Endangered Species Recovery Metrics

Measuring changes in recovery status for better conservation decisions

DOD Natural Resources Program
December 17, 2020

This project was supported by DoD Legacy Award NR-19-003

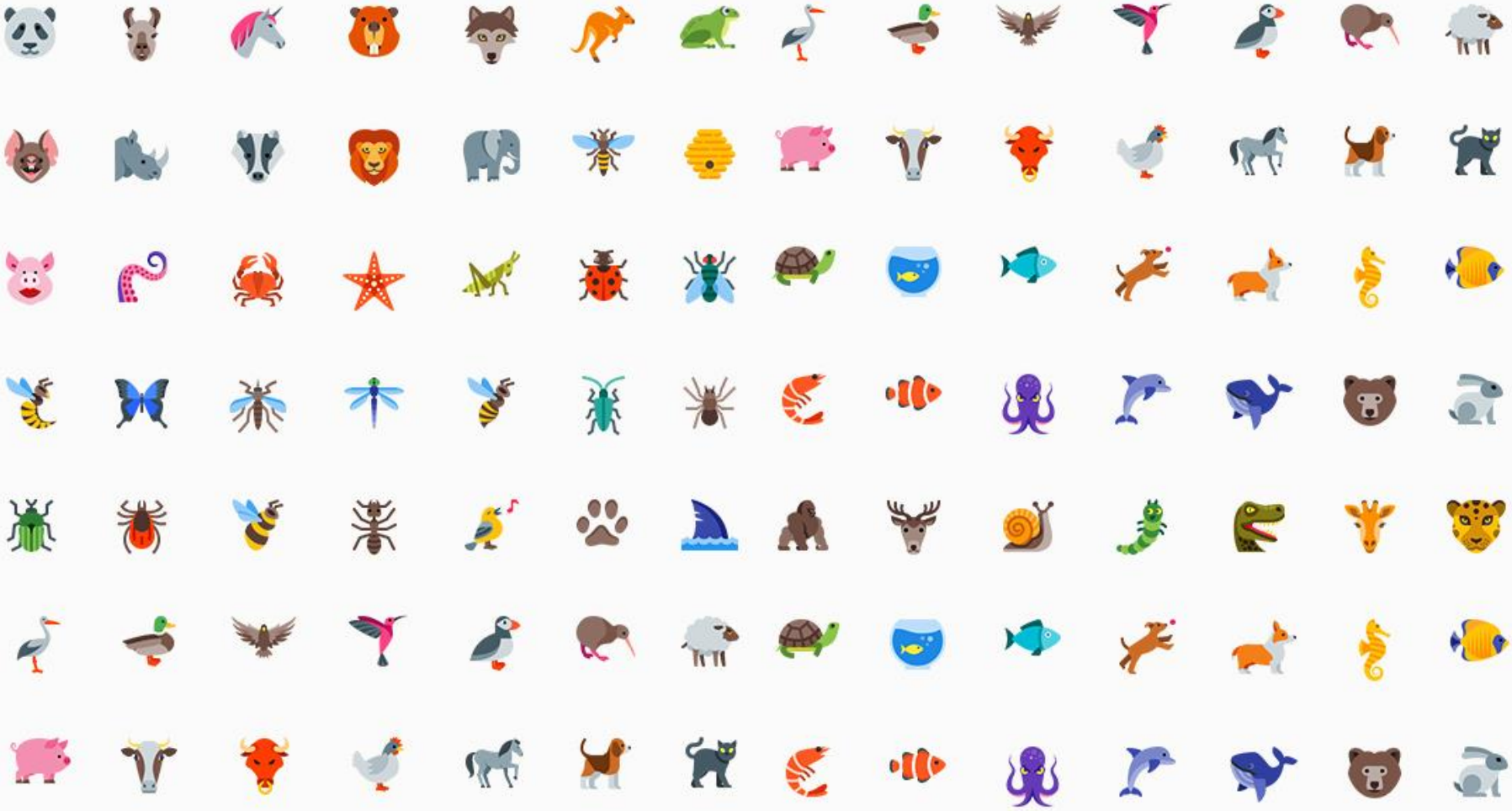
Jake Li

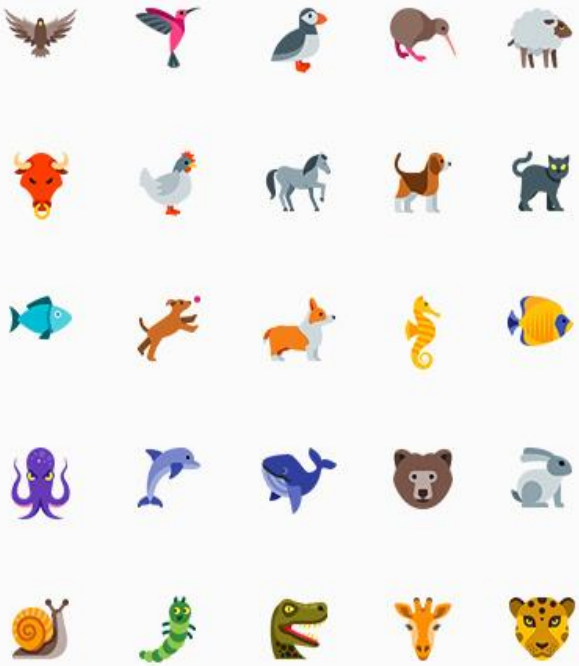
Director for Biodiversity | Environmental Policy Innovation Center
Washington, D.C.

