WF4313/6413-Fisheries Management

Class 22

Announcements

PANTHERA · VIRGINIA TECH · AMERICAN MUSEUM OF NATURAL HISTORY · CUNY THE CITY UNIVERSITY OF NEW YORK

Carnivores in a Changing World: New Perspectives

Research Seminar
3:00pm, November 29, 2018
A100 – Tully

Claudia Wultsch, PhD
City University of New York, NY, US

Revised Schedule**

- ~~November 27th –No lab work on your briefs~~
- DRAFT Due 11/30/2018 by 5pm!
- December 4th Brief presentations during lab.
- Final Exam 12/11 @ 8am

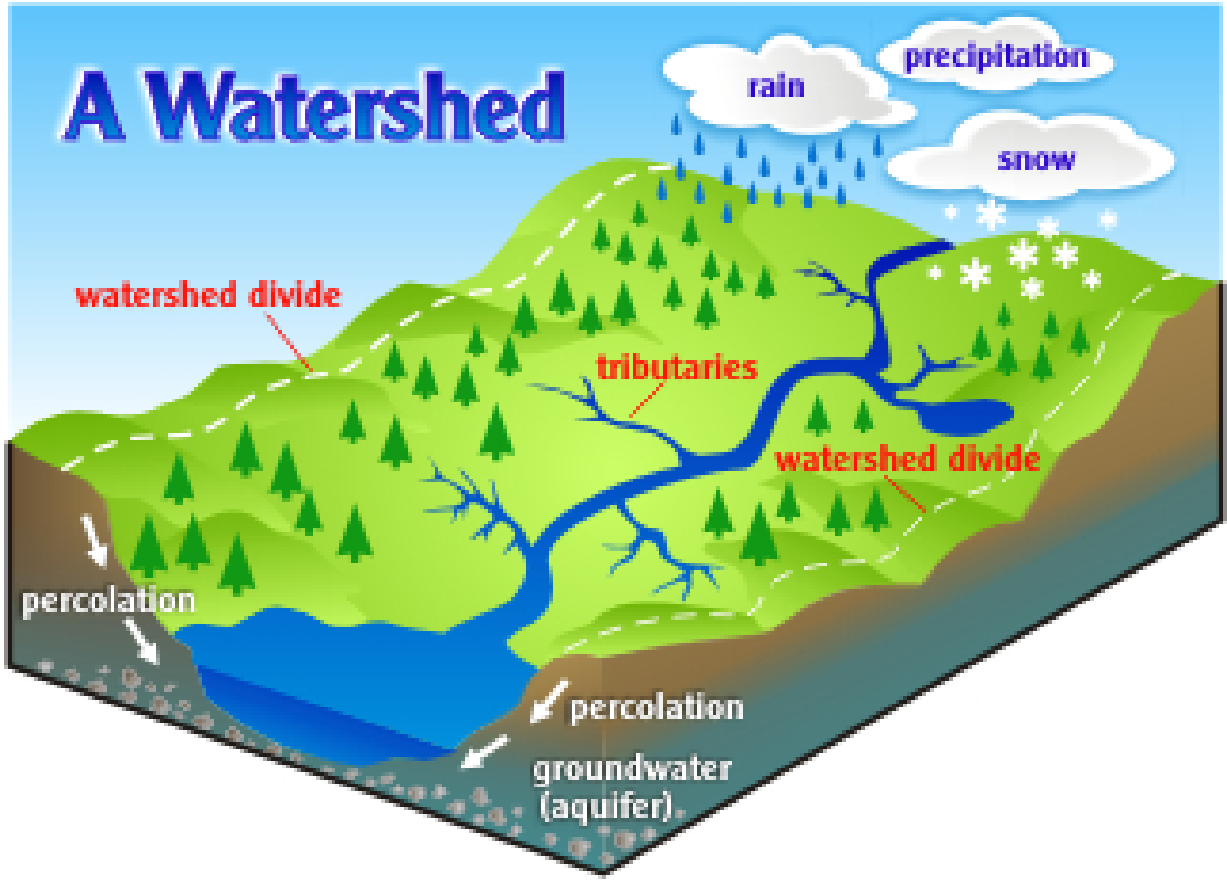

WHERE WE LEFT OFF

Methods of Eradication & Control

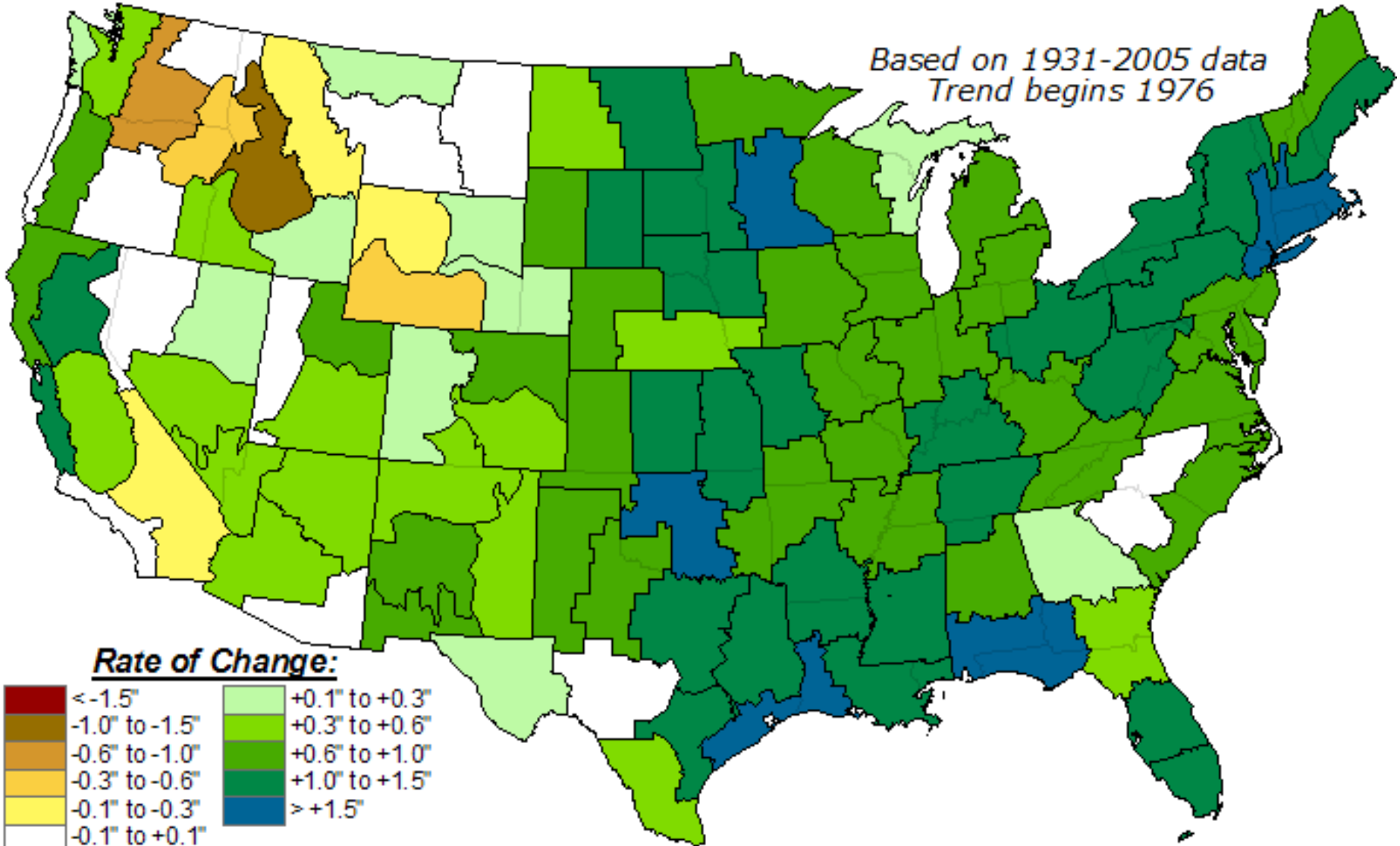
- Chemicals
  - Rotenone, Lampricide
- Physical
  - Traps, nets, explosives, water level, electrofishing, commercial fishing
- Biological
  - Predator & prey, pathogens, daughterless technologies, pheromones

