



# A RAD Response to Ecosystem Transformation

*A Change in Thinking  
for the Change We Are Navigating*

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*Fish and Wildlife Biologist*

*Columbia River Fish and Wildlife Conservation Office*

*July 17, 2024*



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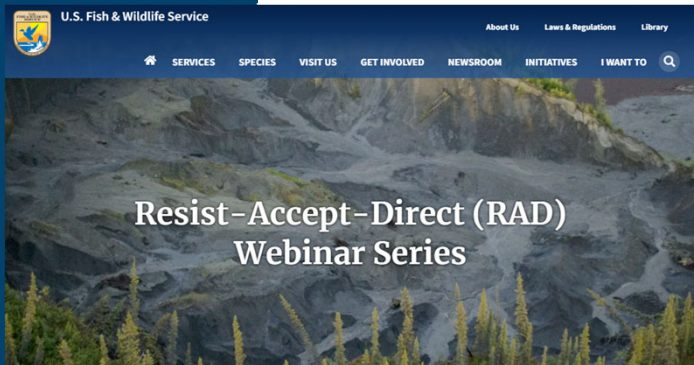
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**Karen Prentice**





**RAD**



*National Conservation Training Center*

**(Resist, Accept, Direct)**



*Billy Frank Jr. Nisqually NWR*



*Chassahowitzka NWR*



# Resources

*Just scratching the surface...*



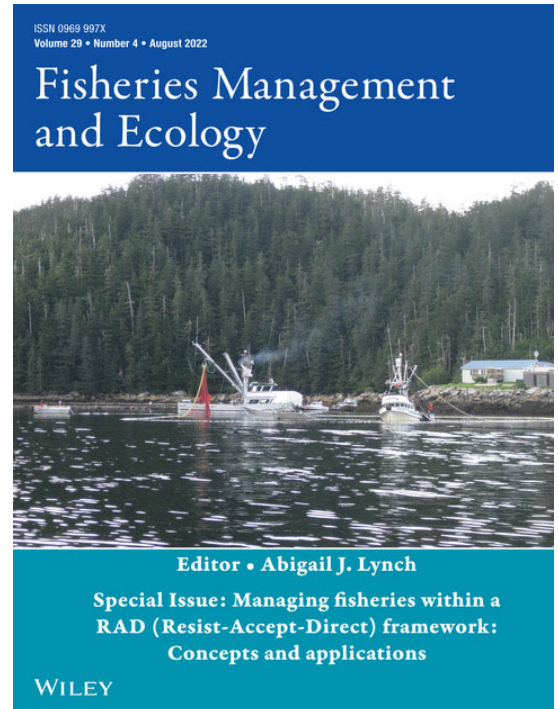
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## Resist-Accept-Direct (RAD) Framework

ACTIVE

By [Climate Adaptation Science Centers](#)





# Ecosystem transformation

Ecosystem transformation is change that re-arranges historical species composition and the ecological function of habitats