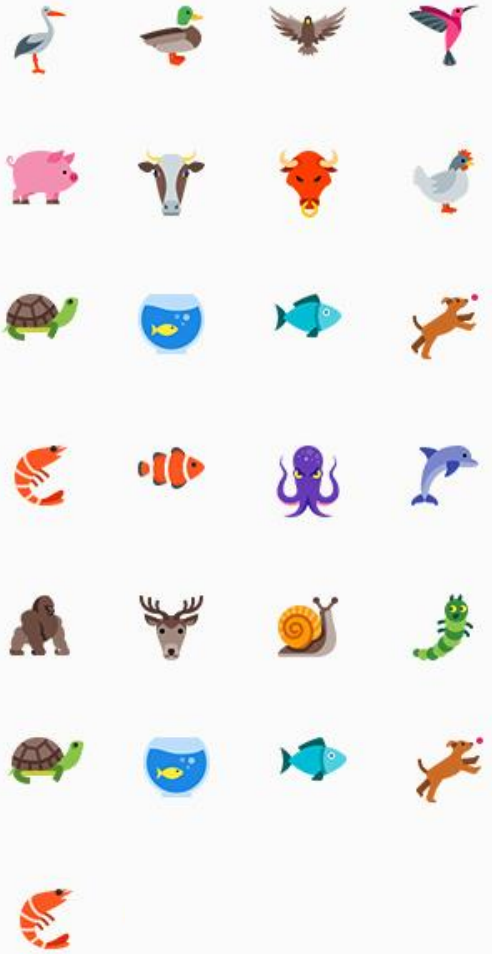
Jake@policyinnovation.org

ENVIRONMENTAL POLICY INNOVATION CENTER

What's your overall species recovery progress?

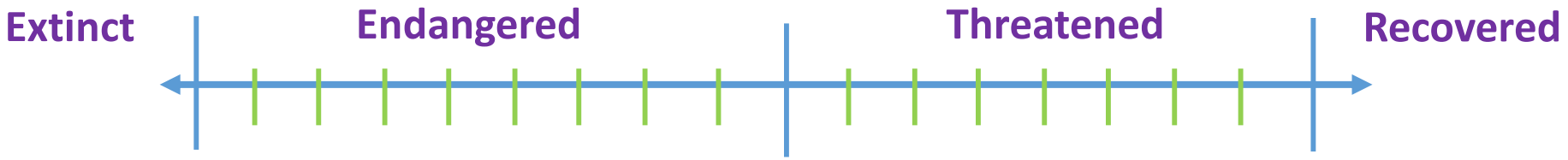






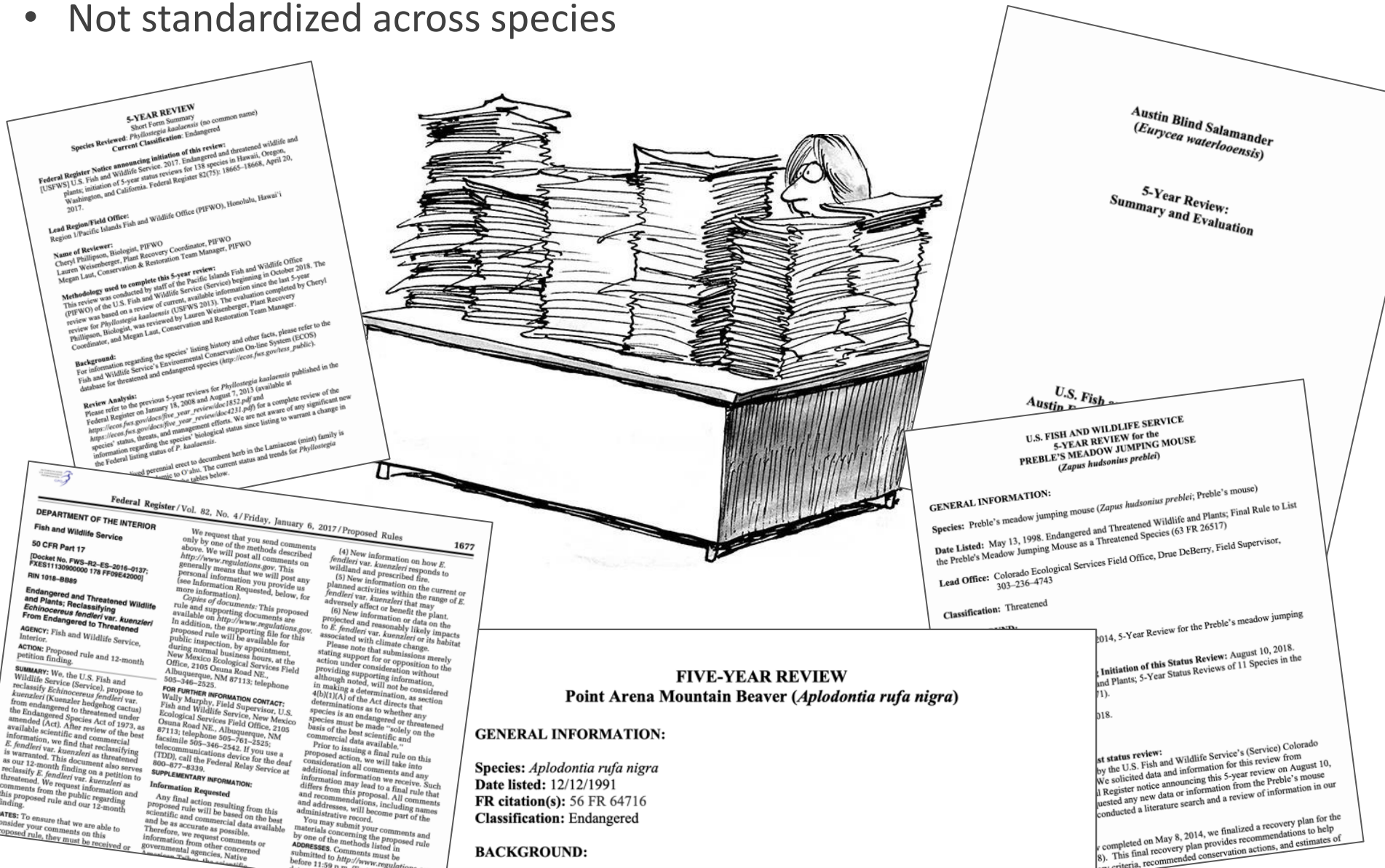
Option 1: Number of ESA Reclassifications