Climate change & water

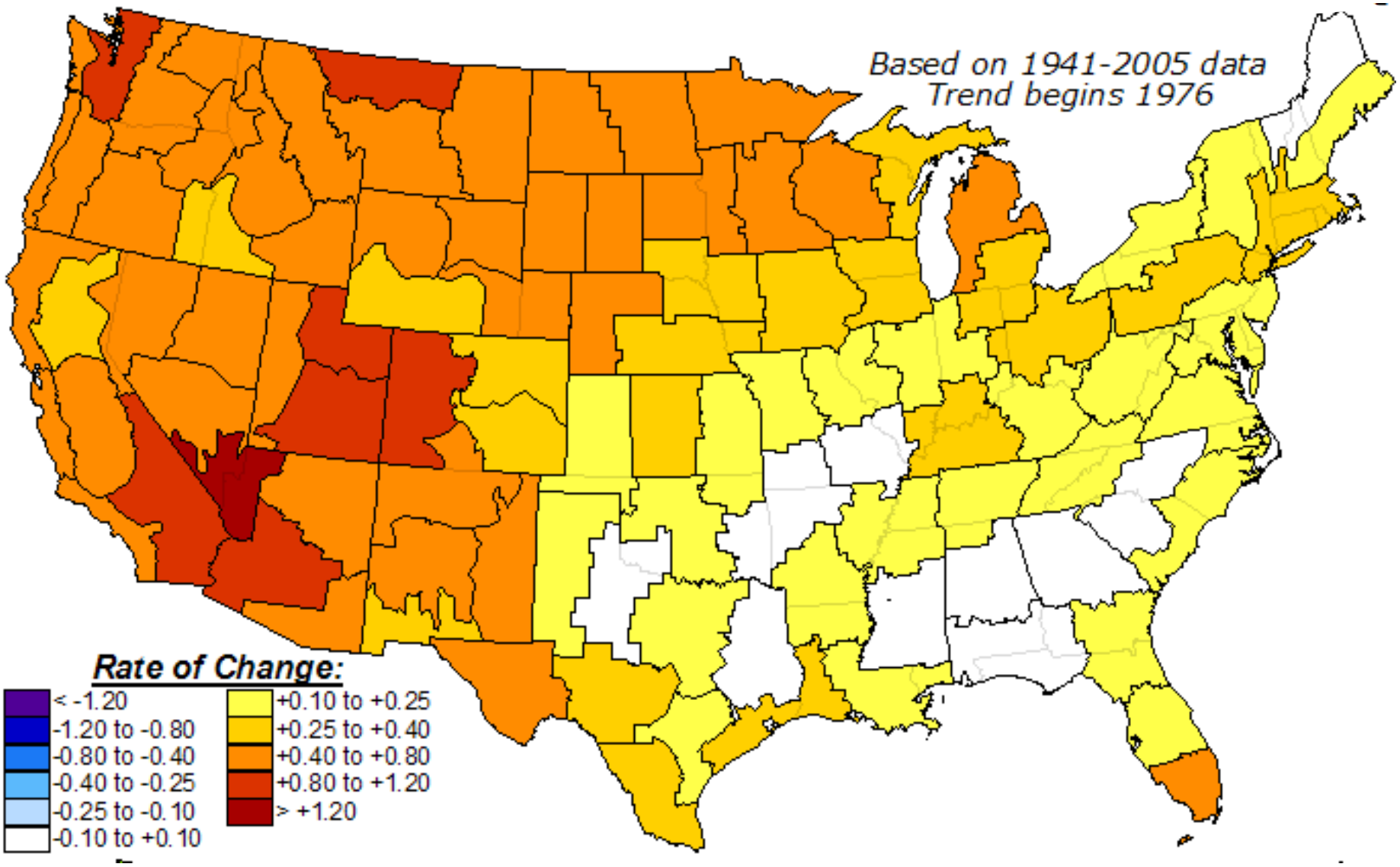
- Amount
- Temperature

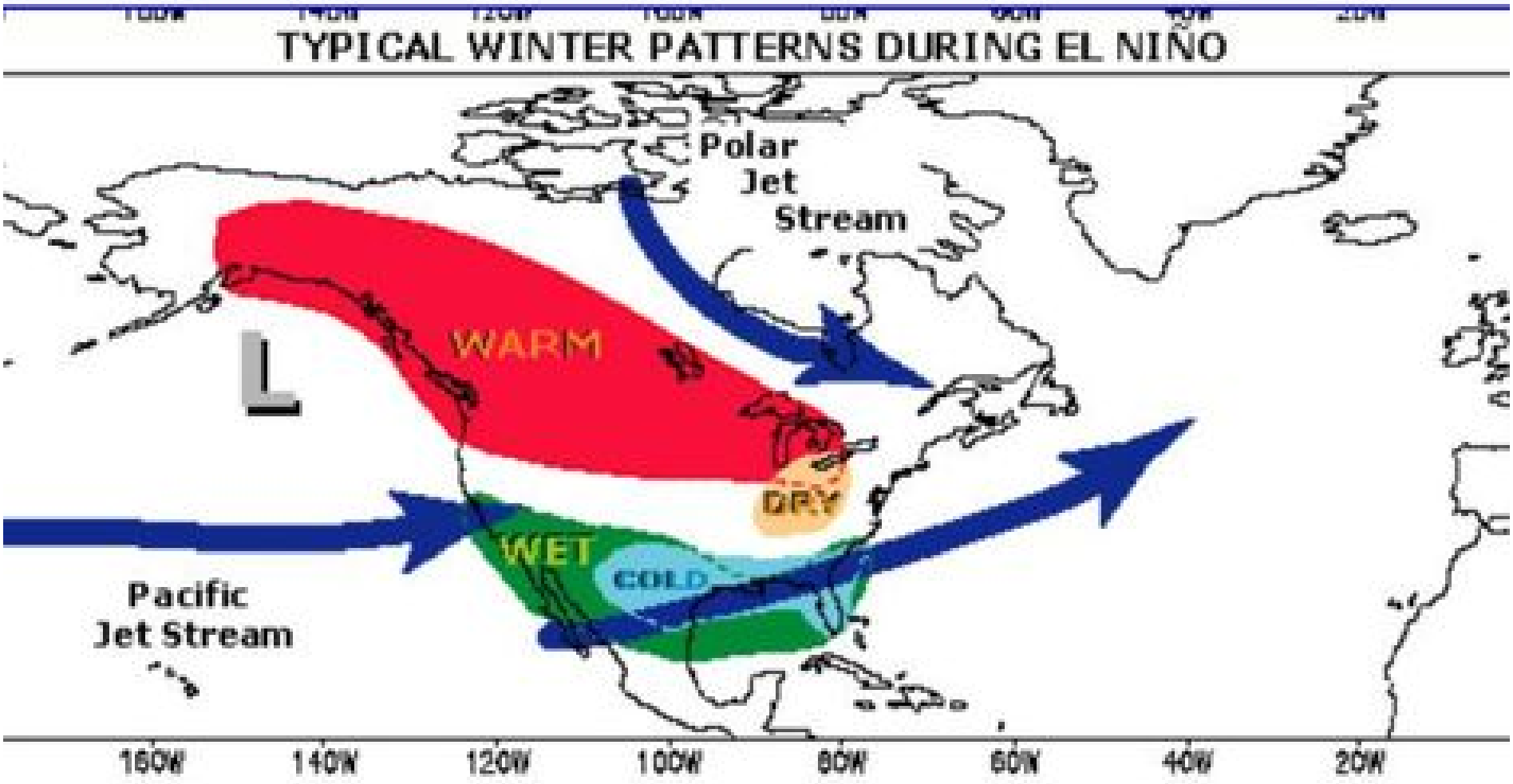


Precipitation trends

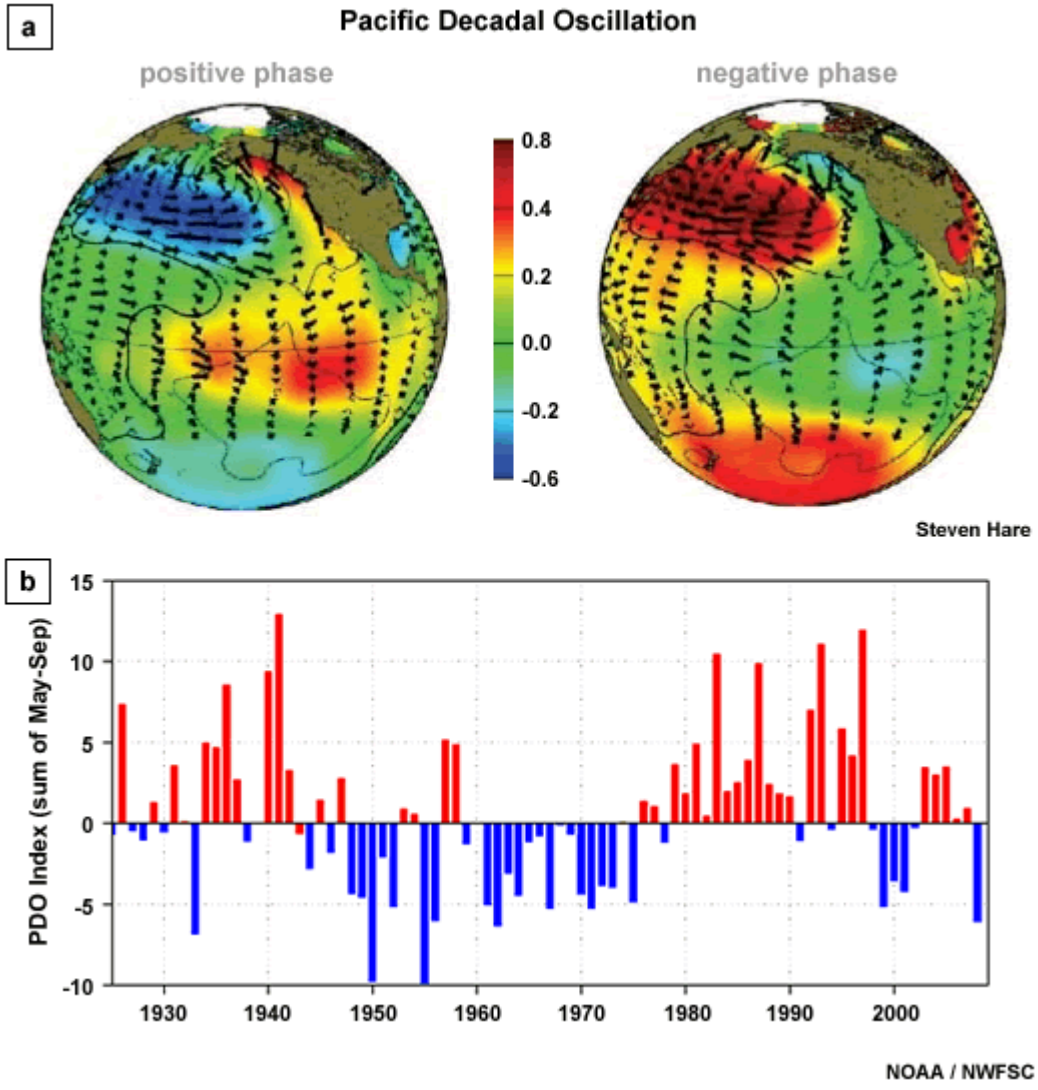


Temperature trends




TYPICAL WINTER PATTERNS DURING EL NIÑO
Polar
Jet
Stream
L
WARM
DRY
WET
COLD
Pacific
Jet Stream
160W
140W
120W
100W
80W
60W
40W
20W