# ECOSYSTEM TRANSFORMATION

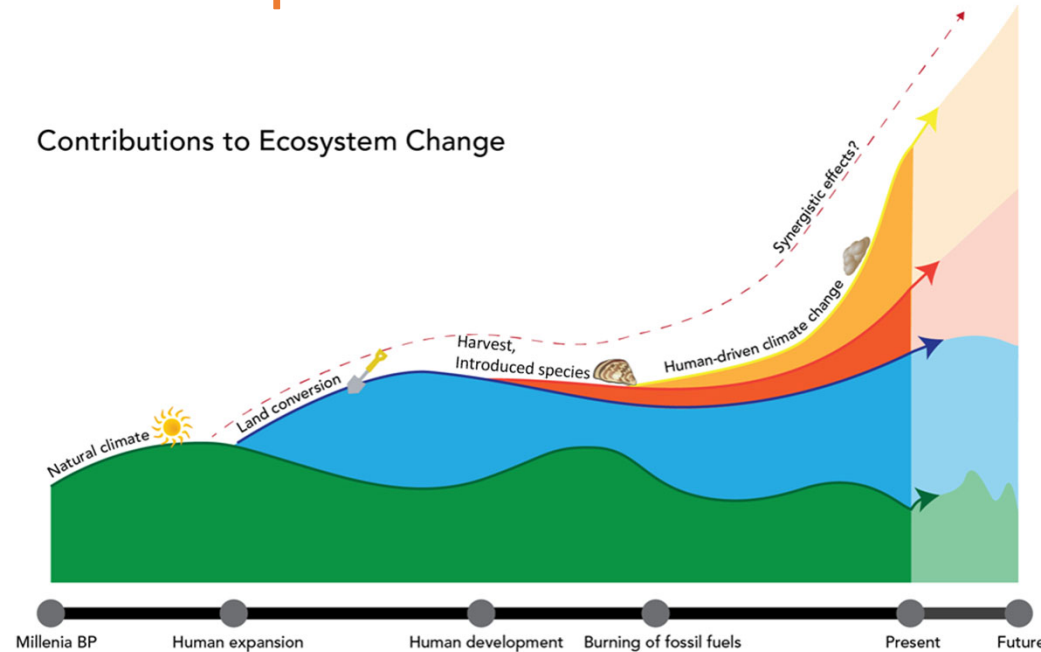


## Ecology of ecosystem transformation

Ecosystem transformation is nothing new...

BUT, the current causes *are* unprecedented

- Anthropogenic climate change
- Land use change
- Invasive species
- Disease
- Habitat fragmentation
- ...



Thompson et al. 2021

# ECOSYSTEM TRANSFORMATION



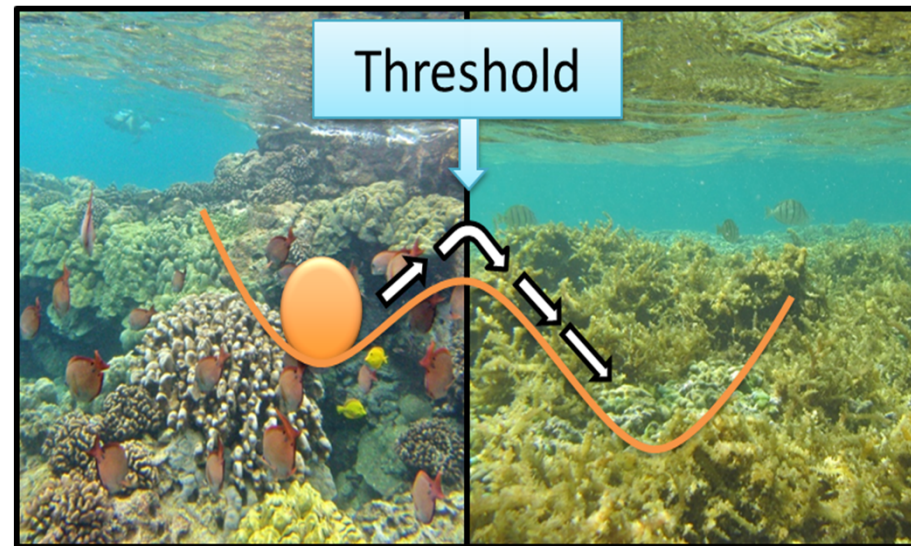
## Ecology of ecosystem transformation

Ecosystem transformation is nothing new...