- Too coarse – recovery status doesn't change enough to trigger reclassification.
- Can't capture incremental but meaningful progress.



Option 2: Read 5-Year Reviews

- Infeasible across many species
- Not standardized across species



5-YEAR REVIEW
Short Form Summary
Species Reviewed: *Phyllostegia kaalaensis* (no common name)
Current Classification: Endangered

Federal Register Notice announcing initiation of this review:
[USFWS] U.S. Fish and Wildlife Service. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Lead Region/Field Office:
Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai'i

Name of Reviewer:
Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:
This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2018. The review was based on a review of current, available information since the last 5-year review for *Phyllostegia kaalaensis* (USFWS 2013). The evaluation completed by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

Background:
For information regarding the species' listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (*http://ecos.fws.gov/tess_public*).

Review Analysis:
Please refer to the previous 5-year reviews for *Phyllostegia kaalaensis* published in the Federal Register on January 18, 2008 and August 7, 2013 (available at *https://ecos.fws.gov/docs/five_year_review/doc1852.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4231.pdf*) for a complete review of the species' status, threats, and management efforts. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *P. kaalaensis*.

...lived perennial erect to decumbent herb in the Lamiaceae (mint) family is ...emic to O'ahu. The current status and trends for *Phyllostegia* ...tables below.

Austin Blind Salamander
(*Eurycea waterlooensis*)

5-Year Review:
Summary and Evaluation

U.S. Fish ...
Austin ...

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW for the
PREBLE'S MEADOW JUMPING MOUSE
(*Zapus hudsonius preblei*)

GENERAL INFORMATION:

Species: Preble's meadow jumping mouse (*Zapus hudsonius preblei*; Preble's mouse)

Date Listed: May 13, 1998, Endangered and Threatened Wildlife and Plants; Final Rule to List the Preble's Meadow Jumping Mouse as a Threatened Species (63 FR 26517)

Lead Office: Colorado Ecological Services Field Office, Drue DeBerry, Field Supervisor, 303–236–4743

Classification: Threatened

...014, 5-Year Review for the Preble's meadow jumping

...Initiation of this Status Review: August 10, 2018.
...nd Plants; 5-Year Status Reviews of 11 Species in the
...71).

...018.

...st status review:
...by the U.S. Fish and Wildlife Service's (Service) Colorado
...We solicited data and information for this review from
...l Register notice announcing this 5-year review on August 10,
...uested any new data or information from the Preble's mouse
...conducted a literature search and a review of information in our

...completed on May 8, 2014, we finalized a recovery plan for the
...8). This final recovery plan provides recommendations to help
...criteria, recommended conservation actions, and estimates of

Federal Register / Vol. 82, No. 4 / Friday, January 6, 2017 / Proposed Rules 1677

DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
50 CFR Part 17
[Docket No. FWS–R2–ES–2016–0137; FXES11130900000 178 FF09E42000]
RIN 1018–BB89

Endangered and Threatened Wildlife and Plants; Reclassifying *Echinocereus fendleri* var. *kuenzleri* From Endangered to Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule and 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to reclassify *Echinocereus fendleri* var. *kuenzleri* (Kuenzler hedgehog cactus) from endangered to threatened under the Endangered Species Act of 1973, as amended (Act). After review of the best available scientific and commercial information, we find that reclassifying *E. fendleri* var. *kuenzleri* as threatened is warranted. This document also serves as our 12-month finding on a petition to reclassify *E. fendleri* var. *kuenzleri* as threatened. We request information and comments from the public regarding this proposed rule and our 12-month finding.

DATES: To ensure that we are able to consider your comments on this proposed rule, they must be received or

We request that you send comments only by one of the methods described above. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see Information Requested, below, for more information).

Copies of documents: This proposed rule and supporting documents are available on *http://www.regulations.gov*. In addition, the supporting file for this proposed rule will be available for public inspection, by appointment, during normal business hours, at the New Mexico Ecological Services Field Office, 2105 Osuna Road NE., Albuquerque, NM 87113; telephone 505–346–2525.

FOR FURTHER INFORMATION CONTACT: Wally Murphy, Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna Road NE., Albuquerque, NM 87113; telephone 505–761–2525; facsimile 505–346–2542. If you use a telecommunications device for the deaf (TDD), call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Information Requested

Any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate as possible. Therefore, we request comments or information from other concerned governmental agencies, Native

(4) New information on how *E. fendleri* var. *kuenzleri* responds to wildland and prescribed fire.

