



Overcoming Challenges to the Recovery of Declining Amphibian Populations in the United States

DoD Natural Resources
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Endangered Species Act

- One of the most important environmental laws ever enacted in the U.S.
- Since enacted, <1% of listed species have become extinct; status of 52% of listed species has stabilized or improved



Recovery Success Stories (under the ESA)

American Alligator
(*Alligator mississippiensis*)
Delisted in 1987



Lake Erie Watersnake
(*Nerodia sipedon insularum*)
delisted in 2011



Concho Watersnake
(*Nerodia paucimaculata*)
Delisted in 2011



Morelet's Crocodile
(*Crocodylus moreletii*)
Delisted in 2012

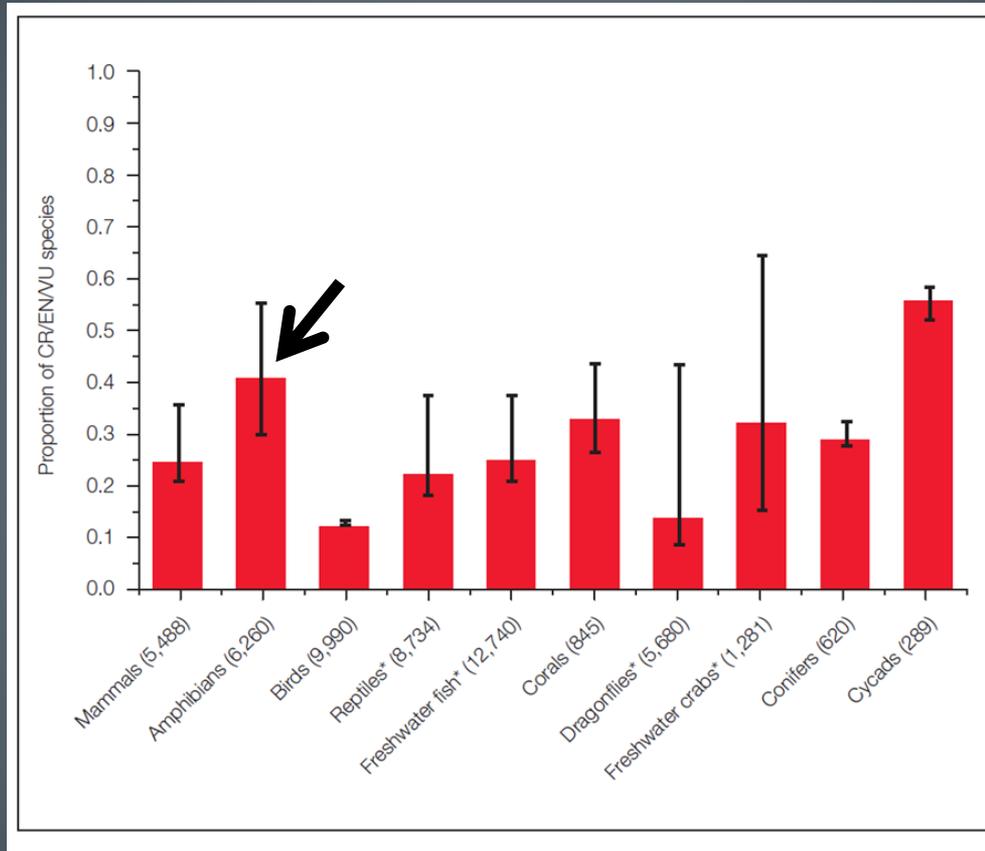


Island Night Lizard
(*Xantusia riversiana*)
Delisted in 2014



Yet, no federally-listed amphibian taxon
has yet to be “recovered”

Amphibians are among the most affected taxa in an on-going biodiversity crisis



Proportion of species threatened with extinction (extrapolated to include Data Deficient species)

Objectives:

1. Explore historical challenges for successful recovery of declining amphibians
2. Examine the current extent of recovery plan development and critical habitat designation for listed species of amphibians
3. Outline strategic actions that could help reduce challenges

