

The Mexican Spotted Owl: Results of a Vulnerability to Climate Change Assessment

Megan M Friggens, Deborah Finch, Karen Bagne, and Sharon Coe

Climate Change Adaptation Workshop April 7-8th, 2010

Flagstaff, AZ



Our partners



Region 3 & WO



Assessment is a questionnaire (25 questions)

1. Each question relates to a trait or criteria that is an important predictor of species response to climate variations
 - User selects from multiple-choice responses
 - Points associated with each response
2. Higher score --> Greater vulnerability, Negative score = resilient
3. 2 types of scores:
 - A. Overall vulnerability (20)
 - B. Categorical score (5)
 - Habitat, Physiology, Phenology, Biotic interactions
4. Currently developed for terrestrial and semi-aquatic vertebrates
5. Assessment is place based
 - AOI, forest, management unit, etc.



RMRS Assessment Tool: Case Studies



Middle Rio Grande, NM



Coronado National Forest, AZ



Barry Goldwater/Fort Huachuca, AZ

Assessing a species

Gather information on projected temperature, precipitation and vegetation for target area

Climate Wizard, Vegetation projections, primary literature, etc.

Gather information for species

Species accounts, primary literature, AnimalDiversity.com and other websources, etc.

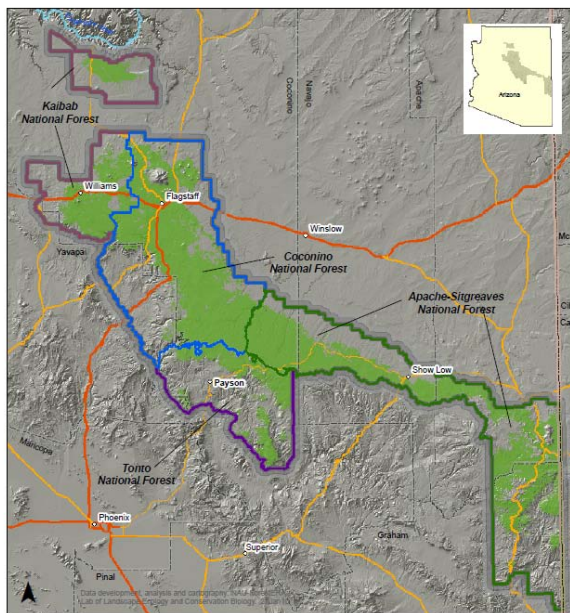
Score species on anticipated fitness consequences of environmental change

Overall score to prioritize species
Categorical scores identify intervention points

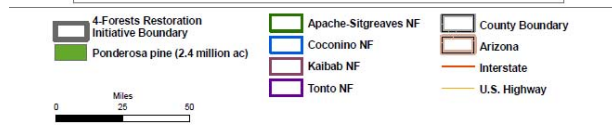
Step 1. Expected consequences of climate changes for wildlife



- Greater exposure to high temps/drought
- Habitat change/shift
- Exposure to fire
- Less water
 - Loss of ephemeral streams
 - Lower peak flows
 - Earlier peak flows (less water in late summer)
- Changes in timing of plant/insect activity
- Disturbance related mortality



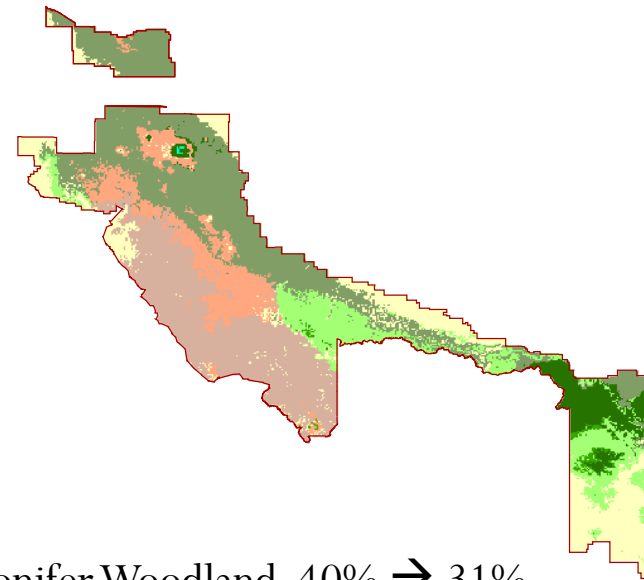
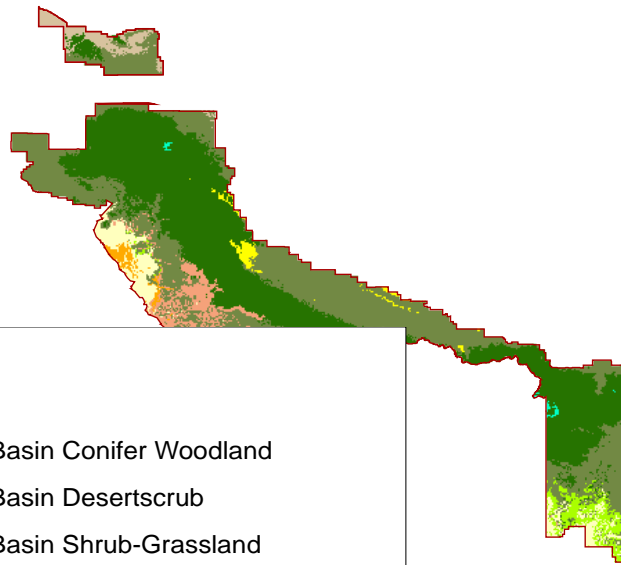
Approximately 2.4 million acres of ponderosa pine-dominated area exists across the 4-Forest Restoration Initiative analysis area.