(5) New information on the current or planned activities within the range of *E. fendleri* var. *kuenzleri* that may adversely affect or benefit the plant.

(6) New information or data on the projected and reasonably likely impacts to *E. fendleri* var. *kuenzleri* or its habitat associated with climate change.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made "solely on the basis of the best scientific and commercial data available."

Prior to issuing a final rule on this proposed action, we will take into consideration all comments and any additional information we receive. Such information may lead to a final rule that differs from this proposal. All comments and recommendations, including names and addresses, will become part of the administrative record.

You may submit your comments and materials concerning the proposed rule by one of the methods listed in **ADDRESSES**. Comments must be submitted to *http://www.regulations...* before 11:59 p.m.

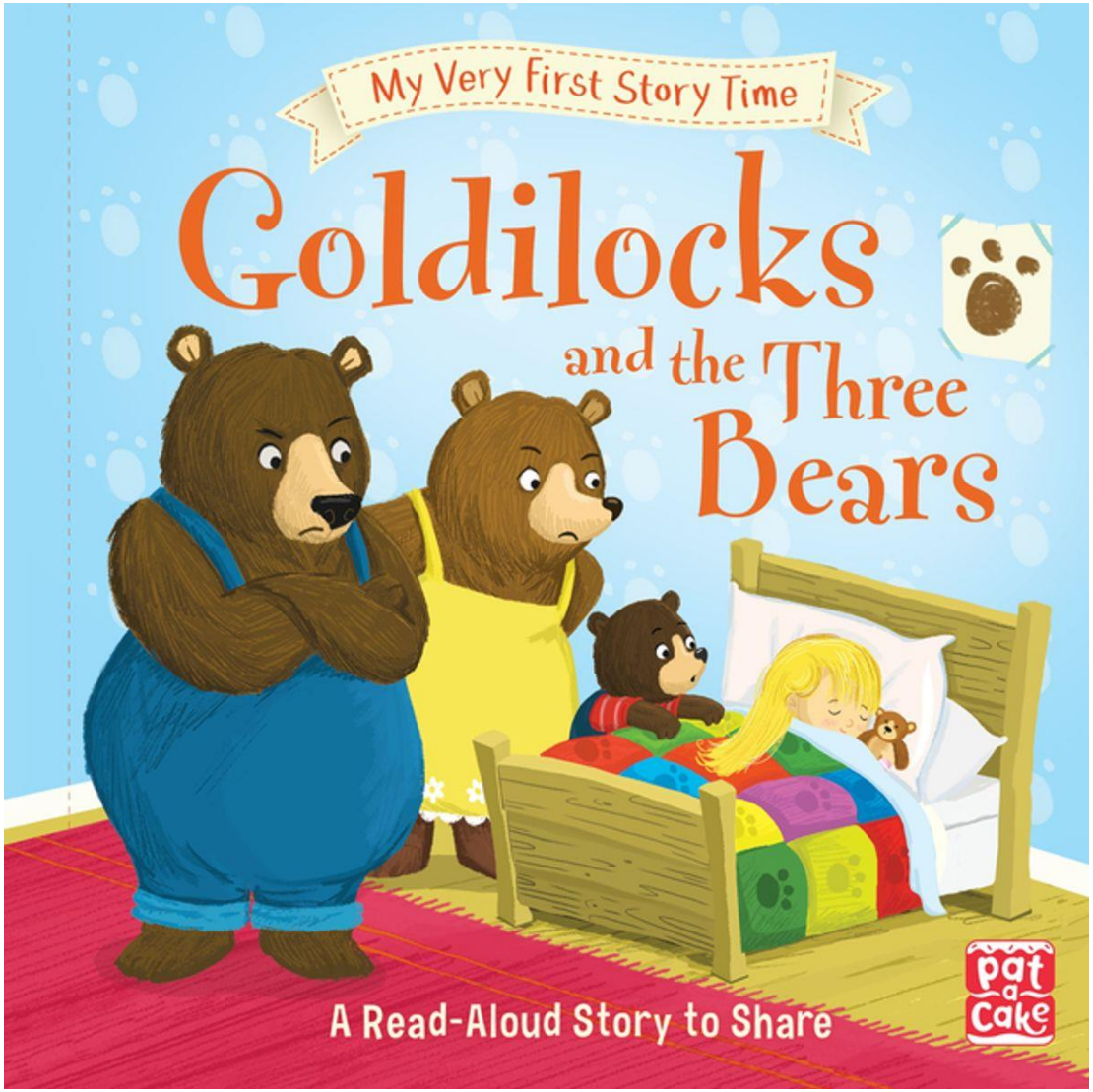
FIVE-YEAR REVIEW
Point Arena Mountain Beaver (*Aplodontia rufa nigra*)

GENERAL INFORMATION:

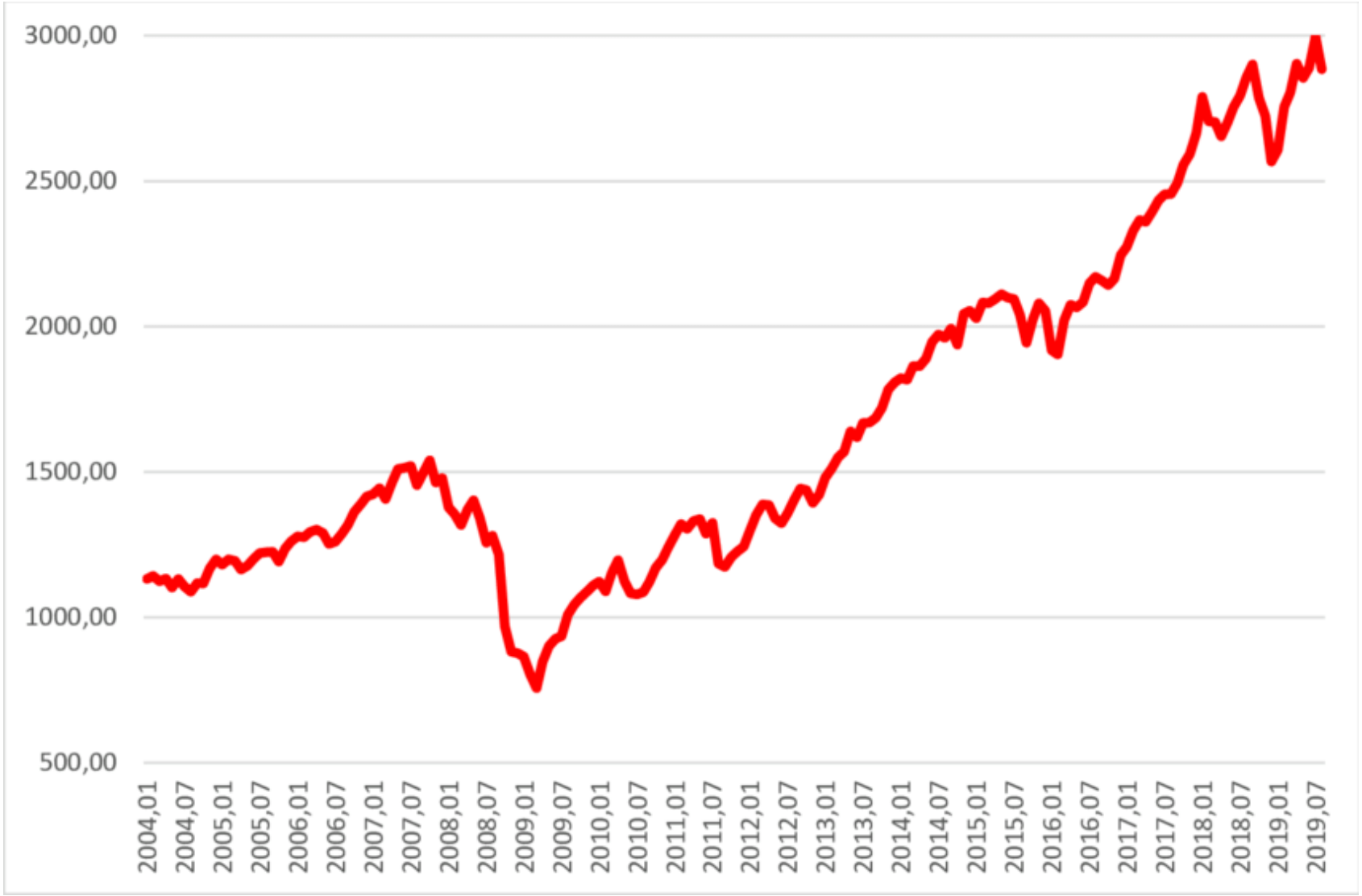
Species: *Aplodontia rufa nigra*
Date listed: 12/12/1991
FR citation(s): 56 FR 64716
Classification: Endangered

BACKGROUND:

Goldilocks Problem



US Stock Index



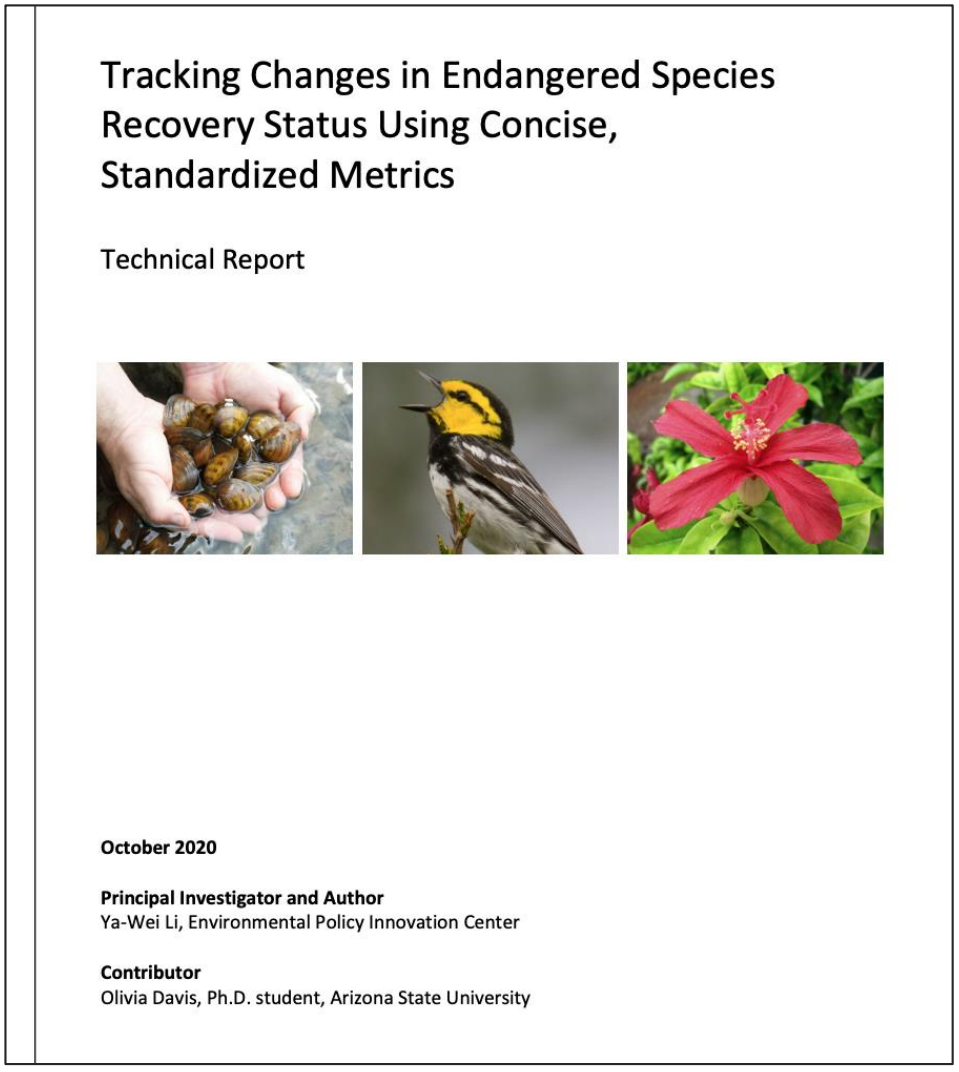
Overview of Presentation

- Summarize project goal
- Summarize results of testing recovery metrics
- Next steps and Q&A



Full Report and Data

http://policyinnovation.org/recoverymetrics



Tracking Changes in Endangered Species Recovery Status Using Concise, Standardized Metrics

Technical Report

October 2020

Principal Investigator and Author
Ya-Wei Li, Environmental Policy Innovation Center

Contributor
Olivia Davis, Ph.D. student, Arizona State University

Project Goal and Benefits

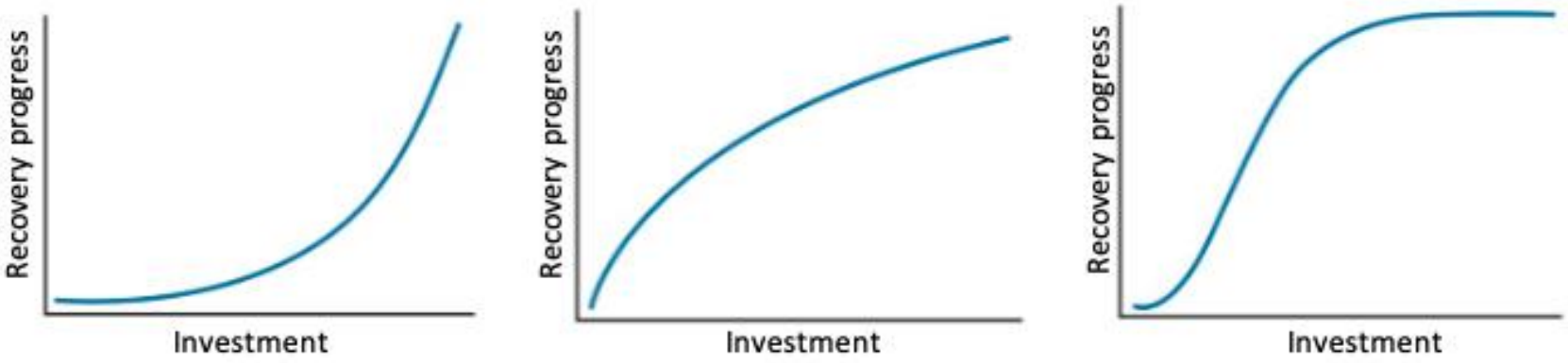
- Develop a method that summarizes a species' recovery status in a concise and standardized manner.

- Benefits
  - *Track trends and patterns in recovery status*

  - *Demonstrate benefits of recovery funding*

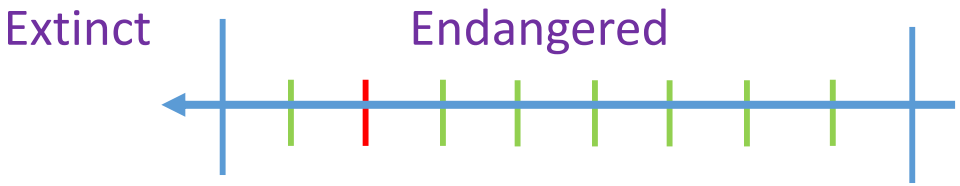
Project Goal and Benefits

- *Optimizing funding allocation based on recovery progress*



- *Enable more flexible ESA regulatory approaches for improving species*

- *Alert system for "endangered" species*



Project Goal and Benefits

- Criteria for evaluating metrics
  - *Are metrics clear and easy for FWS to apply?*
  - *Do metrics generate consistent results?*
  - *Do metrics adequately summarize species recovery progress?*
- Applied as part of 5-year reviews. Instructions provided.