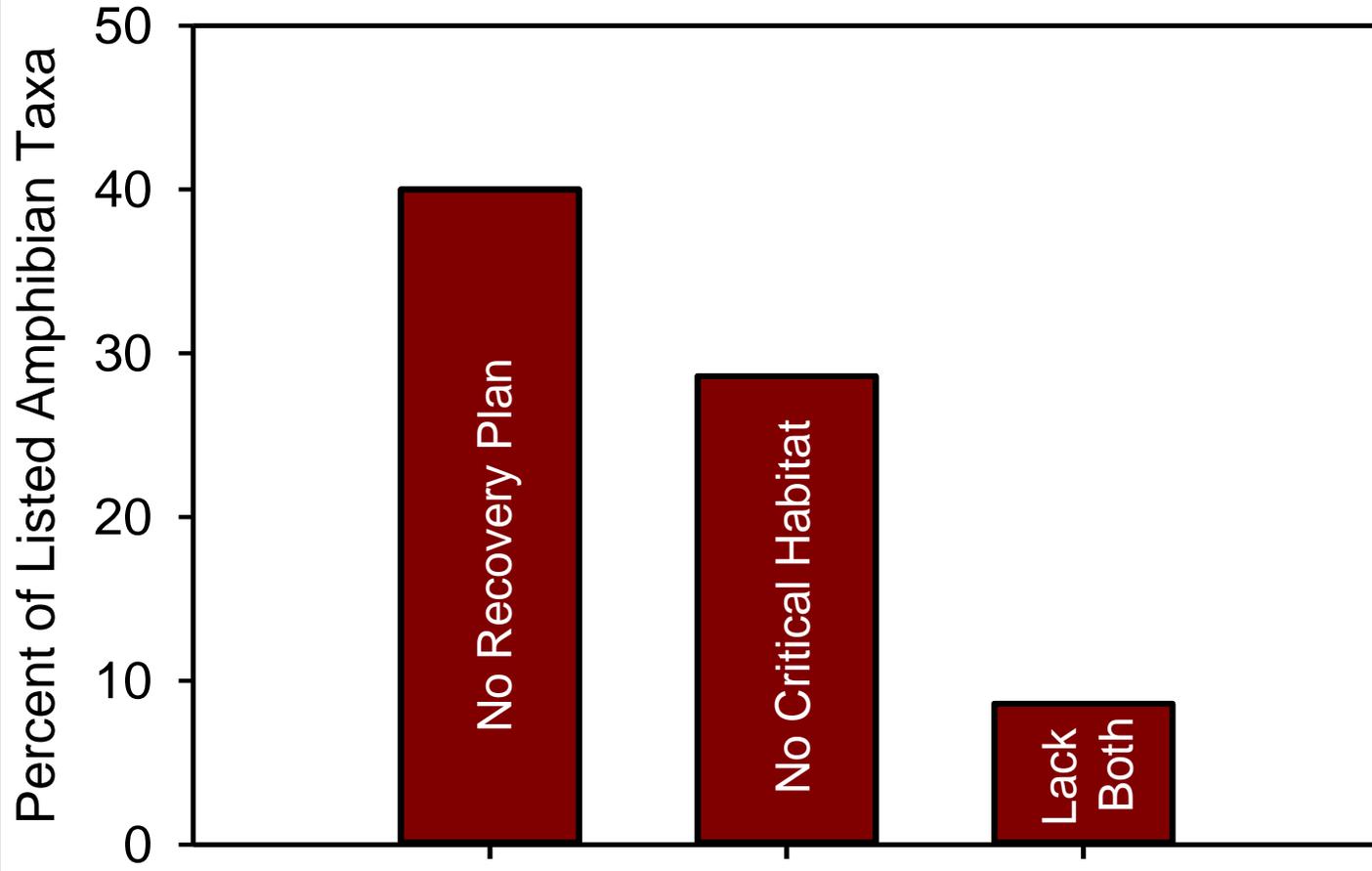
Historical Challenges to Recovery

Delays and biases in:

- Listing
- Development and implementation of recovery plans
- Designation of critical habitat

Recovery plans and critical habitat must exist before they can effectively promote species recovery

- Accessed the USFWS Environmental Conservation Online System
- 35 amphibian “taxa” (including Distinct Population Segments) currently listed as threatened or endangered
- Summarized data on
 - (1) year taxa were listed;
 - (2) existence of recovery plans; and
 - (3) existence of designated critical habitat



Georgetown
salamander,
Threatened



Southern mountain
yellow-legged frog,
Endangered



Yosemite toad,
Threatened



Sierra Nevada yellow-legged
frog, Endangered



Ozark hellbender, Threatened

Salado salamander, Threatened

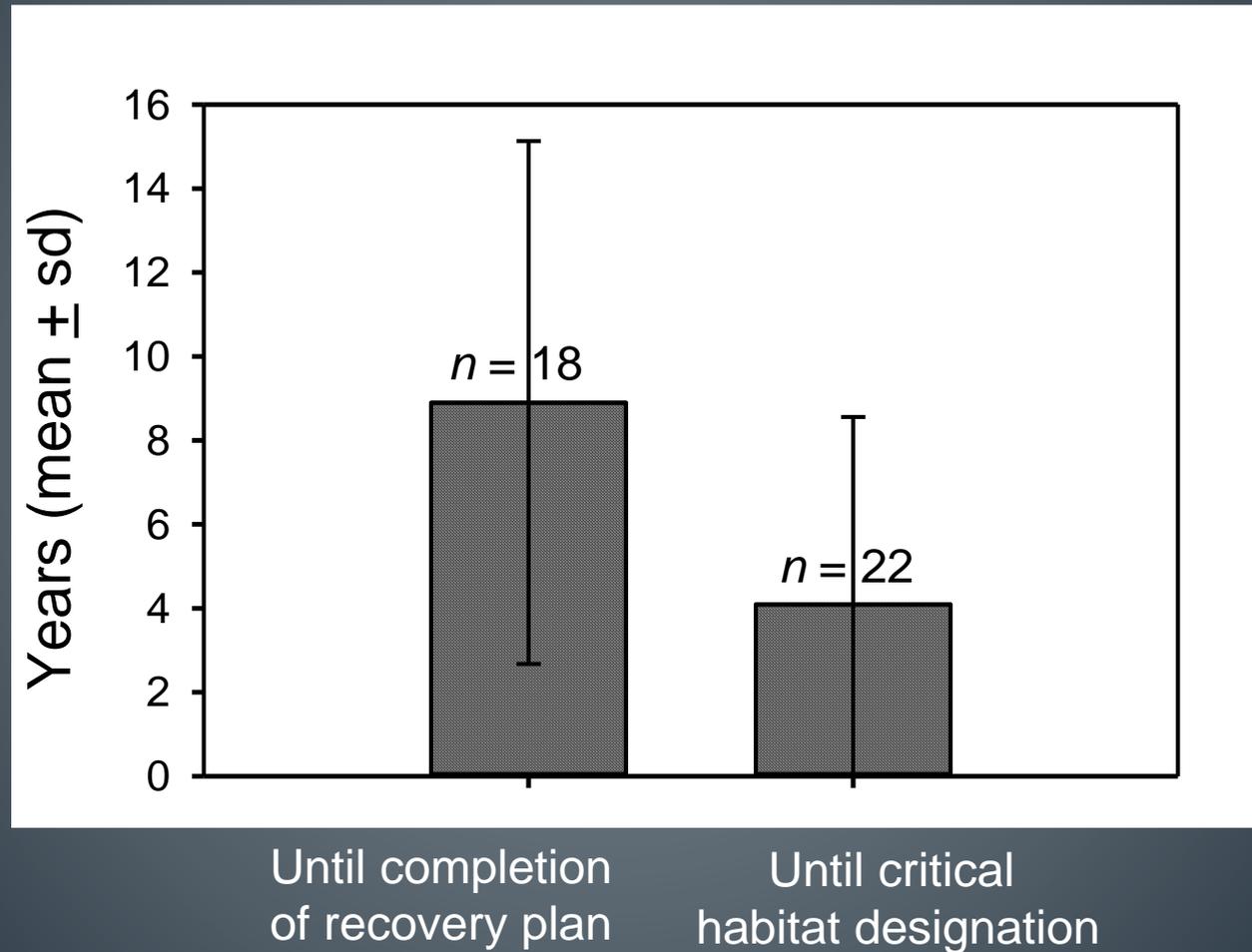
Sierra Nevada yellow-legged frog, Endangered