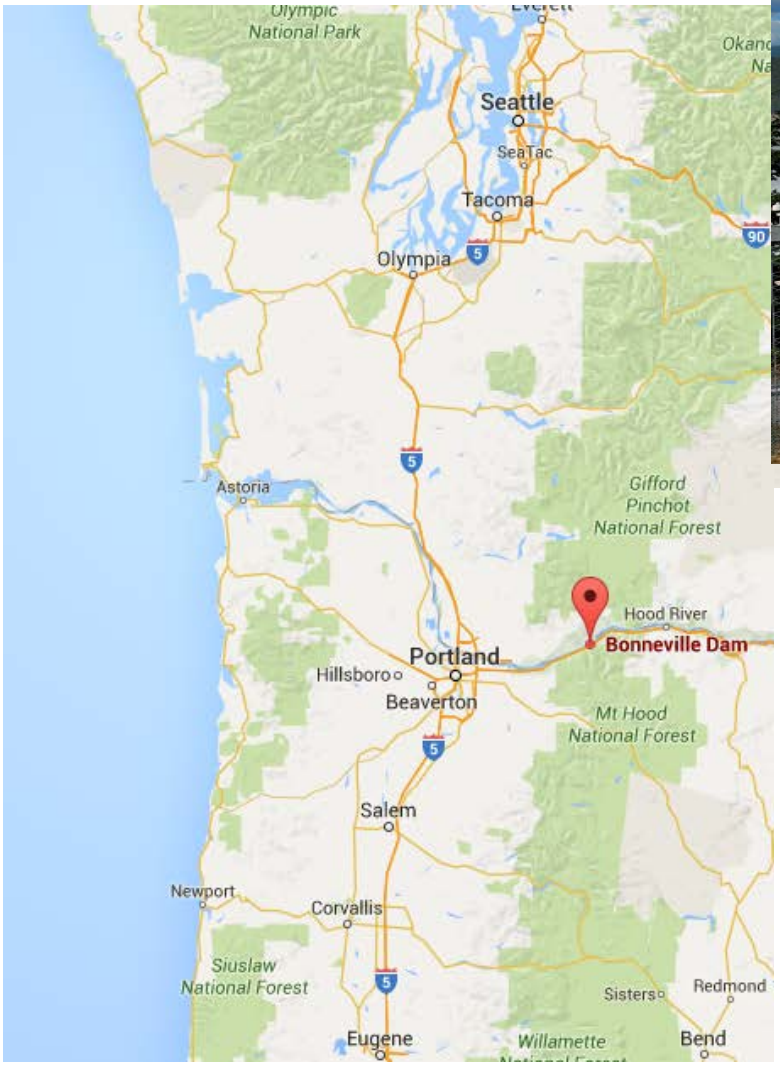
Pacific decadal oscillation

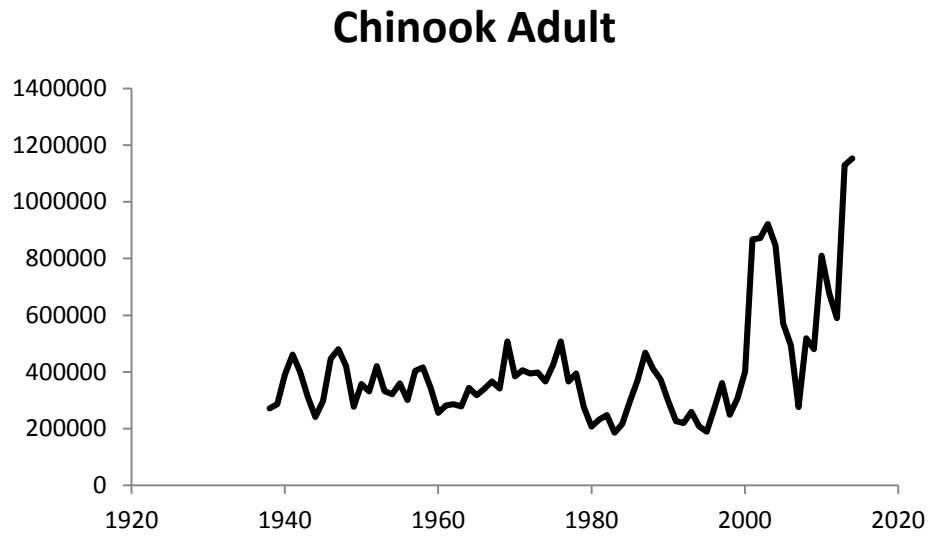


It is difficult to evaluate tease apart the effect of climate, fishery management, & population dynamics without long time series of data.