Recovery Metrics

- **Past change** in 3Rs (resiliency, redundancy, representation) since prior status review
- **Future change** in 3Rs
- **Current levels** of 3Rs
- Change in **threats** since prior status review
- Status of **conservation measures**
- Progress of **recovery planning** efforts
- **Confidence level** for each

Past and Future Changes in 3Rs

			Score					
Category	**Recovery Progress Criteria**		**Decline**	**Some Decline**	**No Change**	**Some Improvement**	**Improvement**	**Unknown**
Change Since Prior Status Review	Resiliency (protection against stocastic fluctuations)	Demographic factors (abundance, productivity, population growth rate, survival, etc.) considering the threats acting on these factors.		✓				
		Habitat factors (habitat quality, availability, connectivity, etc.) considering the threats acting on these factors.			✓			
	Redundancy (protection against catastrophic events)	Number and distribution of populations, considering the threats acting on these factors.					✓	
	Representation (ability to adapt to changing environmental conditions)	Adaptive capacity (genetic, geographic, ecological, and life-history diversity, etc.), considering the threats acting on these factors.						✓
Future Condition	Resiliency (protection against stocastic fluctuations)	Demographic factors (abundance, productivity, population growth rate, survival, etc.), considering the threats acting on these factors.			✓			
		Habitat factors (habitat quality, availability, connectivity, etc.), considering the threats acting on these factors.				✓		
	Redundancy (protection against catastrophic events)	Number and distribution of populations, considering the threats acting on these factors.			✓			
	Representation (ability to adapt to changing environmental conditions)	Adaptive capacity (genetic, geographic, ecological, and life-history diversity, etc.), considering the threats acting on these factors.	✓					

Current Levels of 3Rs

			Score				
Category	**Recovery Progress Criteria**		**High**	**Medium**	**Low**	**Very Low / None**	**Unknown**
Current condition	Resiliency (protection against stocastic fluctuations)	Demographic factors (abundance, productivity, population growth rate, survival, etc.) considering the threats acting on these factors.		✓			
		Habitat factors (habitat quality, availability, connectivity, etc.) considering the threats acting on these factors.			✓		
	Redundancy (protection against catastrophic events)	Number and distribution of populations, considering the threats acting on these factors.	✓				
	(ability to adapt to changing environmental conditions)	Adaptive capacity (genetic, geographic, ecological, and life-history diversity, etc.), considering the threats acting on these factors.				✓	

Changes in Threats

		Primary Threat(s)	All Other Threat(s)
Threats (since prior status review)	Eliminated or fully controlled		
	Decreased		✓
	No change		
	Increased	✓	
	Impossible to control		
	Unknown or not applicable		
	Confidence (Low, medium, high)		

Conservation Measures

		Score	Confidence (Low, Medium, High)
Conservation Measures	Conservation efforts are not being implemented (other than the protections of section 7 & 9 of the ESA)		
	Conservation efforts are being implemented but do not yet demonstrate effectiveness in reducing or removing a species' primary threat or are unable to do so.		
	Conservation efforts are being implemented and are effective at a small scale, but are not yet feasibly implemented at a scale needed to advance recovery	✓	High
	Conservation efforts are effective and implemented at a scale that advances recovery, but no assurances are in place to ensure their continuation		
	Conservation efforts are effective, implemented at a scale that advances recovery, and assurances are in place to continue implementation if the ESA's protections were removed		

Testing Metrics – 50 ESA Species

- Lead biologist for 49 of 50 species
- 16 biologists from HQ/RO and 1 solicitor
- Every species scored ≥ twice

ILLINOIS NATURAL HISTORY SURVEY
PRAIRIE RESEARCH INSTITUTE

- Every species scored 1 – 4 times
- All scorers are taxa experts

ASU School of Life Sciences
Arizona State University

- Every species scored 1 – 3 times
- 2 PhD students, 3 undergrads

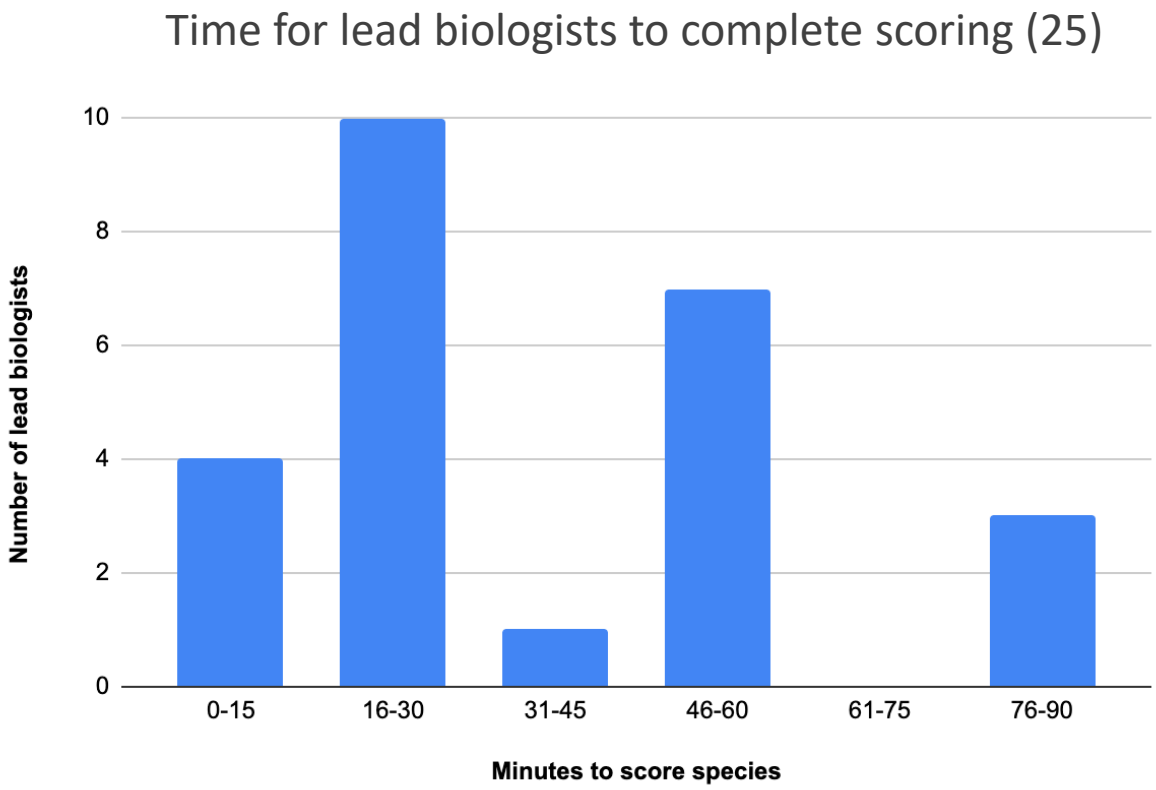
- Every species scored ≥ once
- 3 scientists (2 PhD, 1 MS)