Yosemite toad, Threatened

Southern mountain yellow-legged frog, Endangered

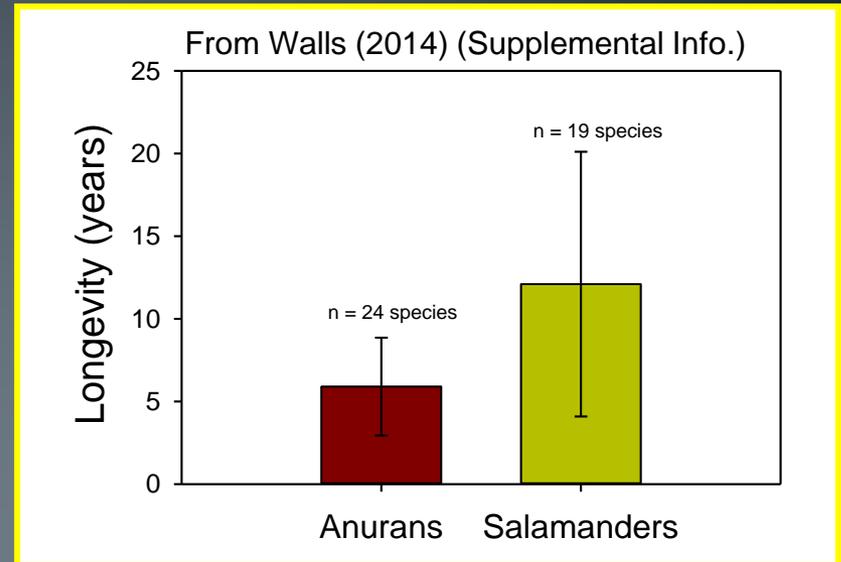
Georgetown salamander, Threatened

Time Lags after a Species' Listing



Delays in Listing & Longevity of some southeastern amphibians

Delays: median = 4.82 yr



Lithobates sevosus (Dusky Gopher Frog):

- 1982: concern about status first raised
- 2001: Listed as endangered
- 2012: Critical habitat designated
- 8-10 generations in the intervening 30 years
- Longevity: 4-5 yr; 6-10 yr. max (Amphibiaweb)

Necturus alabamensis (Black Warrior Waterdog):

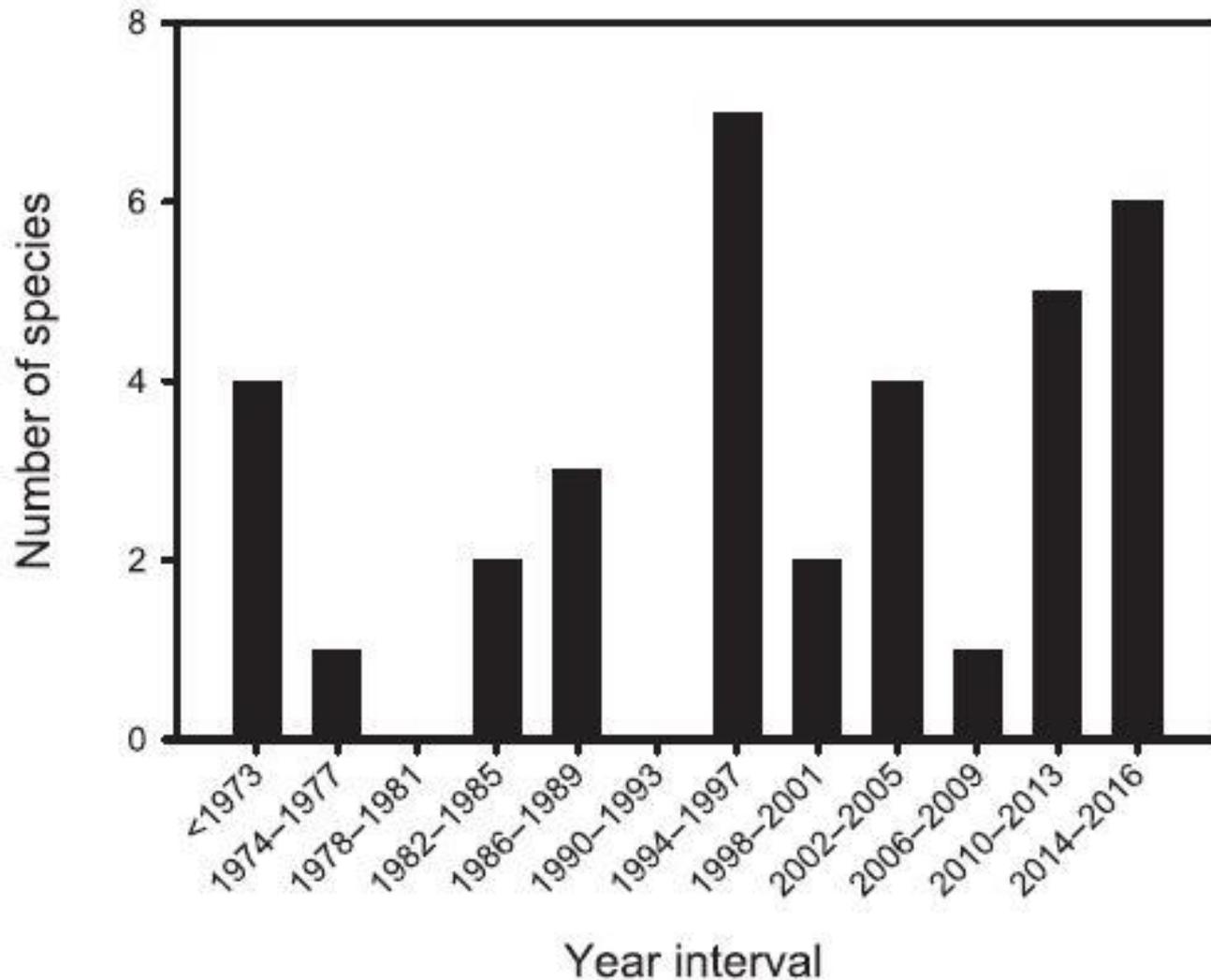
- 1991: recognized as a C2 species
- 1999: given candidate status
- 2016: proposed rule to list species as endangered
- Longevity: unknown