CLIMATE CHANGE & MANAGEMENT CONTINUED

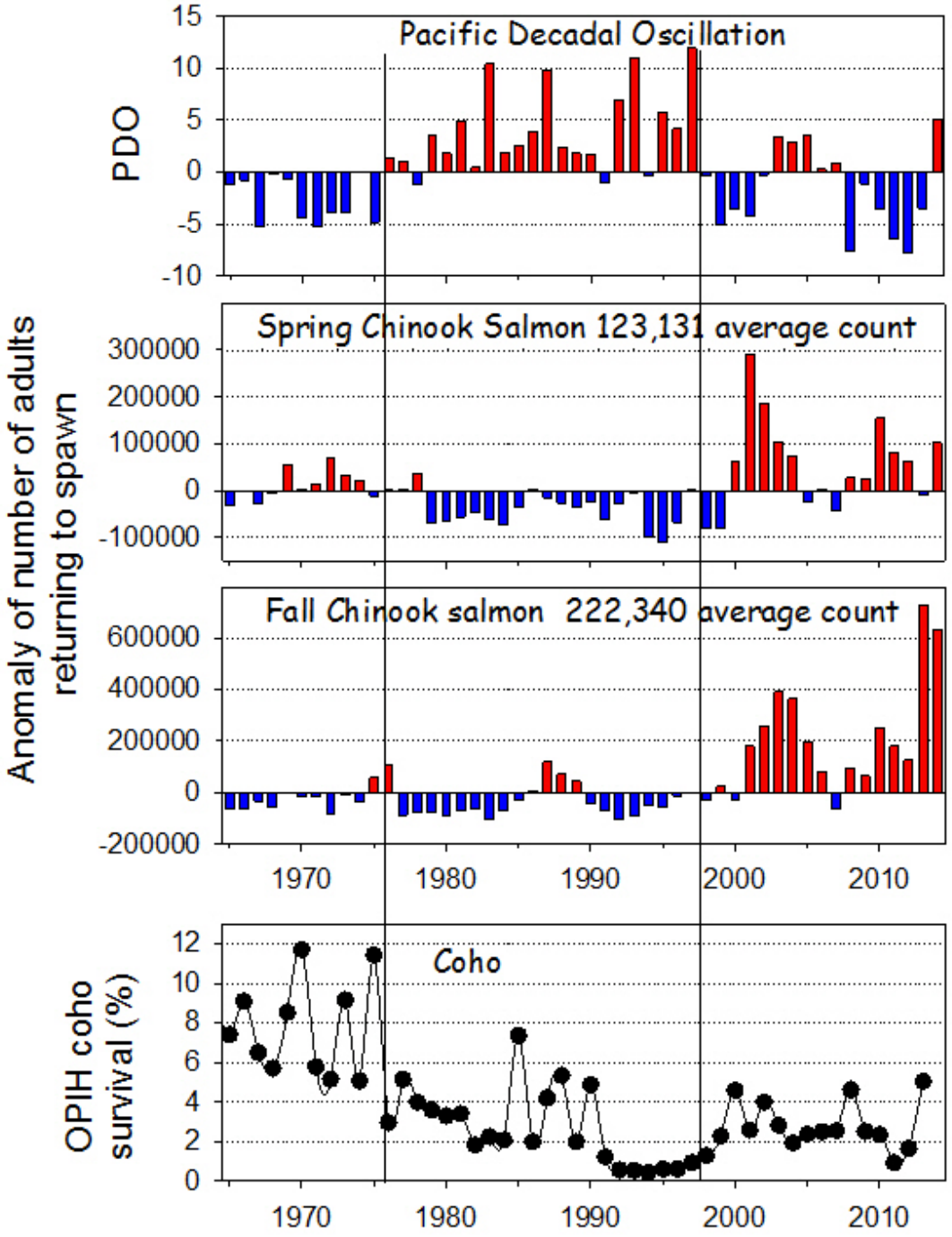
Pacific decadal oscillation





Salmon

- Columbia stocks
- Passing Bonneville Dam



UW TODAY

January 14, 2013

Salmon runs boom, go bust over centuries

Sandra Hines

News and Information

Salmon runs are notoriously variable: strong one year, and weak the next. New research shows that the same may be true from one century to the next.

Scientists in the past 20 years have recognized that salmon stocks vary not only year to year, but also on decades-long time cycles. One example is the 30-year to 80-year booms and busts in salmon runs in Alaska and on the West Coast driven by the climate pattern known as the Pacific Decadal Oscillation.

Now work led by University of Washington researchers reveals those decadal cycles may overlay even more important, centuries-long conditions, or regimes, that influence fish productivity. Cycles lasting up to 200 years were found while examining 500-year records of salmon abundance in Southwest Alaska. Natural variations in the abundance of spawning salmon are as large those due to human harvest.

Researchers gathered sediment cores from lakes in 16 major watersheds in southwestern Alaska. ***Lauren Rogers/U of Washington***

Cycles lasting up to 200 years were found while examining 500-year records of salmon abundance in Southwest Alaska. Natural variations in the abundance of spawning salmon are as large those due to human harvest.

A take home message

Recruitment camps:

1. Climate driven
2. Spawner driven

Need both…

Minimize excessive recruit overfishing so when conditions are good recruitment can happen…

Coolwater species received most attention

Effects on predation and so on unexplored…

EFFECTS ON FISHERIES

Effects on fish & fisheries

1. Fishery closures
2. Movement of fish stocks
3. Disease
4. And more…

Dozens of sturgeon found dead in Columbia River

Originally published July 16, 2015 at 6:56 am | *Updated July 16, 2015 at 12:23 pm*

Sophia Murillo of Kennewick, left, and Frank Carr of Sequim wade into the Columbia River Wednesday to check out an estimated seven-foot long dead sturgeon at the east end of Pasco's Wade Park near Road 39. State fish... (Bob Brawdy/Tri-City Herald) **More**

Washington Fish and Wildlife officials have received repeated reports of dead sturgeon this week on the Columbia River, but the exact cause of death remains a mystery.

http://www.seattletimes.com/seattle-news/dozens-of-sturgeon-found-dead-in-columbia-river/

Hoot owl closures

Heat wave spells early trouble for Montana trout

JUNE 24, 2015 BY LAURA LUNDQUIST

River levels are dropping rapidly as summer temperatures continue to climb, and both trends spell trouble for Montana's trout. As Montana Fish, Wildlife & Parks prepares for fishing closures, anglers can do some things to help fish out.

By Saturday, high temperatures are predicted to top 100 degrees and stay that way at least through Wednesday for parts of western Montana. That's 20 to 25 degrees above normal for this time of year and the extended heat wave will break records,

Hoot owl

FISHING

Go fishing: Hoot owl restrictions lifted on some western Montana rivers

AUGUST 19, 2015 8:52 PM • BY PERRY BACKUS

Longer nights and cooler water temperatures mean an end to fishing restrictions on three of western Montana's most favored trout rivers.

Montana Fish, Wildlife and Parks lifted "hoot owl" restrictions on the Bitterroot, the entire main stem of the Blackfoot and the Clark Fork, downstream of the Rock Creek confluence Wednesday.

The rivers had been under the restrictions that prohibit fishing from 2 p.m. to midnight since July 3 in an effort to reduce the impact on drought-stressed trout.