ENVIRONMENTAL POLICY INNOVATION CENTER

- Every species scored once

Clear and Easy to Apply?

- FWS lead biologists generally didn't have difficulty with metrics, but encountered some challenges.
- Most affected by quality of 5-year review.



Consistent Scores?

- Yes, for species with good 5-year reviews. SSAs helped a lot!
- For statistical analysis, 3R scores converted to numeric scale

Score	Numeric equivalent
Decline	-1.0
Some decline	-0.5
No change	0
Some improvement	0.5
Improvement	1.0

* Same numeric scale used in Malcom JW, Webber WM, Li YW. 2016. *A simple, sufficient, and consistent method to score the status of threats and demography of imperiled species*. PeerJ 2016:e2230. Assumption of interval scale.

Consistent Scores?

- How often did participants scores differ from FWS lead biologists scores?

	Difference btw lead biologists and other participants (avg)		
	Same or ± 0.5	**± 1.0**	**± 1.5 – 2.0**
Past change	83%	14%	3%
Future conditions	78%	15%	7%
Mean	**80%**	**15%**	**5%**

Consistent Scores?

- Standard deviation for 49 species (mean) is reasonably narrow

	Std. deviation	Mean score	Median score	Range of scores
Past conditions	0.38 (0.00 – 0.64)	-0.20	-0.24	-0.91 – 0.37
Future conditions	0.43 (0.07 – 0.62)	-0.32	-0.31	-0.93 – 0.21
Mean	0.40	-0.26		

Consistent Scores?

- Situations that make scoring difficult
  - **Data-poor species** (Ring pink mussel, HI species)
  - **Quality and consistency of status reviews**: *
    - Short-form reviews (Preble's jumping mouse)
    - Information available but not included in status review
    - Status review focuses on threats rather than 3Rs (Barton S. sala)
    - Scoring entire species when data focus on individual populations or pops have very different statuses (American burying beetle)
    - Unusual listings (genus-level listing of *Achatinella* snails)

* This isn't necessarily an issue for the accuracy of a lead biologist's scores; it's mostly an issue of whether the scores match the narrative in a status review.

Consistent Scores?

- Overall assessment
  - For many species, general agreement between 3R scores of lead biologists and other participants
  - Distribution of 3R scores is reasonable
  - Performance could be improved:
    - More consistent and comprehensive status reviews
    - Guidance on applying metrics

Confidence Scores

- Very valuable to include – Many participants liked option.

- Several patterns
  - Among 3Rs, representation had the most uncertainty
  - Future 3Rs had more uncertainty than past change in 3Rs
  - Med-high confidence in most threat scores (augments 3Rs)
  - Med-high confidence in most conservation measure scores

- Species with most uncertainty:
  - Sonoran Pronghorn (short-form 5YR)
  - Preble's meadow jumping mouse (short-form 5YR)
  - Winkler Cactus (limited data species)
  - Austin Blind Salamander (cryptic species)
  - Barton Springs Salamander (cryptic species)
  - Howell's Spineflower (short-form 5YR)

Confidence Scores

- Many species scored with moderate to high certainty for 3Rs:
  - Polar bear (no SSA)
  - Akoko (no SSA but really good 5YR)
  - Furbish lousewort (SSA)
  - American burying beetle (SSA)
  - And many others…

Wrapping Up

- Rigorous testing of draft metrics involving >75 participants and 50 species.
- Received ample quantitative results and qualitative feedback.
- Three criteria for adoption:
  - Ease of application – Yes.
  - Consistency of scores – Yes, with adequate 5YRs.
  - Comprehensive of scores – Yes.
- Major opportunity to increase usefulness of upcoming 5YRs and establish baseline for future recovery tracking.
- Separate opportunity to improve 5YRs and SSAs.

Acknowledgments and Q&A

- Dept of Defense
- FWS HQ Recovery Branch and Regional Offices
- Universities and NGOs
- Get full report here:

  http://policyinnovation.org/recoverymetrics

This project was supported by DoD Legacy Award NR-19-003