On a Positive Note.....

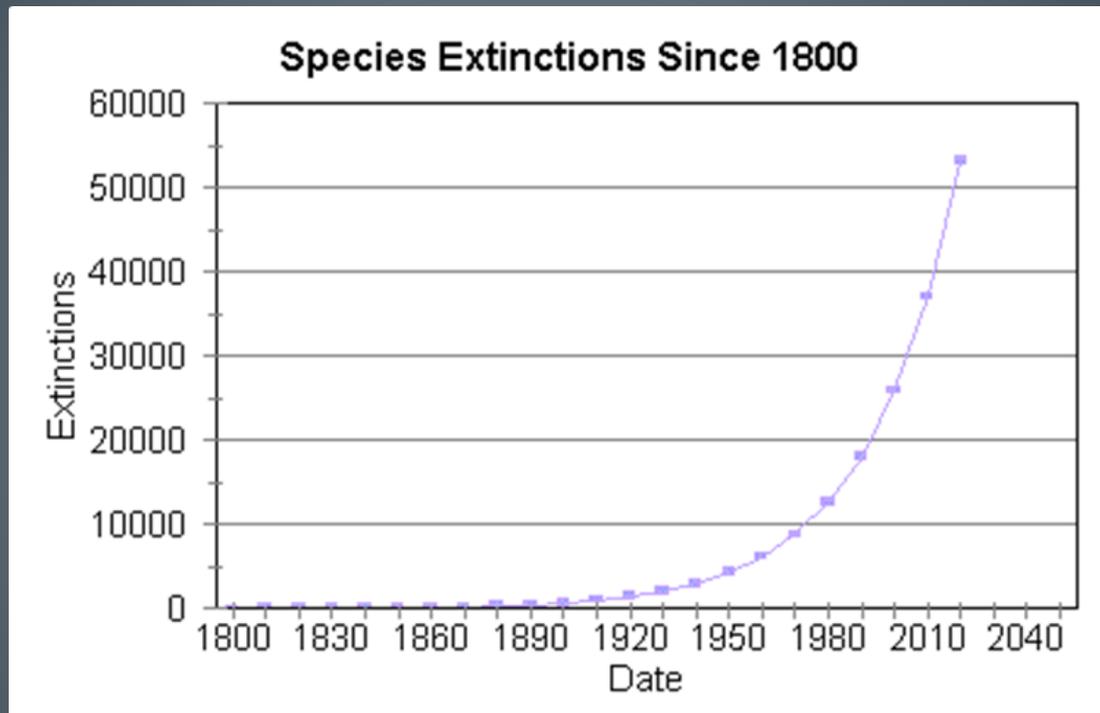
USFWS and NMFS have implemented several improvements

- Development of a multi-year work plan
- Regulation reform
- Seeking conservation partnerships
- Adoption of a Species Status Assessment (SSA) framework (a standardized, analytical approach to using science to inform all ESA decisions; designed to be consistent across all taxa)
- Listing process has become more transparent

Number of species that have received federal protection



Concern for (yet) unlisted “at risk” species



From <http://www.whole-systems.org/extinctions.html>

Current extinction rates are 1,000 times higher than natural background rates of extinction and future rates are likely to be 10,000 times higher (Vos et al. 2015).