FWP's Bitterroot fisheries biologist Chris Clancy said this has been an unusual summer temperature-wise.

"On most years, you could bet money and win that peak water temperatures would appear sometime in the last week of July or first week of August," Clancy said. "This year, the temperatures peaked in late June, early July. It looked really grim for trout back then."

Some timely rains and periodic breaks in the heat made a difference this summer for the Bitterroot River.

"It really didn't turn out all that badly this year," Clancy said.

The state begins to consider instituting "hoot owl" restrictions when water temperatures go over 72 degrees for three consecutive days. Temperatures need to drop below 70 degrees for the same amount of time before the restrictions are withdrawn.

While the upper reaches of the Bitterroot remained cooler due to releases from Painted Rock Reservoir this summer, Clancy said the river downstream of Hamilton started hitting 73 degrees in late June.

In the same time period, water temperatures rose to 76 degrees in the lower reaches of the Bitterroot River near Missoula.

"Trout really don't like 70-degree water all that well," Clancy said.

The preferred water temperature for rainbow and brown trout is around 55 to 65 degrees. Temperatures in the mid 60s are stressful to native bull and westslope cutthroat trout.

Movement

Warmer waters shake up Shore fishing

JANUARY 4, 2015, 10:15 PM LAST UPDATED: SUNDAY, JANUARY 4, 2015, 10:30 PM

BY JAMES M. O'NEILL
STAFF WRITER | THE RECORD

PATRICK FLANAGAN/SPECIAL TO THE RECORD

Malin Pinsky, a marine biologist with Rutgers University, has studied how rising ocean temperatures have affected the commercial and recreational fishing industries off the Jersey Shore.

A dramatic rise in ocean temperature is changing the kinds of fish that swim off New Jersey's coast — a development that has significant ramifications for the state's fishing industry and could even alter restaurant menus.

Species that used to be centered off New Jersey, like shad, have shifted north to New England in search of cooler waters. Fish once centered off Virginia, like black sea bass and summer flounder, now swim in abundance off New Jersey.

"We've been seeing unprecedented warming in the ocean over the past several decades," said Malin Pinsky, a marine biologist at Rutgers University who has studied the changes. "Climate change and the warming of ocean waters is not some abstract global problem. We can see the implications right off our shore in New Jersey."

Temperatures had risen one degree every 14 years off New Jersey since the 1970s. In the past decade, warming has accelerated to one degree every 2½ years, Pinsky said.

"Marine fish are very sensitive to a change in temperature — they can only survive in a narrow range, so they are seeking out cooler waters toward the poles and deeper in the ocean," he said. "And deeper generally means farther from shore."

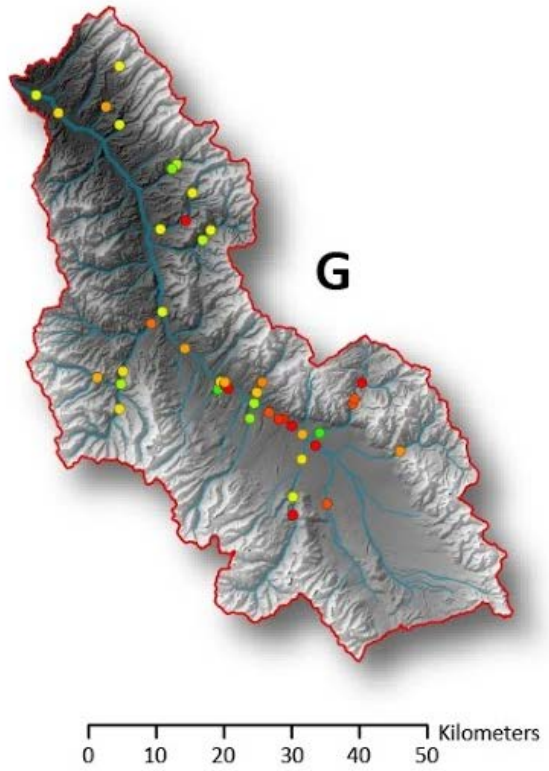
Malin Pinsky, a marine biologist with Rutgers University, has studied how rising ocean temperatures have affected the commercial and recreational fishing industries off the Jersey Shore.

Black sea bass seen at Gray's Reef National Marine Sanctuary in Georgia. The fish once centered off the coast of Virginia are now found in abundance near