Vegetation change (Rehfeldt et al., 2006)

Current

Year 2060



Legend

- Great Basin Conifer Woodland
- Great Basin Desertscrub
- Great Basin Shrub-Grassland
- Madrean Evergreen Forest and Woodland
- Plains Grassland
- Rocky Mountain Montane Conifer Forest
- Rocky Mountain Subalpine Conifer Forest
- Semidesert Grassland
- Sonoran Desertscrub
- Southwestern (Arizona) Interior Chaparral

GB Conifer Woodland 40% → 31%

RM Montane Conifer Forest 40% → 6%

SW Chaparral 7% → 22%

GB Desert Scrub & Sonoran Desert Scrub

2% → 17%

1% → 12%

Step II. The Mexican Spotted Owl (*Strix occidentalis lucida*)

- One of three subspecies
- Largest range of the Spotted owls
- “old growth” resident
- Prefers complex forest structure
- Needs large roosts (snags, cliff crevices)
- Population declines due to habitat loss and conversion
- Listed as Threatened in 1993



Step II. Ecology

- Site fidelity
- Reduced capacity to dissipate heat
- Longlived (15 years)
- Nocturnal
- Produces single clutch of 1-3 eggs/year
- Does not migrate
- Preys on small mammals
- Primary predators in the 4 Forest region: Great-Horned owl and Northern Goshawk



