



State of the Salmonids

North Coast Regional Water Quality Control Board
February 8th, 2018

Peter Moyle, Robert Lusardi, and Patrick Samuel



State of the Salmonids: Status of California's Emblematic Fishes 2017

A report commissioned by California Trout

August 2017

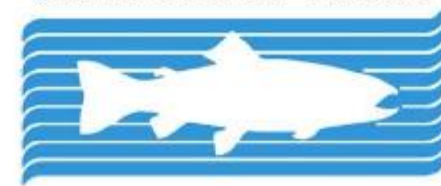
Peter B. Moyle, PhD
Robert A. Lusardi, PhD
Patrick J. Samuel, MA
Jacob V. E. Katz, PhD



UCDAVIS

CENTER FOR WATERSHED SCIENCES

CALIFORNIA TROUT



FISH · WATER · PEOPLE

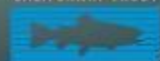


SOS II: FISH IN HOT WATER

Status, threats and solutions for California salmon, steelhead, and trout.

Based on a report by Dr. Peter B. Moyle, Dr. Rob Lusardi and Patrick Samuel commissioned by California Trout.

CALIFORNIA TROUT



FISH · WATER · PEOPLE

UCDAVIS

CENTER FOR WATERSHED SCIENCES

Talk Summary

- Methods
- Findings
- Examples
- Return to Resilience



State of Salmonids 2017

- Updates 2008 Report
- 579 pages
- Peer-reviewed
- Status scores
 - 7 metrics
- Confidence rating



2008 vs 2017 report

SOS: California's Native Fish Crisis

*Status of and solutions for restoring our vital
salmon, steelhead and trout populations*



California Golden Trout
State Fish of California
ART BY JOSEPH DOMELLER

*Based on a report by Dr. Peter B. Moyle, Dr. Joshua A. Israel,
and Sabra E. Purdy, commissioned by California Trout*



SOS II: FISH IN HOT WATER

*Status, threats and solutions for California salmon,
steelhead, and trout.*

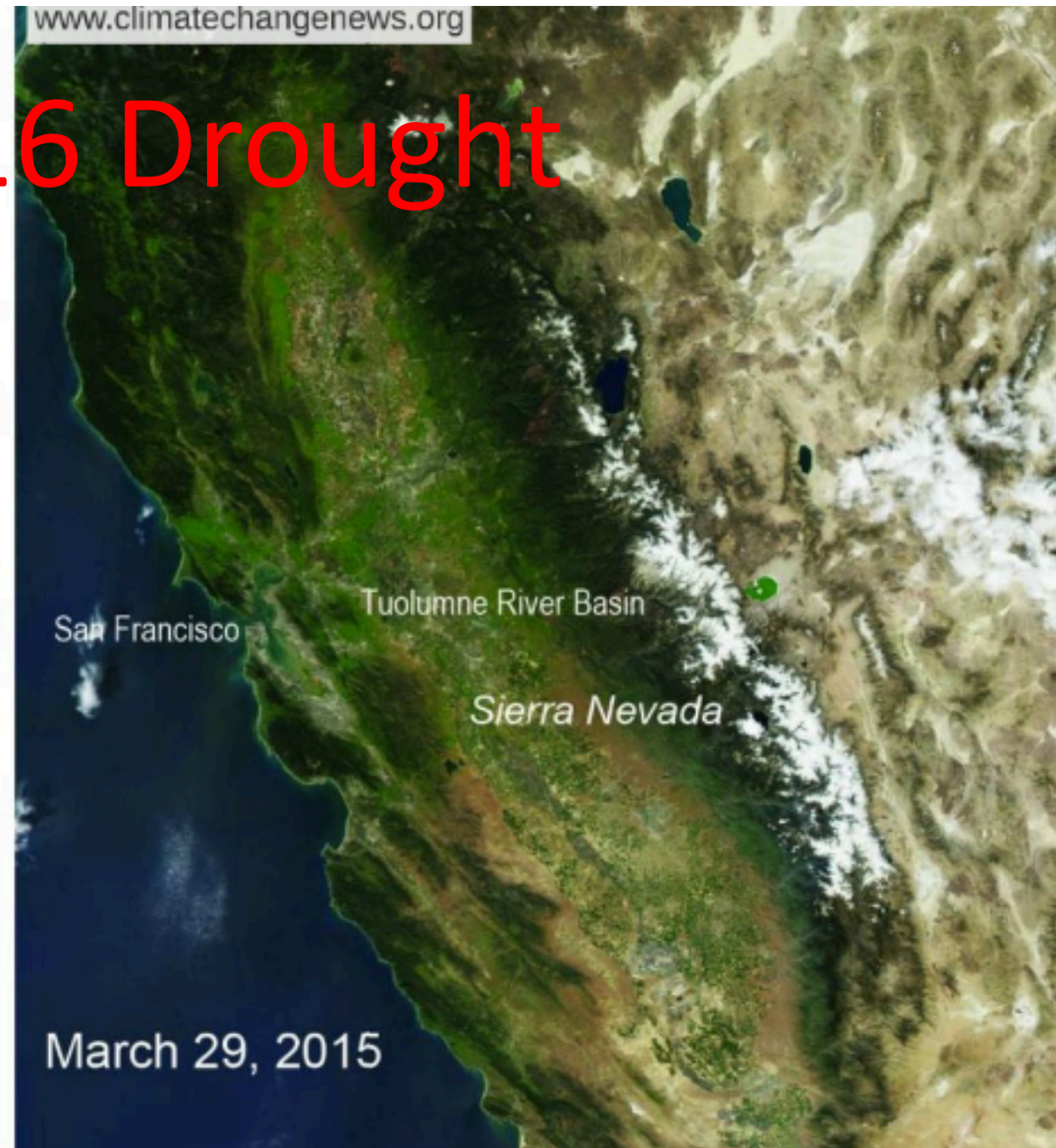
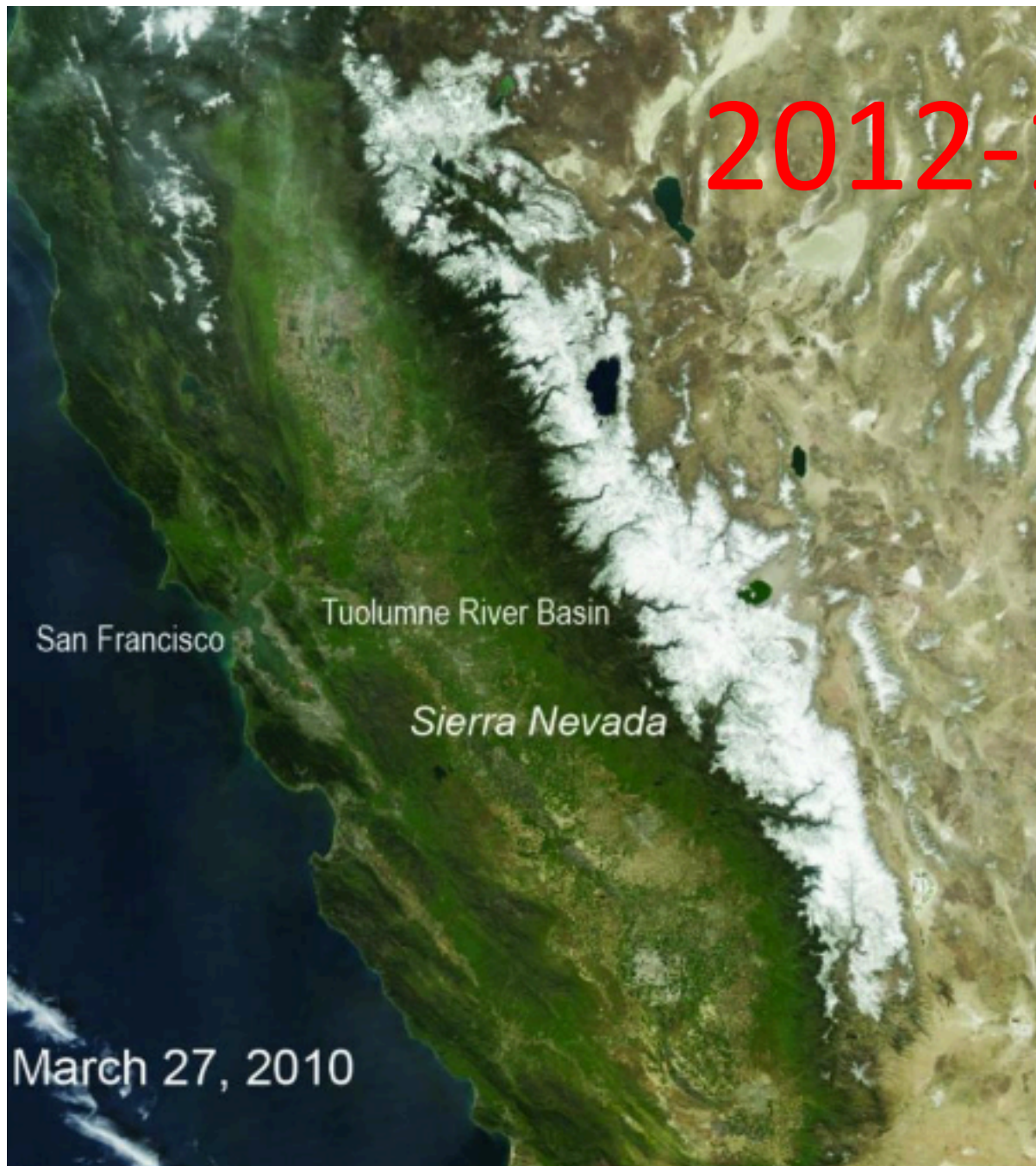
Based on a report by Dr. Peter B. Moyle, Dr. Rob Lusvardi and Patrick Samuel commissioned by California Trout.