BUT, the current causes *are* unprecedented

AND, the relationships are hard to predict

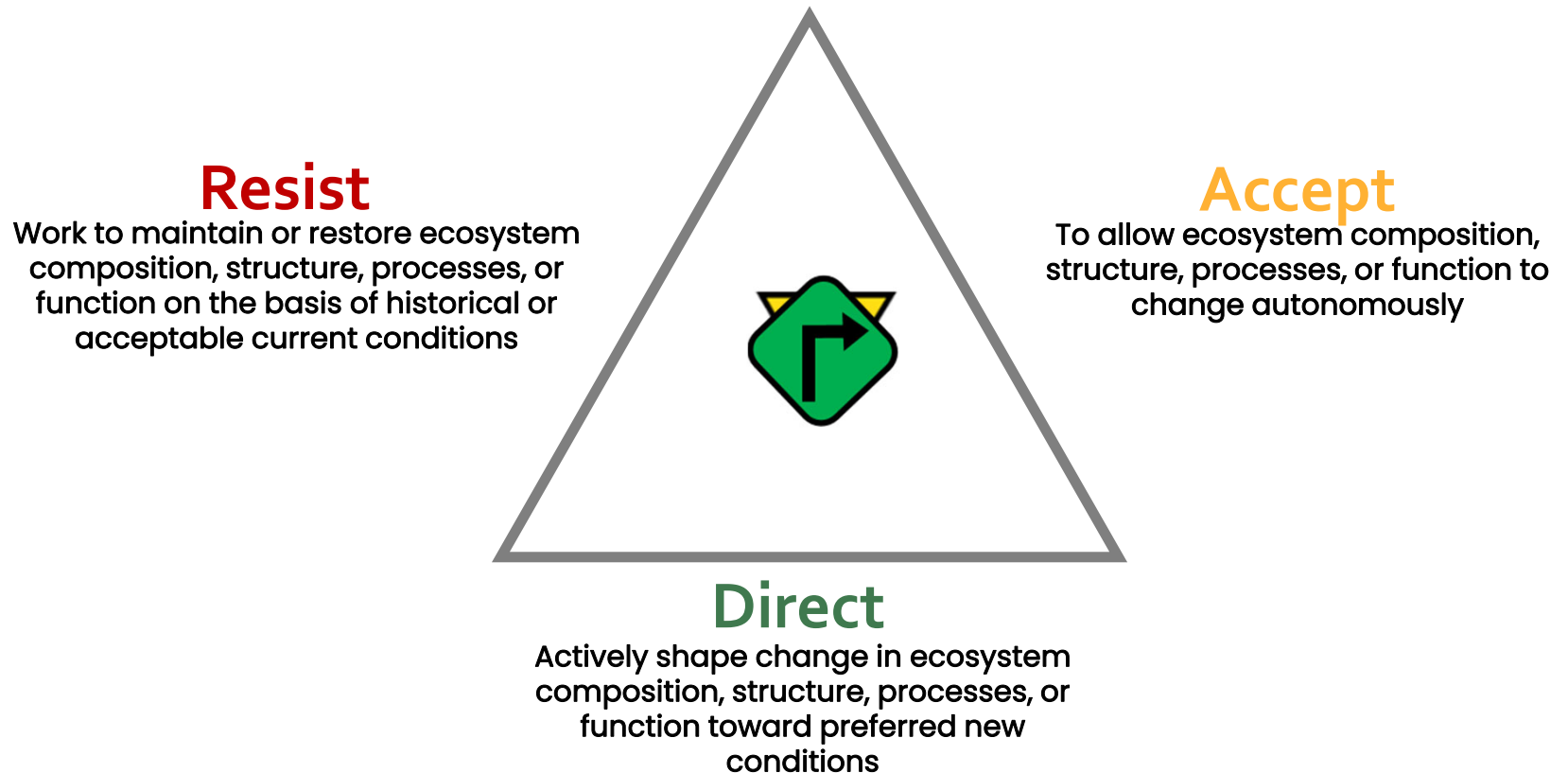
- Novel communities
- Indirect effects
- Additive / synergistic effects
- Thresholds / tipping points
- ...



[oceantippingpoints.org](http://oceantippingpoints.org)



## The RAD framework



*Definitions from Crausbay et al. (in press); design from Thompson et al. 2021*



# Putting RAD into action

*Challenges for USFWS managers*

## USFWS Mission:

Working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.





## RAD and wilderness areas

*USFWS manages public lands for conservation*

National Wildlife  
Refuge System:  
568 wildlife  
refuges (NWRs)  
including 21 NWRs  
designated as  
wilderness

Bitter Lake NWR/Salt Creek Wilderness,  
New Mexico



Wichita Mountains NWR and Wilderness,  
Oklahoma



# CHALLENGES



## RAD and threatened or endangered species *USFWS administers the Endangered Species Act (ESA)*



Oregon Silverspot Butterfly



Mojave Desert Tortoise



Dwarf-Bear Poppy



Amargosa Niterwort



Bull Trout



Yuma Ridgway's Rail

# CHALLENGES



# Threatened and endangered species

## *Ongoing litigation*

Conservation groups to sue Fish and Wildlife Service over wolverine non-listing

BY LAURA LUNDQUIST | OCTOBER 12, 2020

A U.S. Fish and Wildlife Service decision to withdraw the wolverine from consideration for endangered species protection has prompted another lawsuit against the agency.

Conservation coalition sues over slashing of owl habitat

Wed Mar 31st, 2021 5:15pm - NORTHWEST NEWS

By Claudia Yaw

The (Centralia) Chronicle

The federal government's recent decision to slash critical habitat reserved for northern spotted owls is "without warning, justification or lawful process," according to nine West Coast conservation groups now suing U.S. Fish and Wildlife Service (USFWS) over the decision.

Nonprofit to sue U.S. Fish and Wildlife for not protecting Hawaiian honeycreeper

By NIALUNA | Oct 13, 2020

Japan's Princess Mako marries commoner, loses royal status

Mexico's oil and gas boom seeks September trial date

Waipahu company settles \$1.1 million federal labor claim

Thirty Motor Vehicle protesters oppose Biden's U.S. military push in Hawaii

Longtime booster selected to lead Hawaii Board of Education

Conservation Groups Sue USFWS to Save Wild Red Wolves

CHAPEL HILL, N.C. – On behalf of Red Wolf Coalition, Defenders of Wildlife, and Animal Welfare Institute, the Southern Environmental Law Center today [sued the U.S. Fish and Wildlife Service](#) in the U.S. District Court for the Eastern District of North Carolina for violations of the Endangered Species Act caused by new, illegal agency policies that bar the use of proven management measures to save wild red wolves.