Proactive (or prelisting) conservation

- Targets at-risk species before they need the protection of the ESA
- “An idea whose time has come” (Waples 2016)
- Not intended to supplant ESA protection but, rather, should be viewed as a means of increasing its effectiveness
- Has led to successful recovery of many at-risk species, thus eliminating their need for listing under the ESA

Recent Examples:



Least Chub
(removed from Candidate List in 2014)



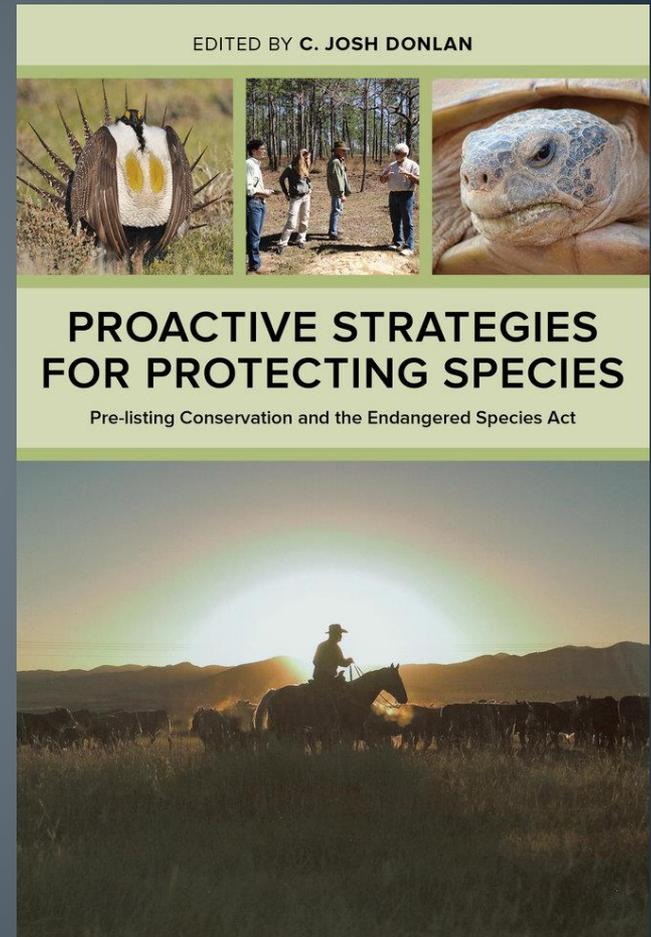
Greater Sage Grouse
(removed in 2015)



Relict Leopard Frog
(removed in 2016)

Advantages of Proactive Conservation Strategies

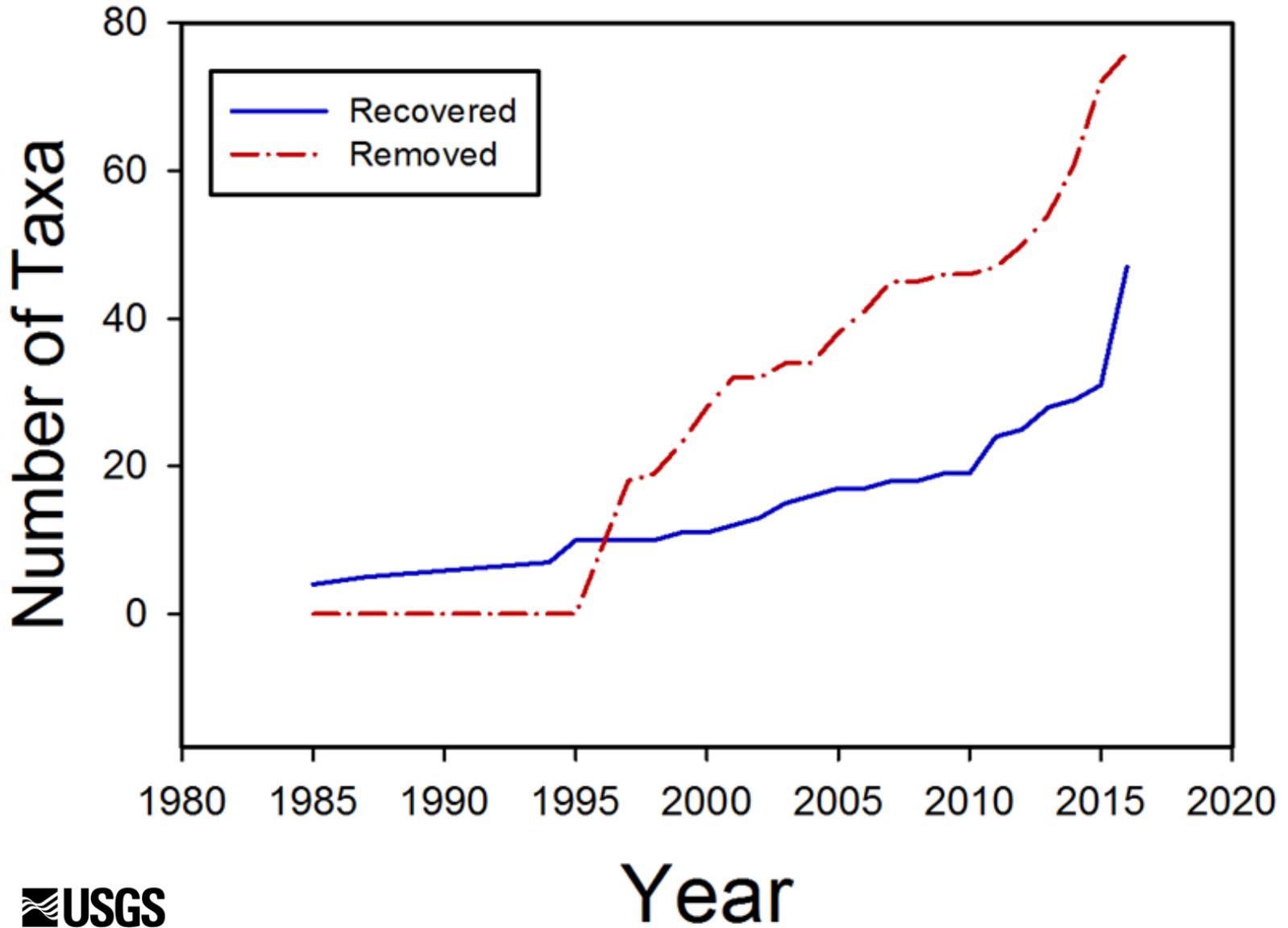
1. can prevent the need for listing
2. conservation efforts get underway sooner
3. reduces risk of extinction by not allowing populations to decline to very low levels
4. saves money