CALIFORNIA TROUT



UC DAVIS
CENTER FOR
WATERSHED SCIENCES

2012-16 Drought



Report Focus

- What is the status of California salmonids?
- What factors cause declines
- How can they be conserved?

Methods: Metrics

- Area occupied
- Adult abundance
- Intervention dependence
- Physiological tolerance
- Genetic risks
- Climate change vulnerability
- Threats



Rating Status: 7 Metrics

- Based on literature, prof. judgement
- Transparent
- Repeatable
- Status scored 1.0-5.0
 - Critical to low concern

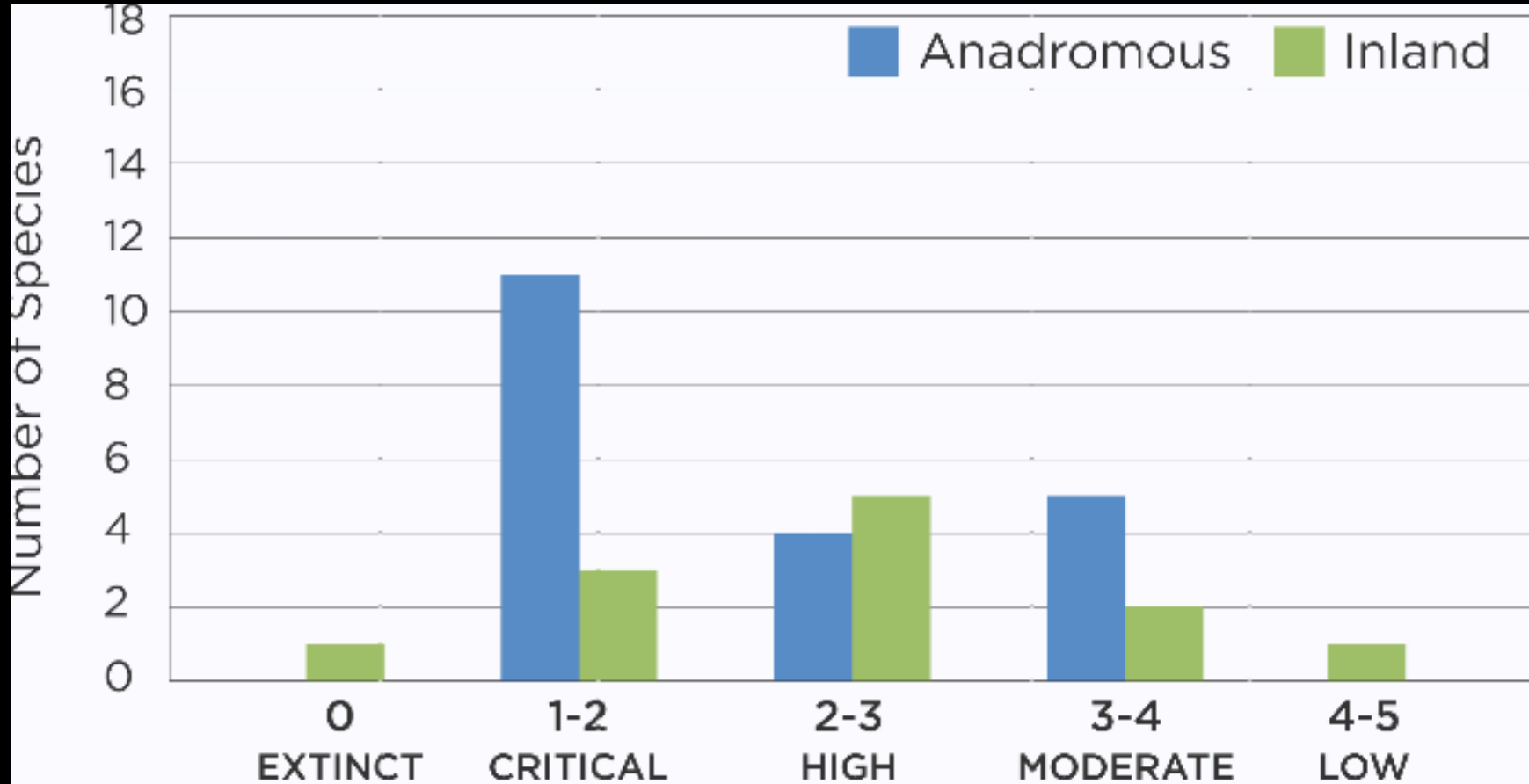


Findings

- Most declined since 2007
- 74% extirpated by 2100
- 45% extirpated in 50 years.