"The Fish and Wildlife Service is managing this species for extinction," said Sierra Weaver, senior attorney at the Southern Environmental Law Center which represents the conservation organizations in court. "Faced with a wild population of only seven known animals, the Fish and Wildlife Service is now claiming—without basis—that it's not allowed to take proven, necessary measures to save the wild red wolves. The service urgently needs to restart red wolf releases from captivity, which it did regularly for



# Lack of policy support

## *Roadblocks to Assisted Migration*



Downloaded from <https://science.sciencemag.org> on May 2, 2021

### CONSERVATION

## Global policy for assisted colonization of species

Coordinated policies are needed for the translocation of species for conservation

By J. J. Brodie<sup>1,2</sup>, Susan Lieberman<sup>3</sup>, Axel Moehrenschrager<sup>4,5,6</sup>, Kent H. Redford<sup>7,8,9</sup>, Jon Paul Rodriguez<sup>10</sup>, Mark Schwartz<sup>11</sup>, Philip J. Seddon<sup>12</sup>, James E. M. Watson<sup>13,14,15</sup>

**N**egotiations in advance of the 15th meeting of the Conference of the

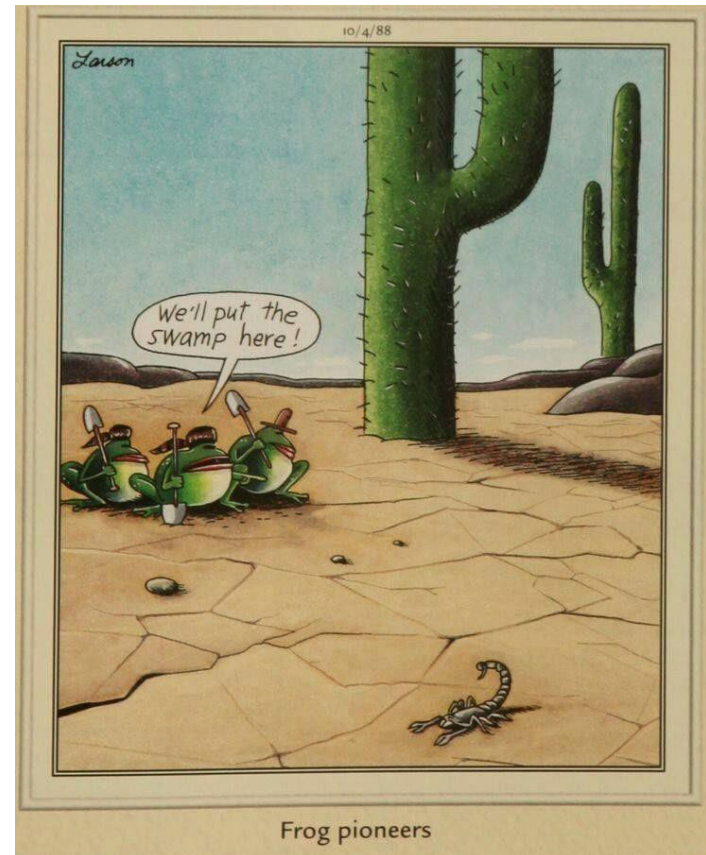
spectively) and so need to match advances in knowledge and evidence on the immediate and devastating impacts of climate change. Over just the past few years, the frequency and severity of extreme weather events have accelerated. By one recent estimate, one-third of species may now have an increased risk of

facilitate species conservation by moving individuals of species that cannot disperse around these barriers, allowing them to escape from shrinking climate refugia and to establish populations in new locations that have the conditions needed for population persistence. But despite having been dis-

## Additional barriers to RAD implementation

*Faced by natural resource managers*

- **Lack of coordination across agencies, NGOs, private companies, geographic areas, or jurisdictions**
- Lack of funding
- Limited staff or high staff turnover
- Shifting political administrations and priorities
- State, city, or other municipal prohibitions
- Societal resistance