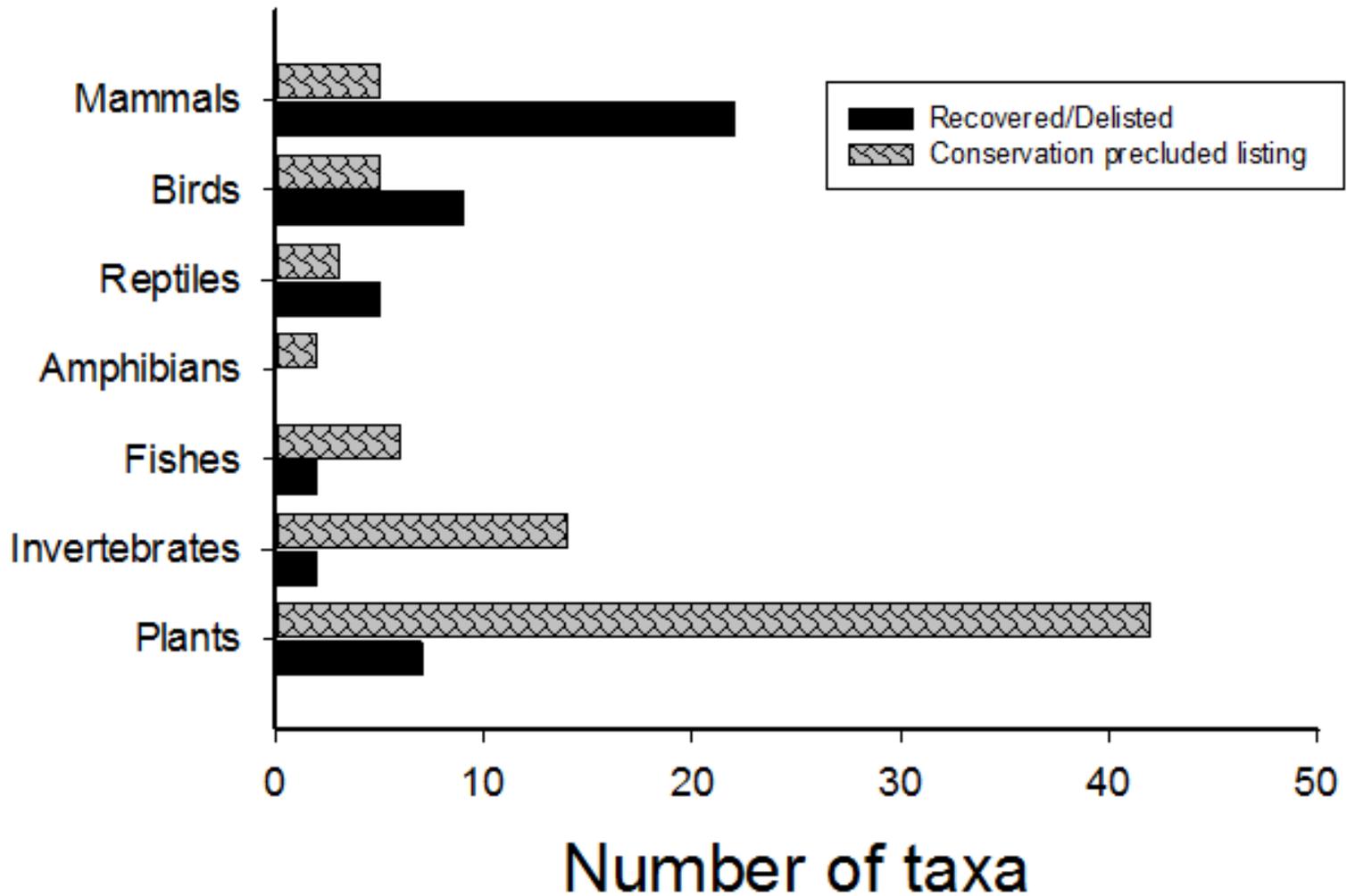


Advantage 1:

Proactive conservation can prevent the need for listing

- Again accessed the U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS)
- Summarized number of plant, invertebrate, fish, amphibian, reptile, bird, and mammal taxa that have had “successful” conservation outcomes
- “Taxon” defined as before
- An effort was considered “successful” if it led to:
 - (1) delisting a species due to recovery (as defined by the USFWS) or
 - (2) not listing a species because doing so was precluded by proactive conservation efforts.