2017 Status Scores



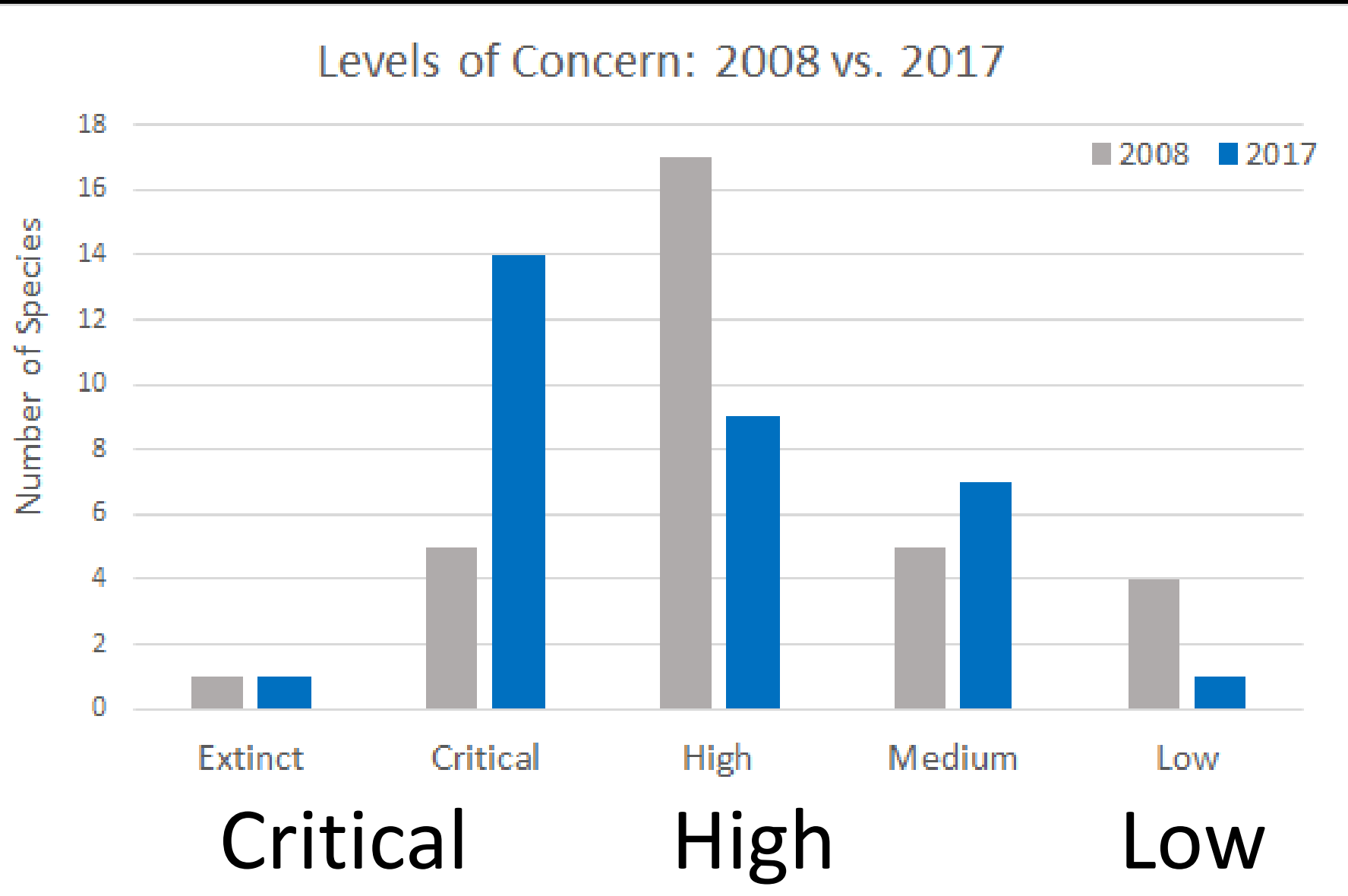
Critical

High

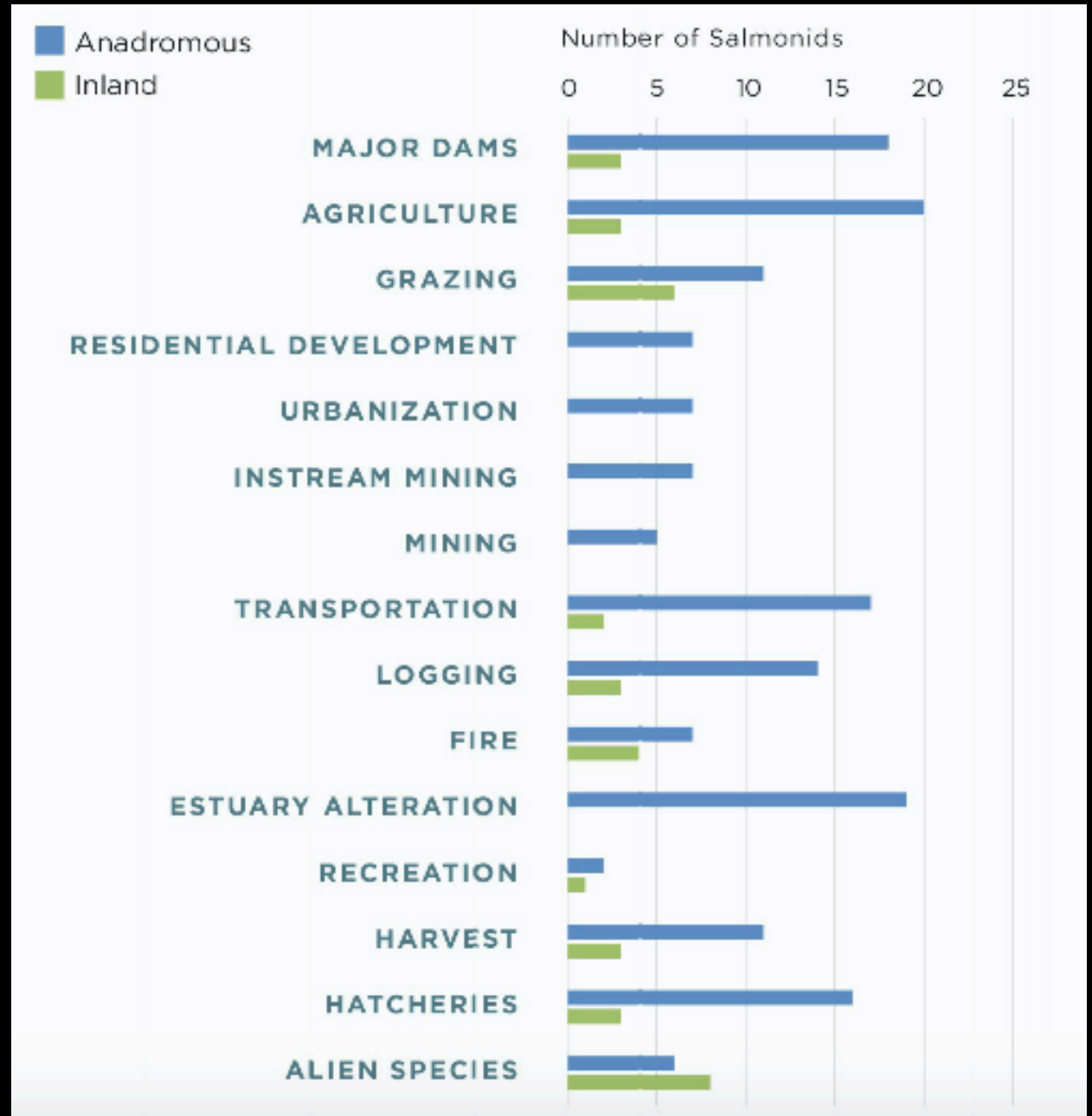
Low

Status of California salmonids; 21 anadromous species and 11 inland species.

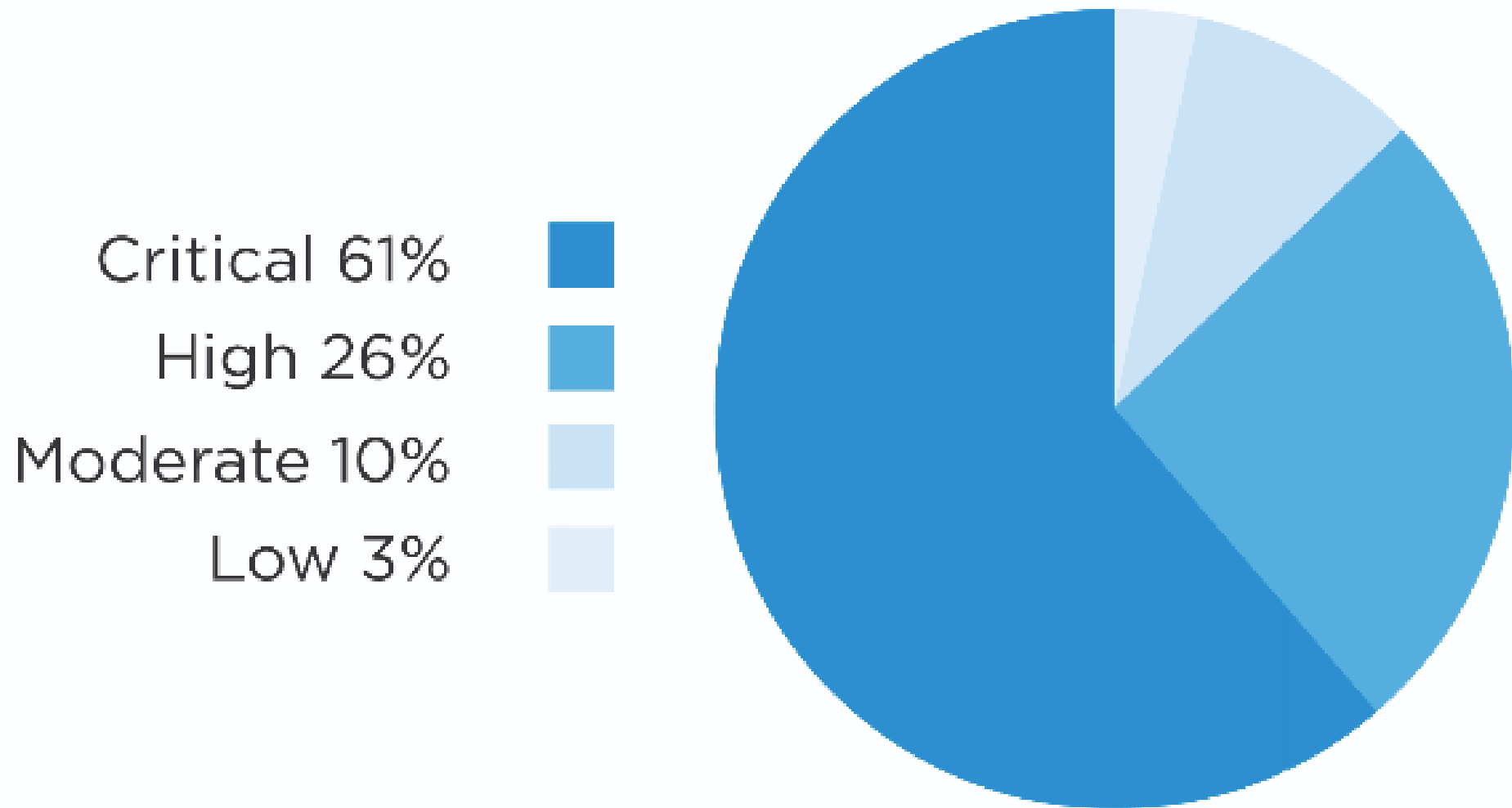
Levels of Concern: 2008 vs. 2017



Causes = multiple



Climate Change Threat



Example: Central California Coast Coho Salmon

Major Threats:

- Water diversions (vineyards and cannabis cultivation)
- Dams
- Logging legacy effects
- Estuary alteration
- Climate change

Metric	Score	Justification
Area occupied	2	Most populations not self-sustaining in long run.
Estimated adult abundance	2	All populations are small, isolated, and may function independently. Most are <100 in most years.
Intervention dependence	1	All populations require intervention to persist and most have intensive management in place or proposed.
Environmental tolerance	1	Coho are among the most sensitive salmonids to environmental conditions.
Genetic risk	1	Populations small and isolated.
Climate change	1	At southern end of range so exceptionally vulnerable.
Anthropogenic effects	1	1 Critical, 3 High factors.
Average	1.3	9/7.
Certainty (1-4)	4	Well documented.