# RAD



# Creating nesting habitat for crocodiles

*Crocodile Lake NWR*



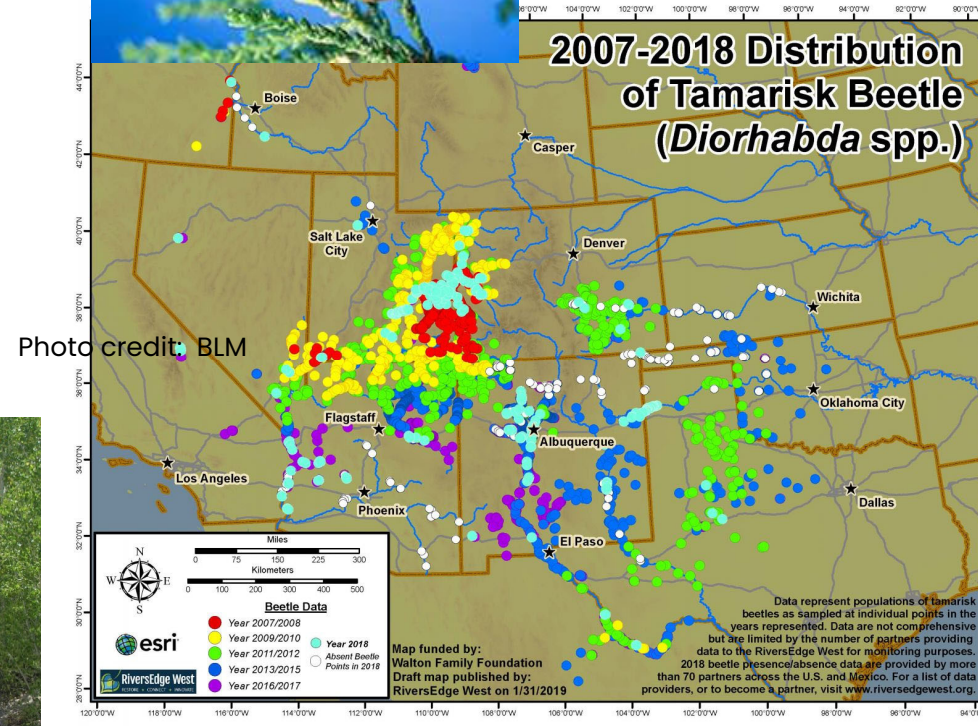
## Removing invasive riparian vegetation *To maintain native riparian habitat for endangered birds*



After manual removal



Native cottonwood and willow recovery



# Accepting invasive vegetation

*Blackwater National Wildlife Refuge*

- Invasive species may preclude other options
- Too costly or ineffective to move habitat toward the desired condition
- May provide some benefits that would be lost if removed (e.g., phragmites prevents erosion by holding marsh together)



# Accepting northward expansion of mangroves

## *Chassahowitzka National Wildlife Refuge*

- Native mangrove species moving north up the coast
- Colonizing salt marshes



- Marshes disappearing due to sea level rise, mangroves maintain an ecological foothold

# Conserving future habitats

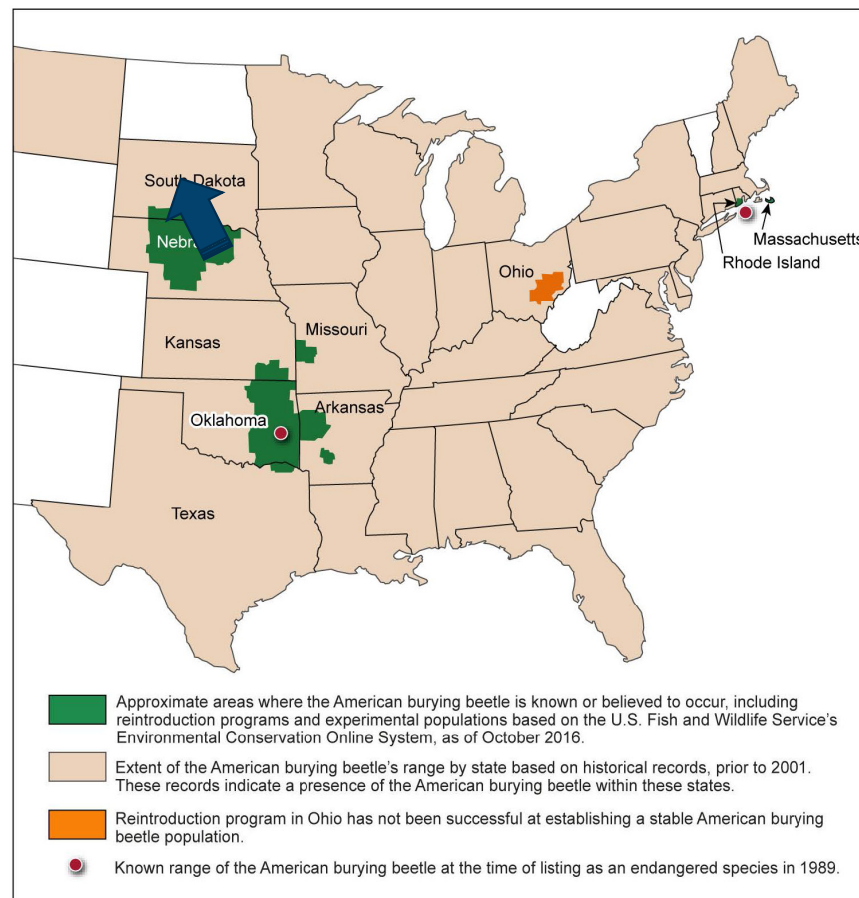
## American Burying Beetle (*Nicrophorus americanus*)