Data from: USFWS Environmental Conservation Online System

<http://ecos.fws.gov>

Advantage 2: Expeditious conservation prevents populations from declining to very low levels



Black-footed Ferret
(*Mustela nigripes*)



Red Wolf
(*Canis lupus*)



California Condor
(*Gymnogyps californianus*)

- All three species listed as endangered in 1967 and continued to decline
- When taken into captivity, only 18 ferrets, 17 red wolves, and 27 condors remained in the wild
- All three recovery programs have experienced a number of successful milestones and failures but, currently, all three remain endangered under the ESA

Advantage 3: saves money

- Globally, annual cost to reduce extinction risk of threatened species has been estimated at US \$76 billion (Baruch-Mordo et al. 2013)
- In the US, annual cost to protect endangered species from just 2 conservation threats (alien species and disruption of natural fire disturbance regimes) was estimated at US \$32-42 million (in 1997 \$US)
- Because of cost, in many cases conservation only starts when species are under mandated statutory protection to prevent extinction
- In a case study from 2011, a proactive approach would have saved between 17.2 mn and 36.4 mn euro (\$18.6 mn to \$39.2 mn) compared to existing policy where conservation was delayed (Drechsler et al. 2011)



Suitable species for proactive conservation

Species proposed for federal listing:

- Louisiana pine snake (*Pituophis rutheveni*): Proposed as Threatened
- Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*): Proposed as Endangered
- Black warrior waterdog (*Necturus alabamensis*): Proposed as Endangered

Federal Candidate Species:

- Striped newt (*Notophthalmus perstriatus*)
- Berry cave salamander (*Gyrinophilus gulolineatus*)
- Gopher tortoise (*Gopherus polyphemus*)



Pituophis rutheveni
(Louisiana pine snake)
Proposed Threatened

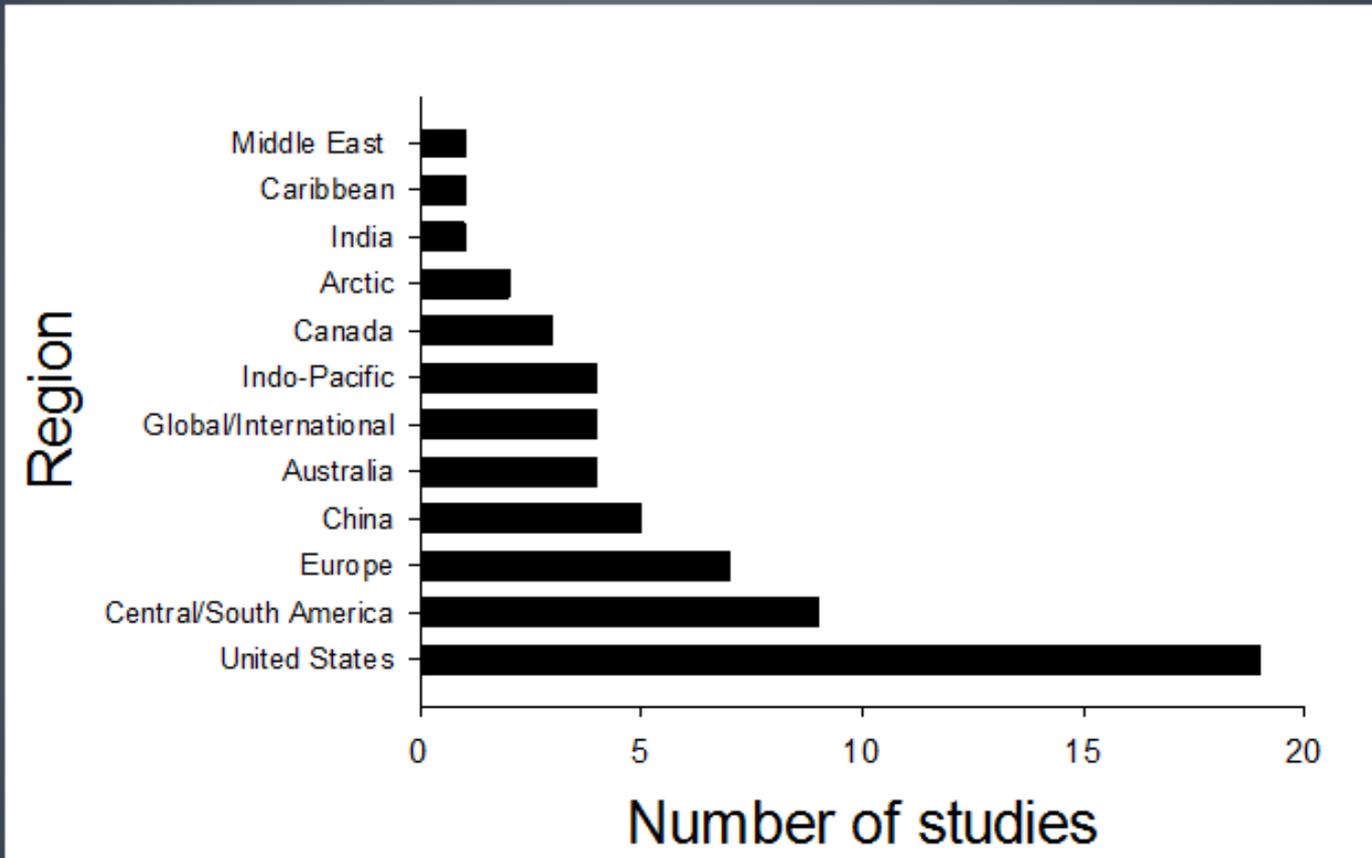


(*Notophthalmus perstriatus*)
(Striped Newt)
Candidate



Gopherus polyphemus
(Gopher Tortoise); **Candidate**

Out of 60 studies reviewed, only 22% indicated that a proactive conservation strategy had actually been implemented



Number of studies in various regions of the world in which proactive conservation was implemented or the need for such a strategy was recognized

Conclusions

- Historically, federally-listed amphibians have experienced delays in listing, development of recovery plans, and designation of critical habitat.
- In terms of listing delays, amphibians have fared better than most other species (4.82 years vs. 12.1 years calculated in another study)
- Amphibians doing better in terms of designation of critical habitat (71.4% of listed amphibians have critical habitat vs. 45% of all listed species)
- Amphibians and reptiles are under-represented among those species that have been recovered, even though they are 2 of the most imperiled of all the vertebrate groups.