Central California Coast Coho Salmon

Recommendations:

- Focus on habitats with high intrinsic recovery potential
- Conservation hatcheries
- Lagunitas Creek
- Work with vineyards and cannabis cultivators
- Special status of Santa Cruz county CCC coho

Metric	Score	Justification
Area occupied	2	Most populations not self-sustaining in long run.
Estimated adult abundance	2	All populations are small, isolated, and may function independently. Most are <100 in most years.
Intervention dependence	1	All populations require intervention to persist and most have intensive management in place or proposed.
Environmental tolerance	1	Coho are among the most sensitive salmonids to environmental conditions.
Genetic risk	1	Populations small and isolated.
Climate change	1	At southern end of range so exceptionally vulnerable.
Anthropogenic effects	1	1 Critical, 3 High factors.
Average	1.3	9/7.
Certainty (1-4)	4	Well documented.



Example: Northern California Summer Steelhead

Major threats:

- Dams
- Agriculture
- Estuary/lagoon alteration
- Climate change

Metric	Score	Justification
Area occupied	2	Much diminished from historical distribution.
Estimated adult abundance	2	Likely fewer than 1,000 adults across the DPS in a given year.
Intervention dependence	3	Require continuous monitoring and significant improvement of habitat and accessibility for recovery.
Environmental tolerance	2	Adults require coldwater refuges and pool habitat with cover that is free from human intervention.
Genetic risk	2	Spatial and temporal segregation between summer and winter fish make this life history susceptible to extinction.
Climate change	1	Highly vulnerable; temperatures and flows already marginal in many areas and summer steelhead require cold water in the warmest months to survive to spawn.
Anthropogenic threats	1	3 High and 5 Medium threats. Sufficient flows and temperatures are rapidly disappearing in the DPS.
Average	1.9	13/7.
Certainty	2-3	Actual numbers of fish poorly known.



Example: Northern California Summer Steelhead

Recommendations:

- Prioritize specific actions to protect summer-run life history
- Restore the Eel River
- Reduce interactions between hatchery and wild fish

Metric	Score	Justification
Area occupied	2	Much diminished from historical distribution.
Estimated adult abundance	2	Likely fewer than 1,000 adults across the DPS in a given year.
Intervention dependence	3	Require continuous monitoring and significant improvement of habitat and accessibility for recovery.
Environmental tolerance	2	Adults require coldwater refuges and pool habitat with cover that is free from human intervention.
Genetic risk	2	Spatial and temporal segregation between summer and winter fish make this life history susceptible to extinction.
Climate change	1	Highly vulnerable; temperatures and flows already marginal in many areas and summer steelhead require cold water in the warmest months to survive to spawn.
Anthropogenic threats	1	3 High and 5 Medium threats. Sufficient flows and temperatures are rapidly disappearing in the DPS.
Average	1.9	13/7.
Certainty	2-3	Actual numbers of fish poorly known.



Example: McCloud RRT



Major threats:

- Non-native species
- Long-term drought
- Small population sizes
- Fire
- Climate change

Metric	Score	Justification
Area occupied	1	Four 'core' populations clustered fairly close to each other and all are in Upper McCloud watershed, so are treated as one 'watershed.'
Estimated adult abundance	1	Population prior to the 2012-2016 drought was likely somewhat less than 3,000 fish over 80 mm FL, with each stream having 100-1,000 fish. In drought years, total numbers of fish over 80mm FL was likely less than 1,250 fish.
Intervention dependence	2	Drought necessitated rescue of several populations and relocation to holding facilities until natural conditions improved; ongoing implementation and recent revision and expansion of a Conservation Strategy is critical for survival.
Tolerance	3	It is likely they are fairly tolerant of high temperatures, as are other redband trout, but water quality in their small streams has to be monitored during drought years.
Genetic risk	1	Hybridization risk with rainbow trout is high; small isolated populations result in genetic bottlenecks and inbreeding depression.
Climate change	1	Vulnerability is high in all streams because of small size and cumulative effects of a changing climate and drought.
Anthropogenic threats	2	1 High and 4 Medium threats.
Average	1.4	10/7.
Certainty (1-4)	4	Most published information is on Sheepheaven Creek population, though recently more studies have come from Edson, Moosehead, and Swamp creeks habitats.

Example: McCloud RRT



Recommendations:

- Establish refuge populations
- Develop genetic management plan
- Enhance existing habitats
- Regular population monitoring

