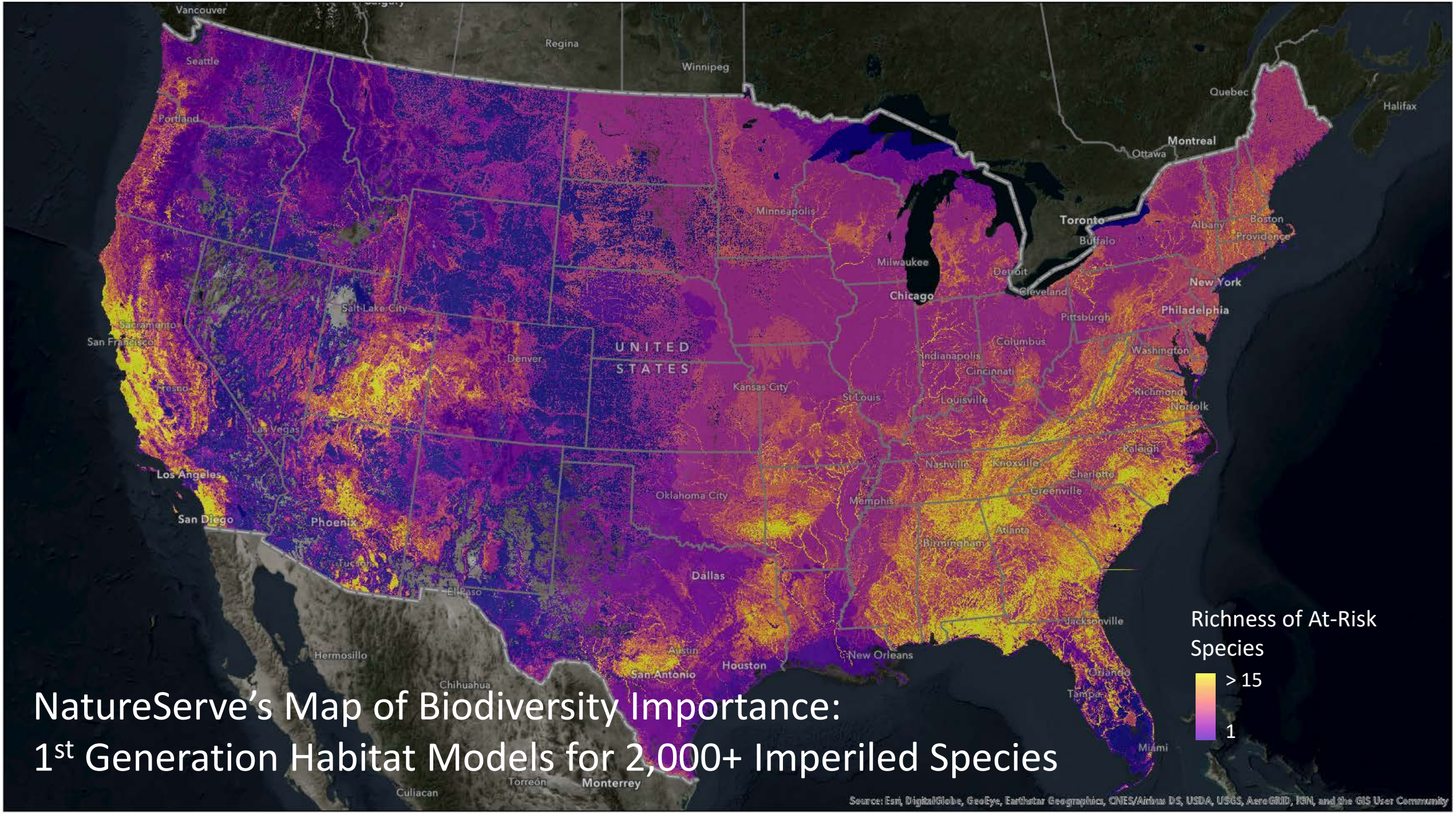
Refining Areas of Potential Conflict

Arizona Ridge-nosed Rattlesnake at Fort Huachuca

Previously:
101 km^2 identified as potential habitat based on elevation requirements.

With Habitat Model: 28 km^2 predicted as suitable habitat. 73% of the previously identified area has *low likelihood of conflict for this species*





NatureServe's Map of Biodiversity Importance:
1st Generation Habitat Models for 2,000+ Imperiled Species

Standards for Distribution Modeling

BioScience

Development and Delivery of Species Distribution Models to Inform Decision-Making

HELEN R. SOFAER, CATHERINE S. JARNEVICH, IAN S. PEARSE, REGAN L. SMYTH, STEPHANIE AUER, GERICKE L. COOK, THOMAS C. EDWARDS JR., GERALD F. GUALA, TIMOTHY G. HOWARD, JEFFREY T. MORISETTE, AND HEALY HAMILTON

Table 1a. Effects of the quantity and quality of species data on model credibility.

	Interpret with caution	Acceptable	Ideal	References
Presence data	Poor or unassessed quality of data (precision, taxonomy).	Spatial error in coordinates < spatial grain of model. Correction of taxonomic	Verified and spatially precise records or weighting of occurrences to place greater	Graham et a et al. 2009
Absence/ background data				
Evaluation data				

Table 1b. Attributes of environmental predictors affecting model credibility.

	Interpret with caution	Acceptable	Ideal	References
Ecological and predictive relevanc				
Spatial and temporal alignmen				

Table 1c. Attributes of the modeling process affecting model credibility.

	Interpret with caution	Acceptable	Ideal	References
Algorithm choice	Models prone to overfitting used for extrapolation, goals of prediction versus explanation confounded.	Selection of algorithm aligned with objectives, including need for actual versus potential distribution.	Selection of algorithm aligned with objectives, including need for actual versus potential distribution. Multiple evaluated.	Qiao et al. 2015
Sensitivity	Single algorithm without evaluation of settings. Ensemble of multiple algorithms based on default settings and without assessment of sensitivity.	Assessment of sensitivity to choice of algorithm(s) and selected settings and input data.	Multiple algorithms with evaluation of model settings and input data, model agreement and uncertainties evaluated via ensemble techniques.	Araújo and New 2007
Statistical rigor	Assumptions not recognized or evaluated.	Assumptions recognized and considered.	Assumptions formally evaluated.	Dormann 2007, Dormann et al. 2013
Performance	Based on single metric, and/or evaluation scores are below generally accepted levels.	Multiple metrics evaluated and evaluation scores are close to generally accepted levels, ecological plausibility evaluated.	Multiple metrics evaluated with scores at or above generally accepted levels, scores connected with implications for intended use considered, ecological plausibility is described	Jarnevich et al. 2015

Other Lessons Learned

- Critical to first review processes/plans already in place
- Present final recommendations to all installations staff
- System/process needed to ensure day-to-day decisions are informed by project recommendations
- After recommendations made, set up plan for future evaluation of their implementation

American Marten (*Martes Americana*)

NatureServe Global Status: Secure (G5)

Photo | Larry Master

Q&A/Discussion