Conclusions, cont'd.

- Proactive conservation can lead - and has led - to recovery of many at-risk species, thus eliminating their need for listing under the ESA
- Several options for engaging in proactive conservation. For example:
 - The USGS ARMI program and others are developing a proactive management framework to plan responses to (Bsal).
 - Start (or continue) restoring habitat; PARC's Habitat Management Guidelines are excellent resources

- Make use of novel conservation tools

e.g. water-borne stress hormone (Corticosterone or CORT) assays

Chronic physiological stress



drives

Change in extinction/
colonization rates



*mechanisms
of*

Change in occurrence a
across a landscape



explains

Species distribution
patterns

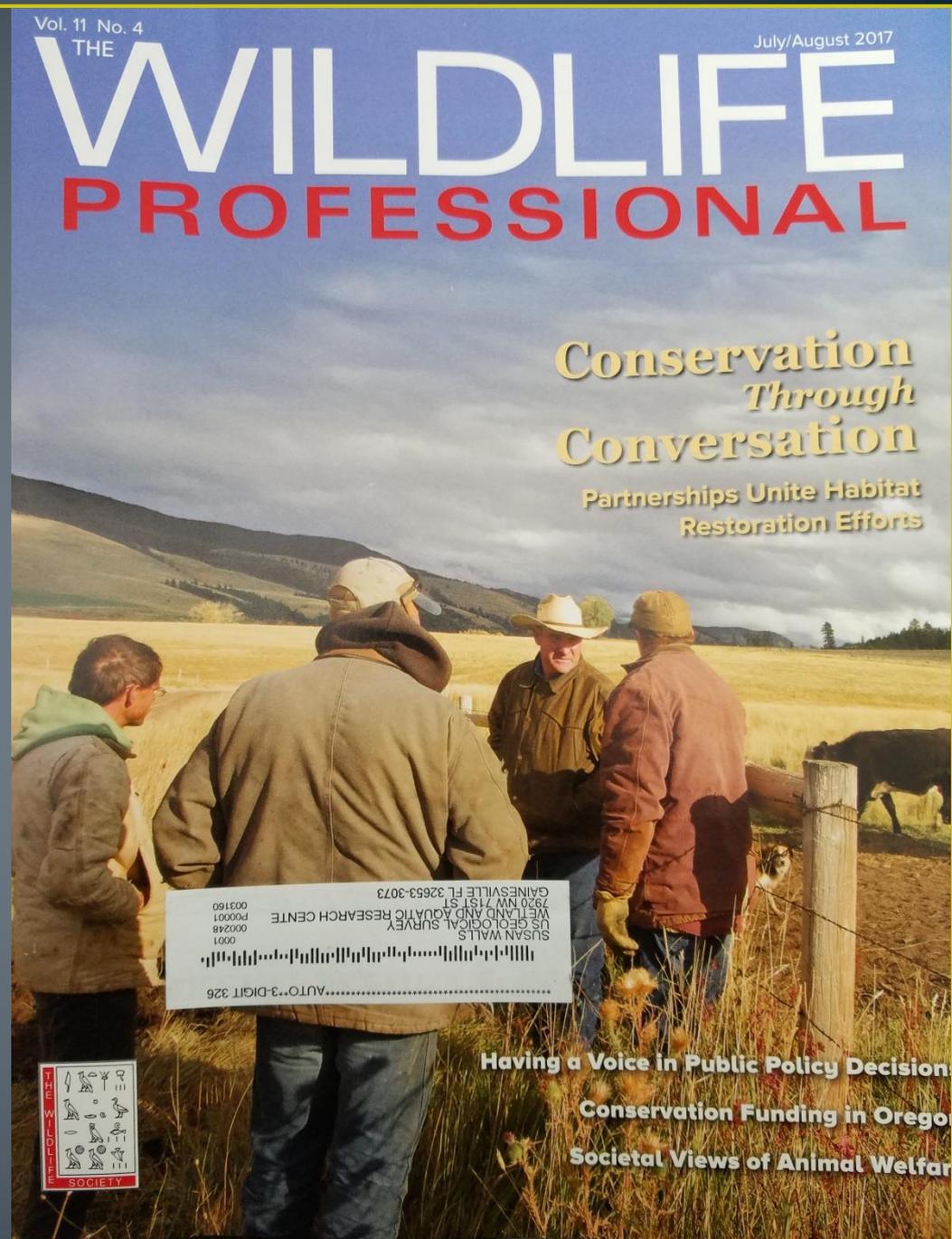
Provides “early
warning system”
that can signal
at-risk populations

Conclusions, cont'd.

- Start a long-term monitoring program that is:
 - question-driven
 - amenable to statistical/modeling rigor (e.g. occupancy and/or abundance estimation)
- Collect much-needed demographic/genetic data
- Identify triggers that, if/when reached, will signal the need for conservation intervention. Decide these ahead of time, not post hoc.
- Try to anticipate the types of information that could be needed, should species you manage become in need of listing:
 - what is the potential for dispersal, metapopulation connectivity?
 - where is there habitat on the landscape that is suitable (or could be made suitable) for translocations?
- Engage your partners

“Partnerships not only combine expertise. They can also pool their resources to fund the scientific efforts that guide management actions.”

D. Kobilinsky. 2017. *The Wildlife Professional* 11(4):16-22.



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