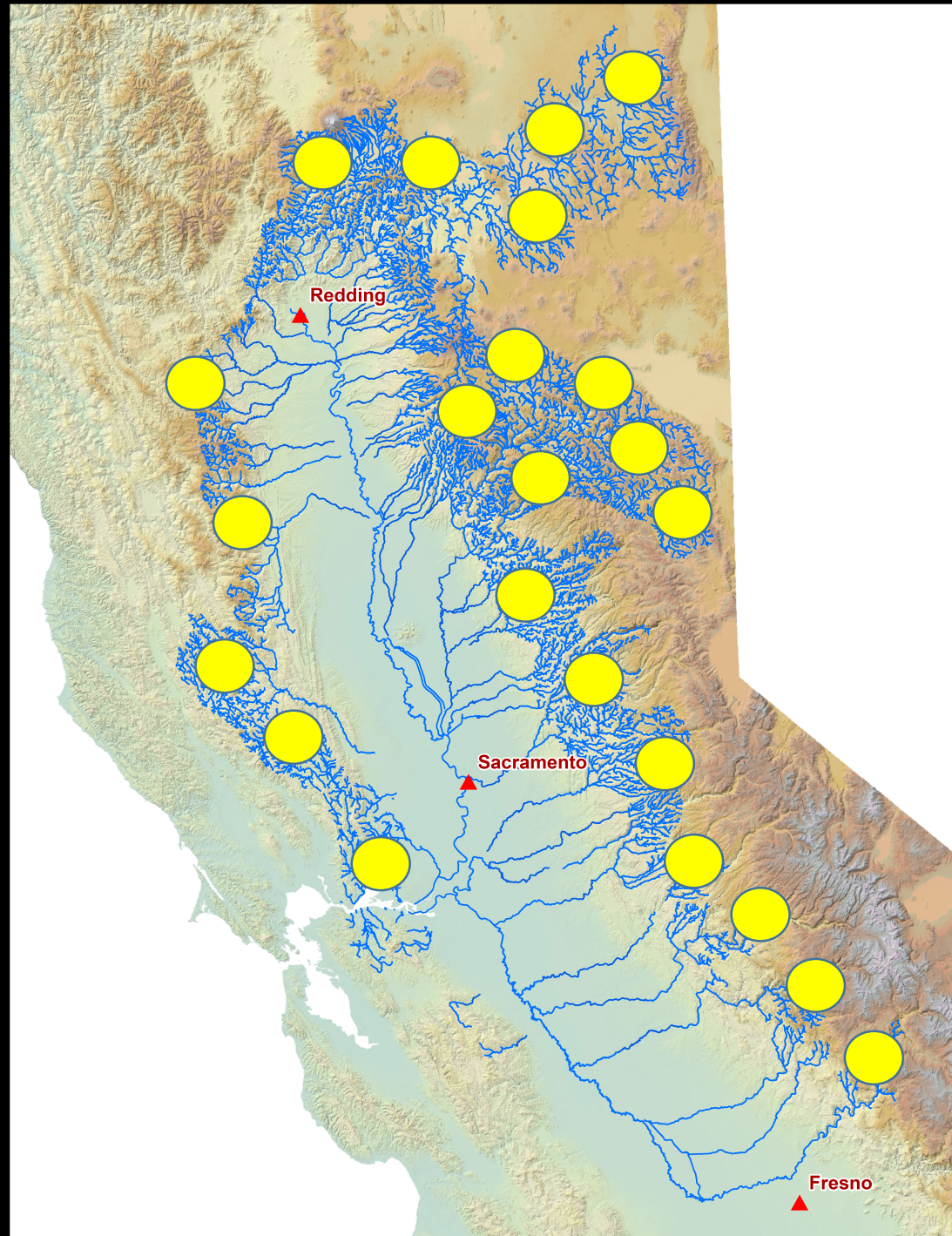
Metric	Score	Justification
Area occupied	1	Four 'core' populations clustered fairly close to each other and all are in Upper McCloud watershed, so are treated as one 'watershed.'
Estimated adult abundance	1	Population prior to the 2012-2016 drought was likely somewhat less than 3,000 fish over 80 mm FL, with each stream having 100-1,000 fish. In drought years, total numbers of fish over 80mm FL was likely less than 1,250 fish.
Intervention dependence	2	Drought necessitated rescue of several populations and relocation to holding facilities until natural conditions improved; ongoing implementation and recent revision and expansion of a Conservation Strategy is critical for survival.
Tolerance	3	It is likely they are fairly tolerant of high temperatures, as are other redband trout, but water quality in their small streams has to be monitored during drought years.
Genetic risk	1	Hybridization risk with rainbow trout is high; small isolated populations result in genetic bottlenecks and inbreeding depression.
Climate change	1	Vulnerability is high in all streams because of small size and cumulative effects of a changing climate and drought.
Anthropogenic threats	2	1 High and 4 Medium threats.
Average	1.4	10/7.
Certainty (1-4)	4	Most published information is on Sheepheaven Creek population, though recently more studies have come from Edson, Moosehead, and Swamp creeks habitats.

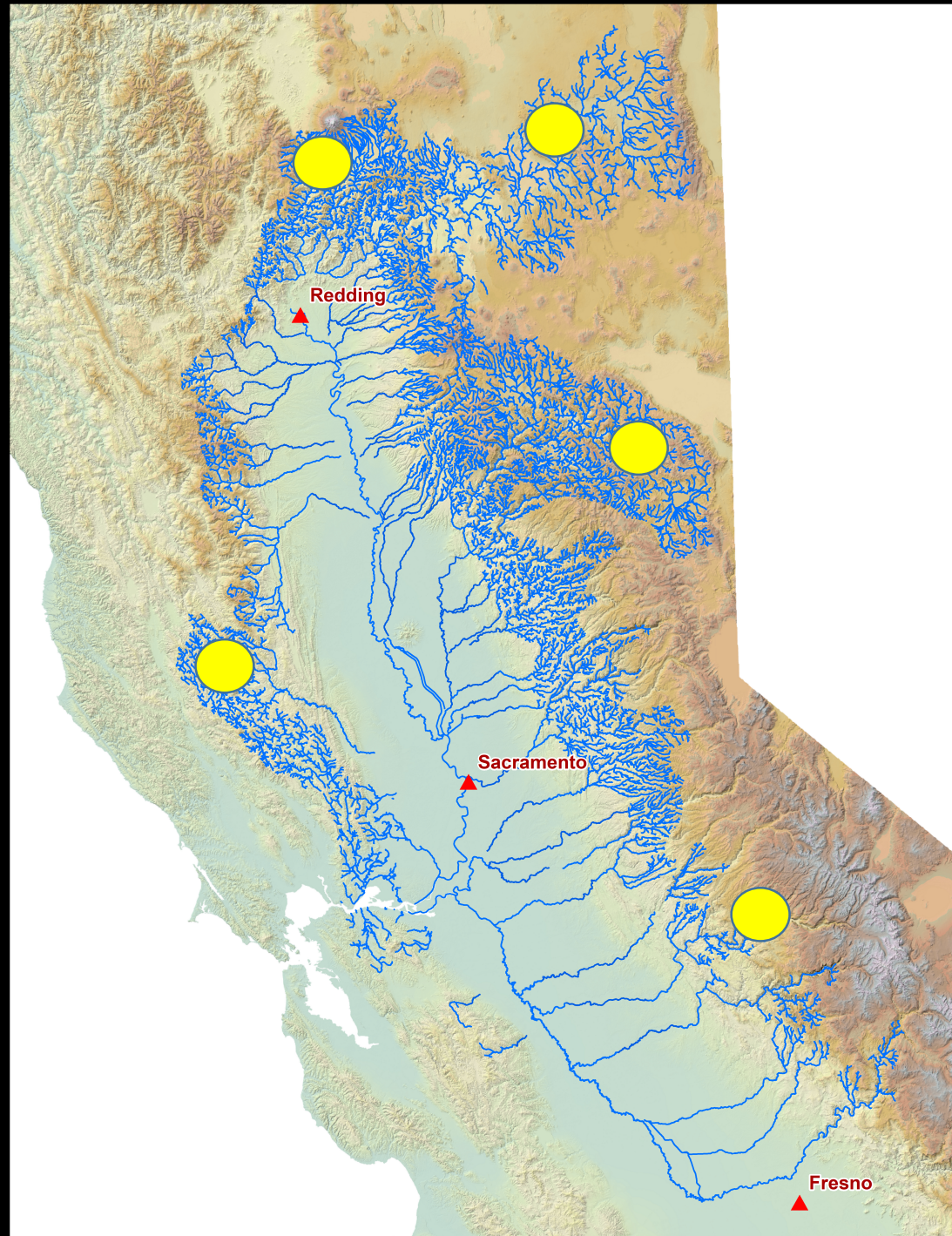
Summary of most imperiled species (status score <1.9)