III. The Mexican Spotted Owl Scores

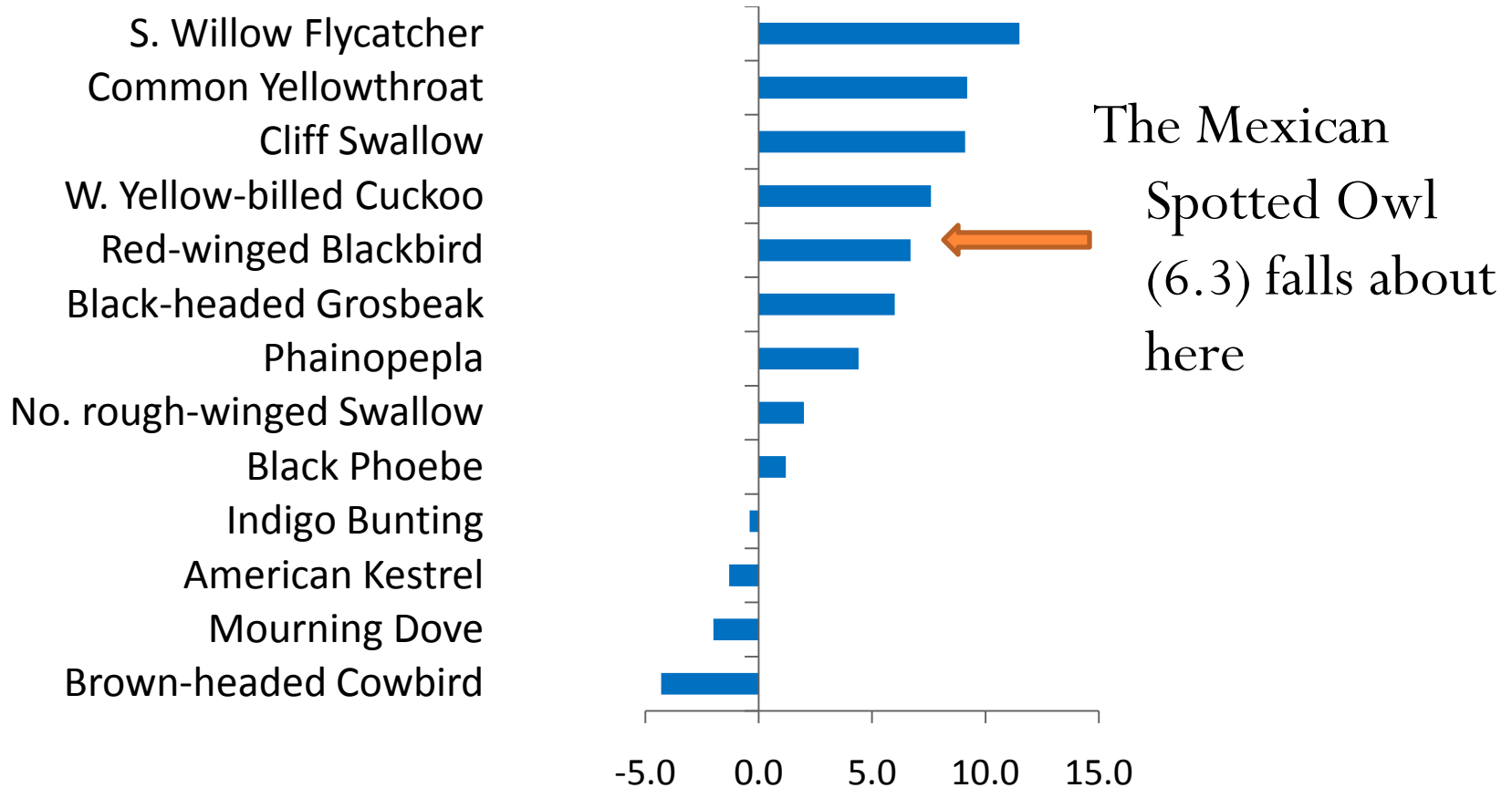
Overall Score: 6.2

Category	Score
Habitat	1.9
Physiology	2.1
Phenology	-0.4
Interactions	1.0

Appears to be moderately sensitive to predicted climate changes and consequences.

How does this compare to other birds?

Bird scores for the Middle Rio Grande Bosque, NM



Categorical score discussion

HABITAT (1.9/5)

- Reduced habitat (coniferous forest)
- Loss of nesting sites/static cliff nests
- But, Good dispersal ability (*fidelity?*)

PHYSIOLOGY (2.1/5)

- Sensitive to heat
- No metabolic savings or food storage
- But, long lived



Categorical score discussion (cont)

PHENOLOGY (0.4/5.0)

- Single reproductive event
- But, Does not migrate, No temp/precip cues

INTERACTIONS (1.0/5.0)

- Starvation a major issue
- Barred Owl could be major threat if it becomes established



Scores of species potentially important to the Mexican Spotted Owl:

Goshawk	
	SCORE
Habitat	1.9
Physiology	2.1
Phenology	0.8
Interactions	0.0
Overall	6.3



Mexican Woodrat	
	SCORE
Habitat	2.0
Physiology	1.4
Phenology	-1.7
Interactions	0.0
Overall	3.9



Great Horned Owl	
	SCORE
Habitat	-0.1
Physiology	0.7
Phenology	-2.1
Interactions	1.0
Overall	0.5

Deer Mouse	
	SCORE
Habitat	0.5
Physiology	1.4
Phenology	-5.0
Interactions	1.0
Overall	0.5

Conclusions



- More research/assessments regarding potential invasion of predators/competitors to FF region.
- More research is needed with respect to the effect of prey fluctuations on owl reproduction and survival
 - Habitat loss projected to occur as a result of warming trends and increased fire is likely to be detrimental to the Mexican Spotted Owl--

Research Needs

HABITAT

- How important is site fidelity?
- Are cool microsites (large trees) a “critical component”?
- Are there measures of habitat quality?

PHYSIOLOGY

- High Juvenile mortality may negate longevity if future conditions lead to even greater mortality.

PHENOLOGY

- Relationship between resource abundance and owl reproductive success?

INTERACTIONS

- Predation influence strong? Diseases? Competition (hybridization) mentioned but not yet an issue for the FF area.



Applying the RMRS vulnerability to climate change tool (V1.0) to the Mexican Spotted Owl (*Strix occidentalis lucida*)

- ❖ The Mexican Spotted Owl is an “old growth” resident that prefers complex forest structure & requires large roosts (snags, cliff crevices).
- ❖ We use the RMRS assessment to identify overall sensitivity to climate related changes to habitat and weather events, as well as identify areas of critical sensitivities for the Mexican Spotted Owl.

Overall Score: 6.2

Category	Score
Habitat	1.9/5
Physiology	2.1/5
Phenology	-0.4 /5
Interactions	1.0/5

This species is moderately sensitive to predicted climate changes and consequences.

- ❖ Starvation is a major issue for this owl. Though difficult to predict at this time, the potential limiting nature of this sensitivity warrants further research and careful monitoring of prey populations and prey-owl interactions.
- ❖ Another limiting variable is the presence of suitable foraging areas and roost sites. Habitat loss projected to occur as a result of warming trends and increased fire is likely to be detrimental to the Mexican Spotted Owl.