Listed as endangered in 1989  
Down listed to threatened in 2020



Figure 6: Current and Reported Historical Range of the American Burying Beetle in the United States, as of October 2016



Sources: GAO analysis of U.S. Fish and Wildlife Service documents; Map Resources (map). | GAO-17-154

# Establishing refugial populations

*Springs Preserve, Las Vegas, NV*



Photo Credit: Tom Brennan





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# RAD IMPLEMENTATION GUIDEBOOK



Deliberative  
Engagement

Application at  
Multiple  
Scopes

Adaptive  
Management

# RAD IMPLEMENTATION GUIDEBOOK



RAD  
Menus

RAD  
Portfolios

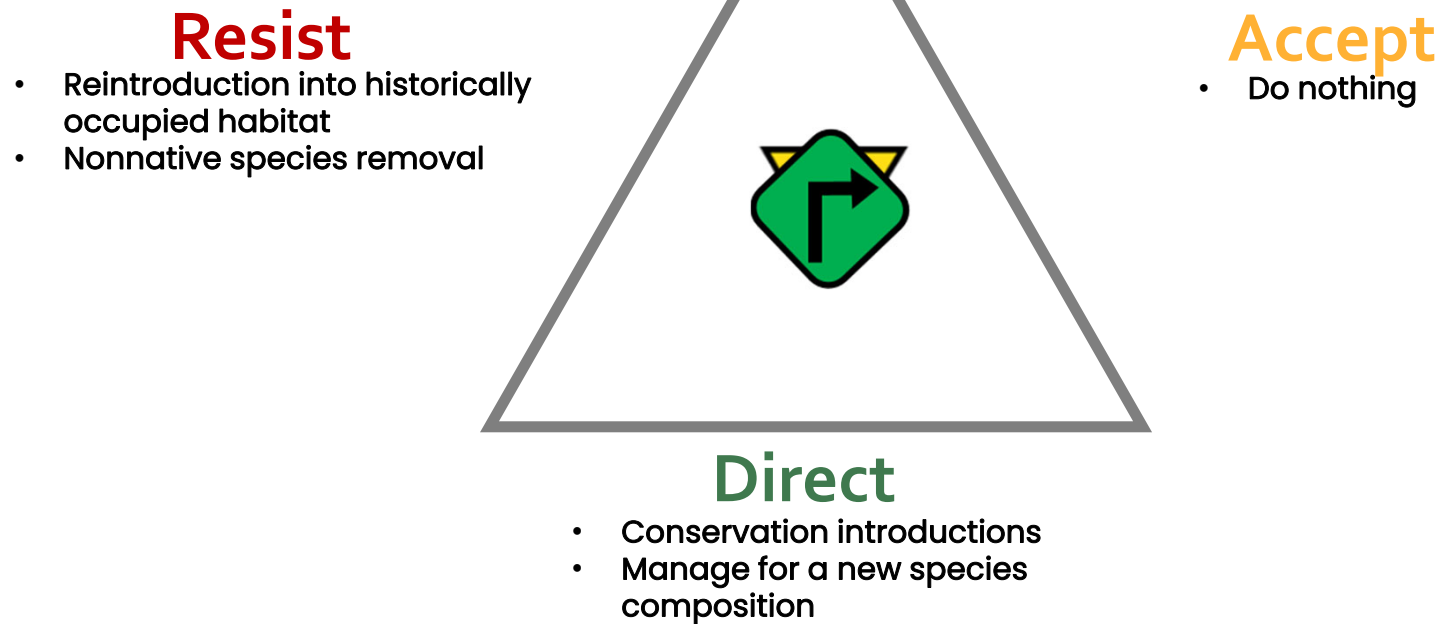
RAD  
Decision  
Context

# RAD MENUS



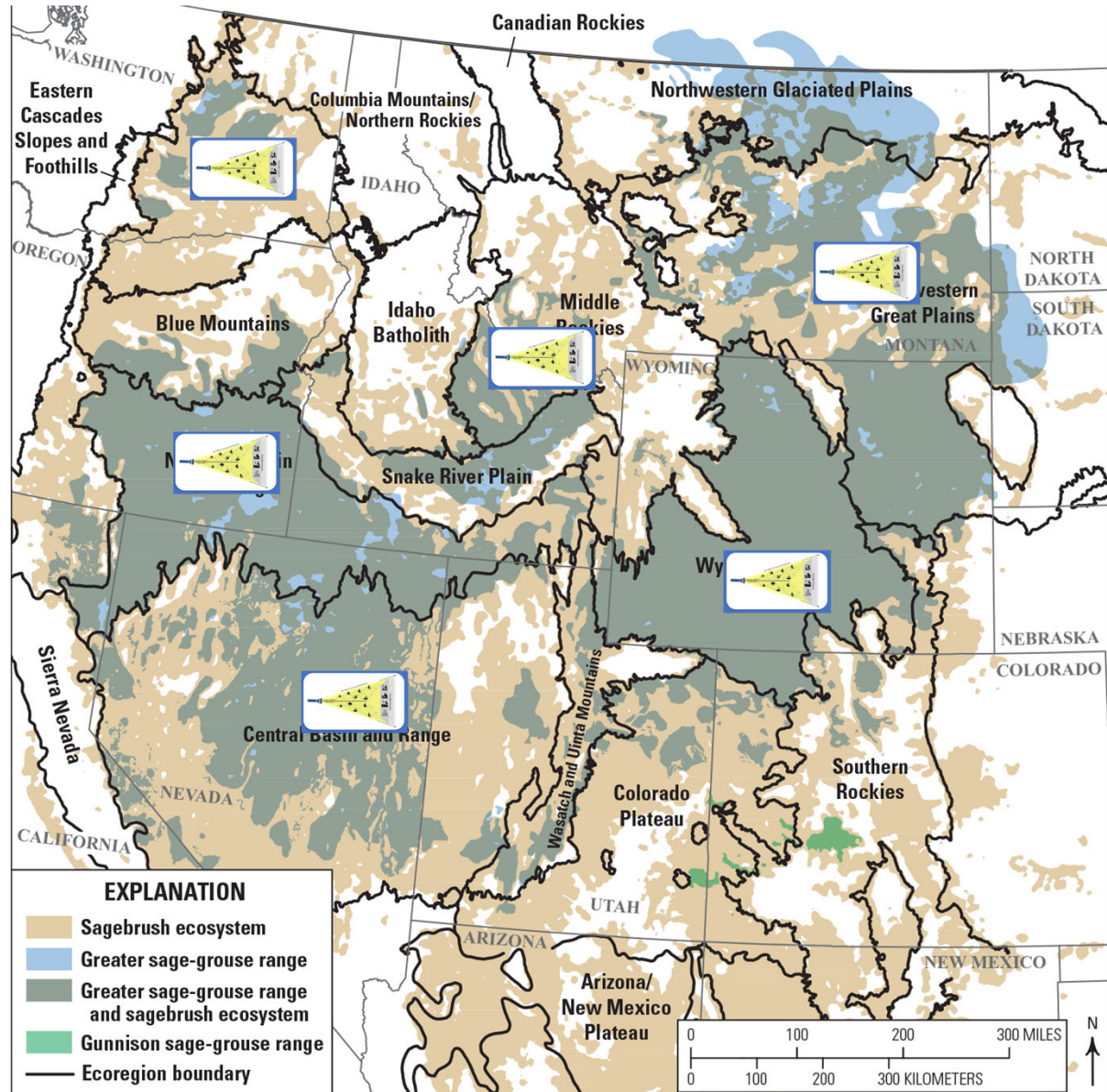


# Bull Trout Recovery



*Definitions from Crausbay et al. (in press); design from Thompson et al. 2021*

# RAD PORTFOLIOS



# RAD DECISION CONTEXT



# RAD



# Hanford Reach



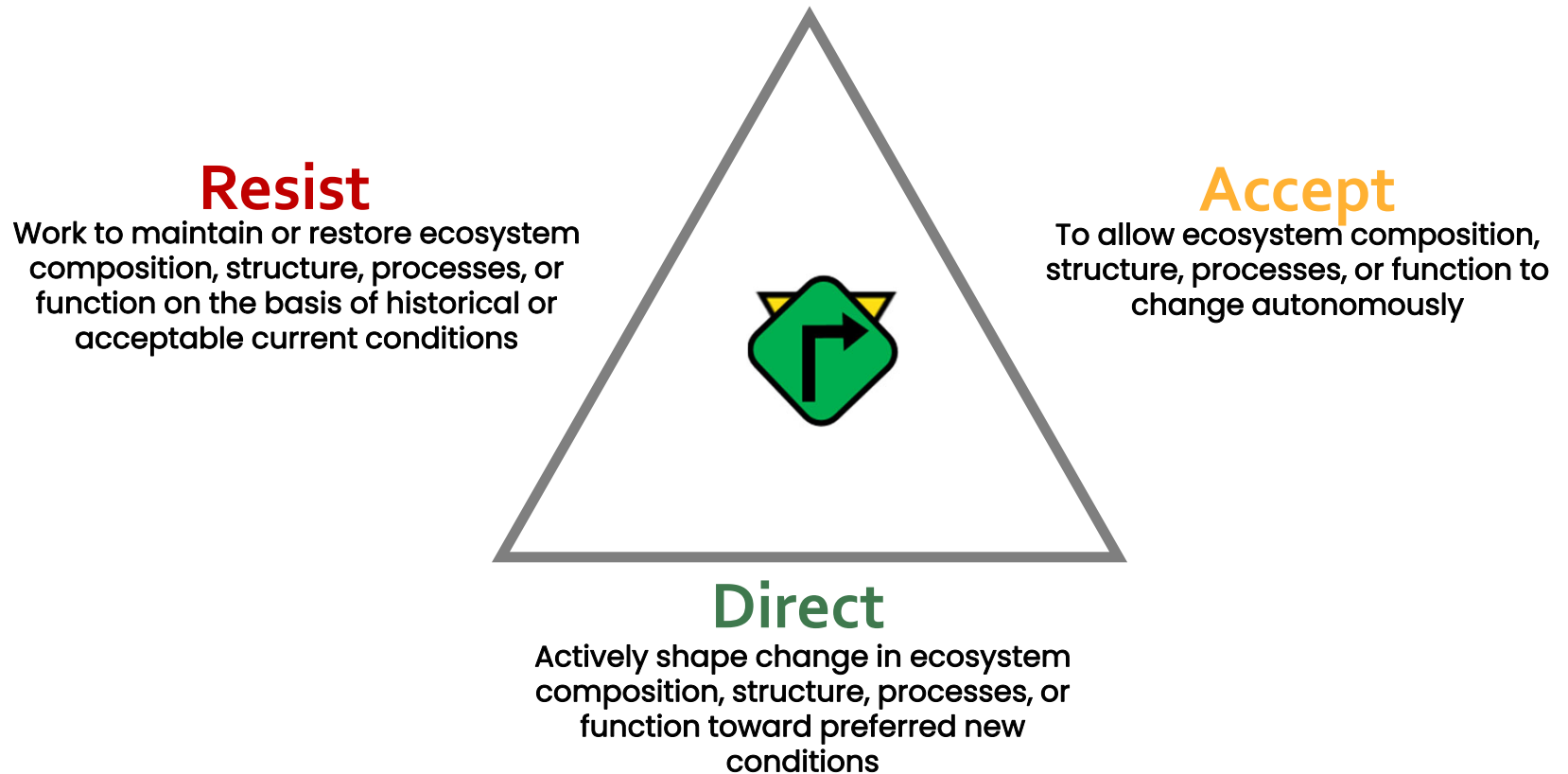
# Florida Keys



# Salmon Conservation and Recovery



# Salmon Conservation and Recovery





## Implementing RAD management approaches

*Guidelines and tips*

Avoid paralysis

Conduct experiments and use pilot

Con

Mainta

This is not  
what is meant  
by Pilot  
Testing



depositphotos.com



pitchvision.com

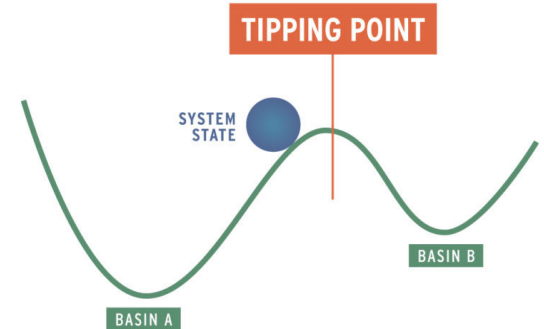


Illustration by Andrew Bernier, adapted from Walker, B. & Salt, D. (2006) Resilience Thinking: Sustaining Ecosystems and People in a Changing World. Island Press: Washington, DC.

Thank you