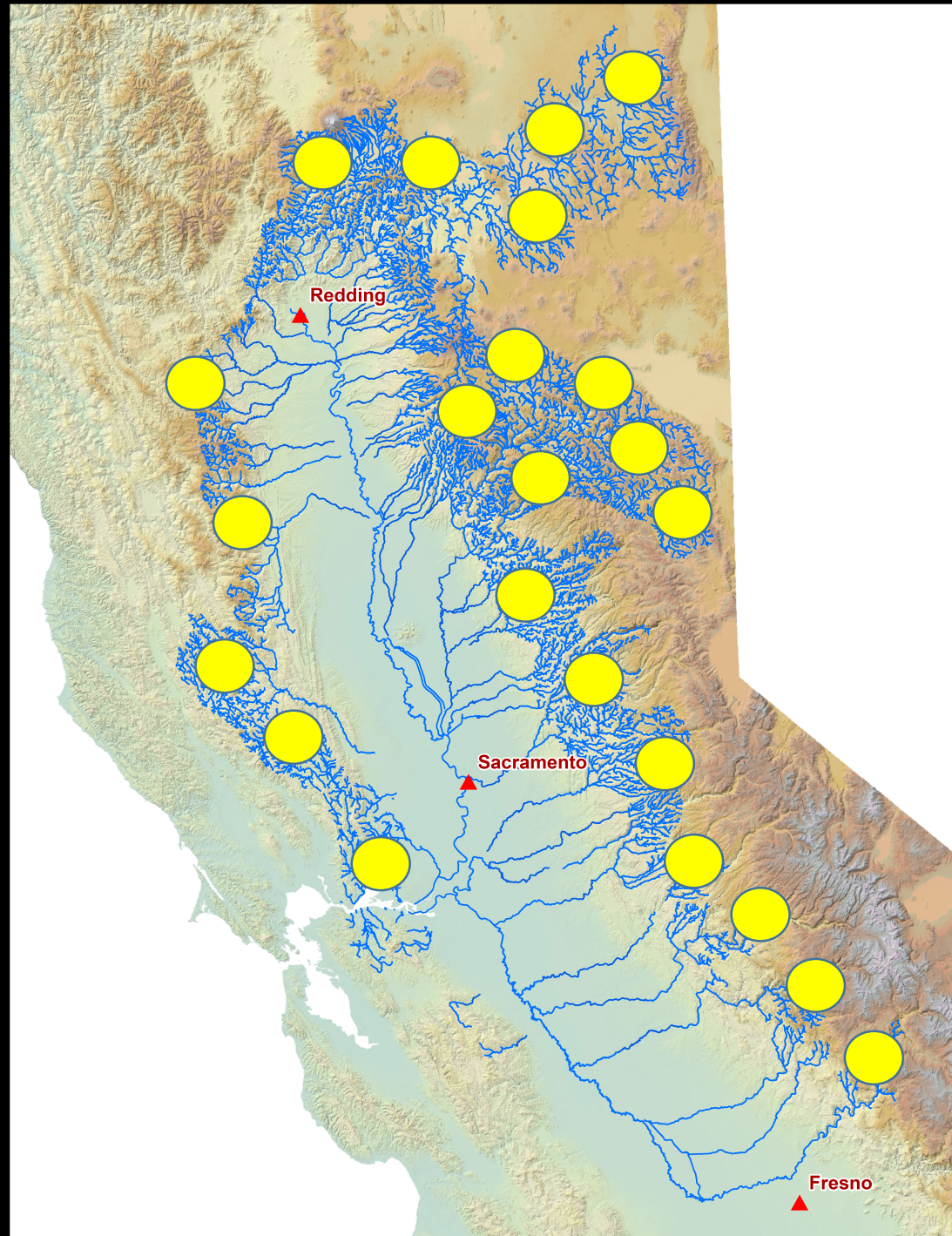
- Central Valley winter-run Chinook
- Central Valley spring-run Chinook
- Central California Coast coho
- SONCC coho
- Upper Klamath spring-run Chinook
- Upper Klamath summer steelhead
- Northern California summer steelhead
- South-central California coast steelhead
- Southern steelhead
- California golden trout
- Kern River rainbow trout
- McCloud River rainbow trout

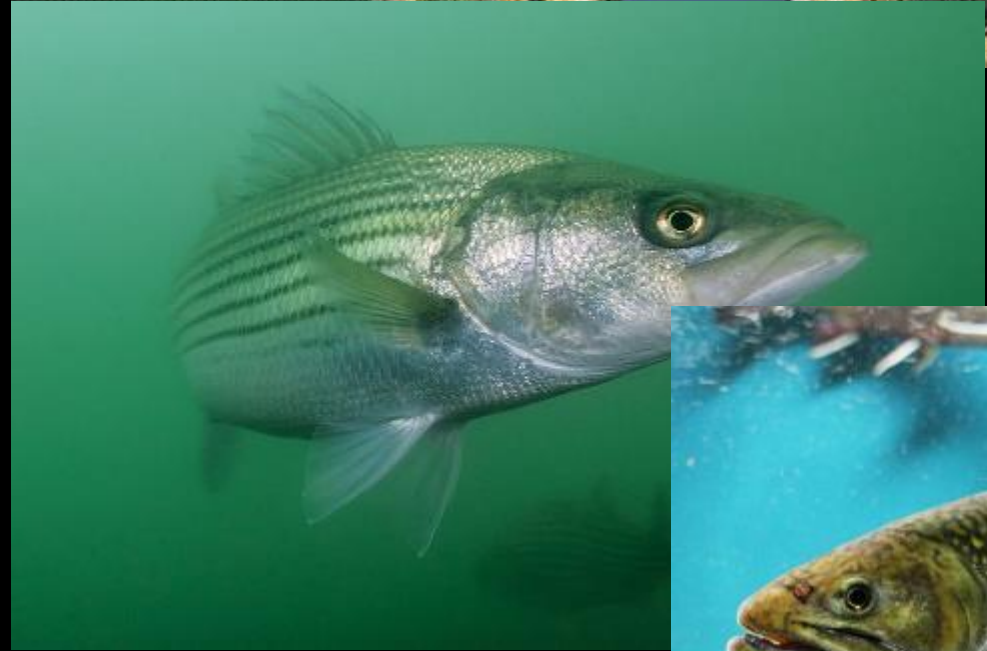


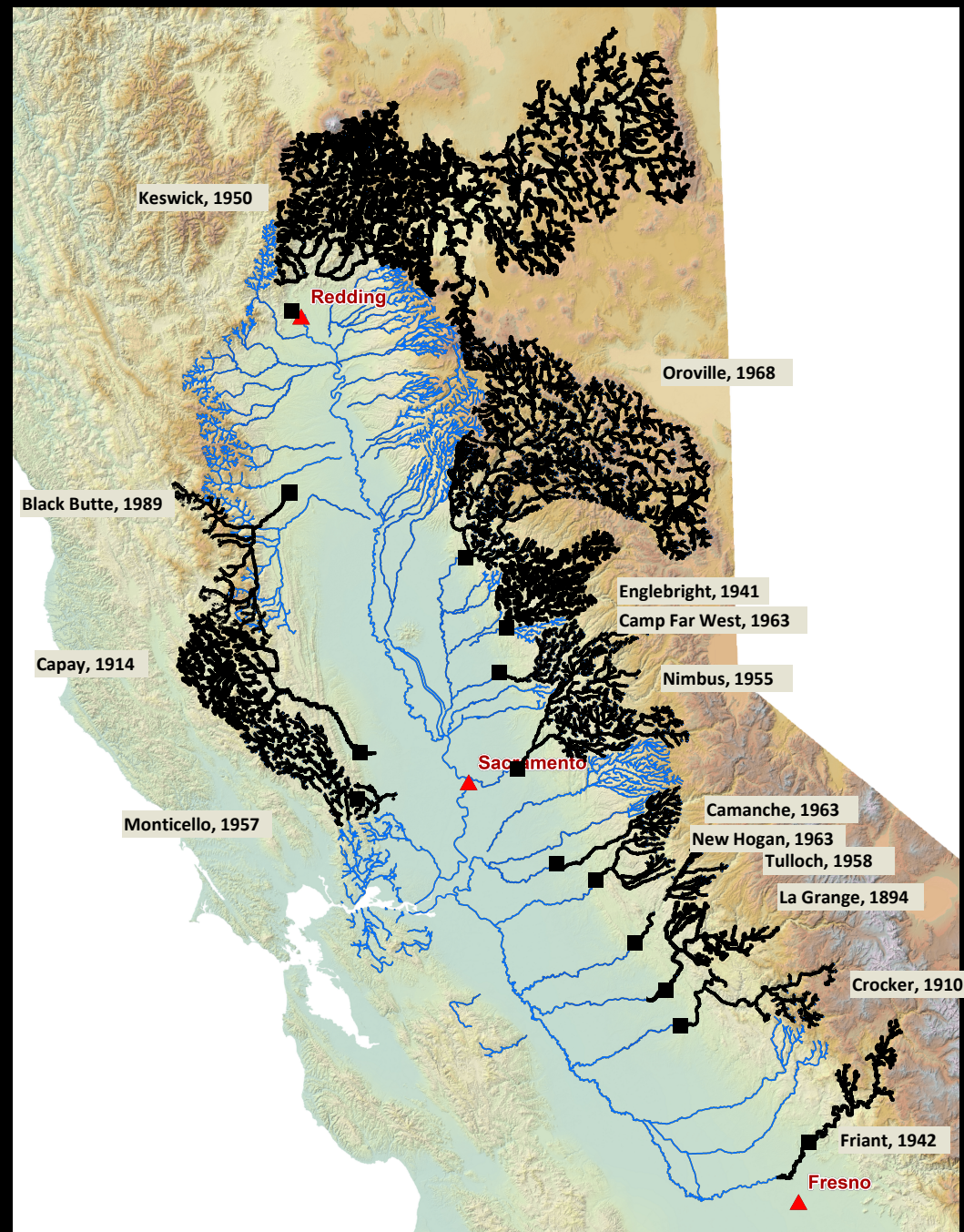












Restoring Salmonid Population Resiliency

Places



Strategies



Places: Strongholds



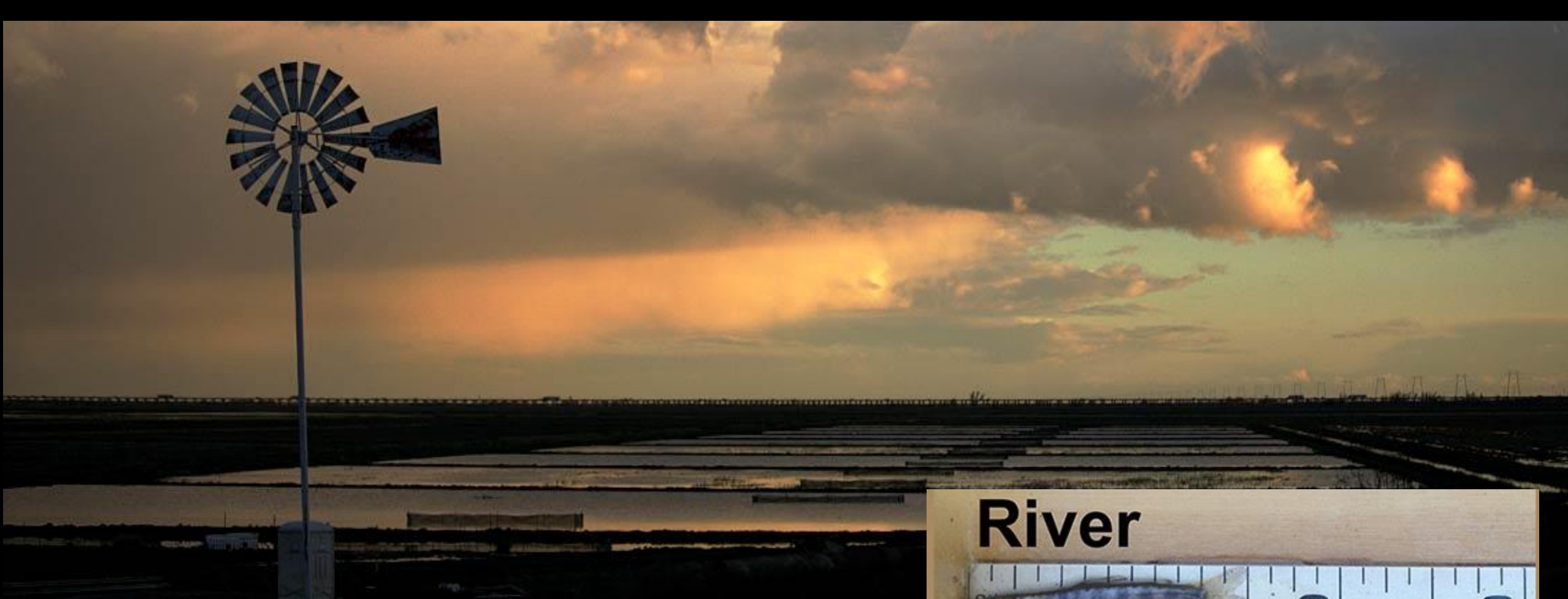
Places: Source Waters



Places: Productive and Diverse habitats







Strategies: Adopt Reconciliation Ecology



Strategies: Provide habitat connectivity and passage to historical habitat



Strategies: Improve Genetic Management



Thank you and acknowledgements