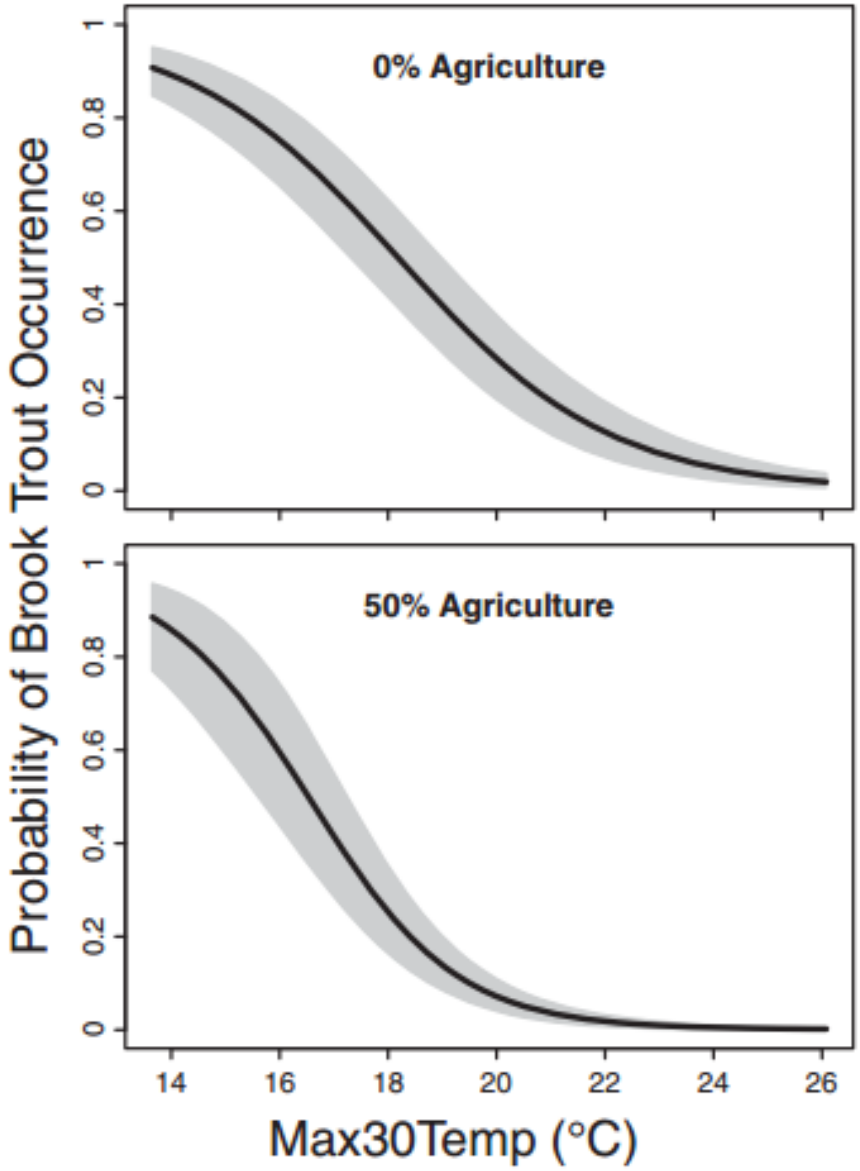
Species like shad have shifted to the north

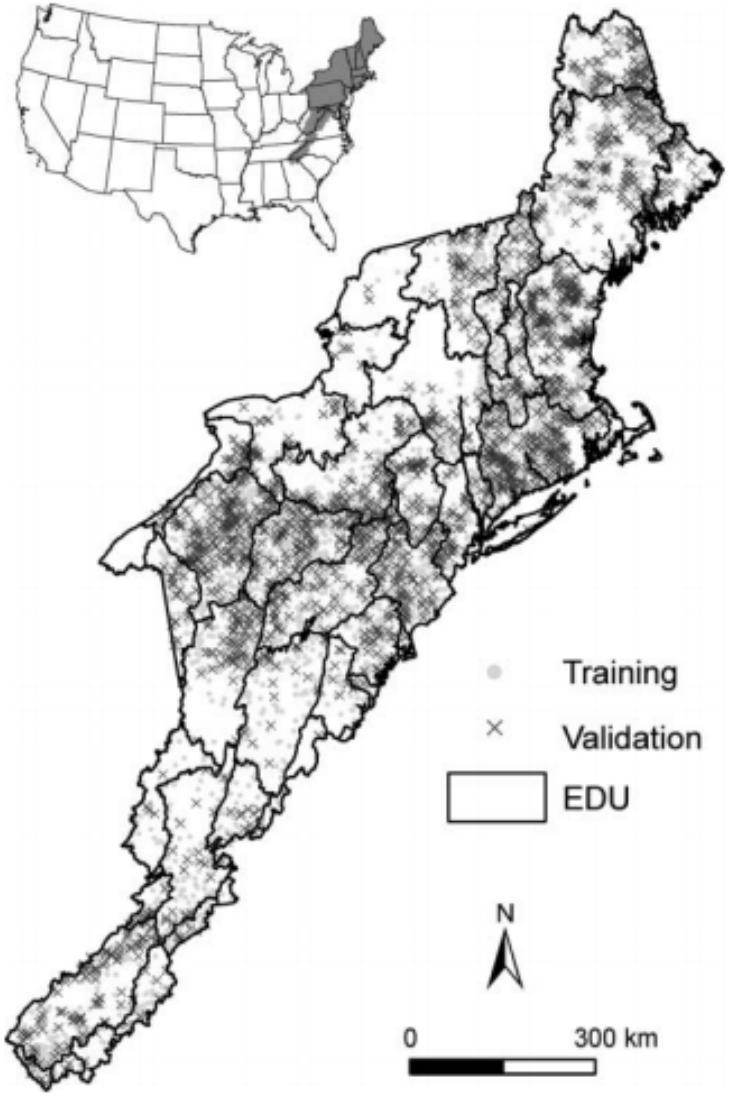
Within stream networks

Move towards cooler water, if available…



Brook trout


0% Agriculture
50% Agriculture
Probability of Brook Trout Occurrence
0
0.2
0.4
0.6
0.8
1
14
16
18
20
22
24
26
Max30Temp (°C)


Training
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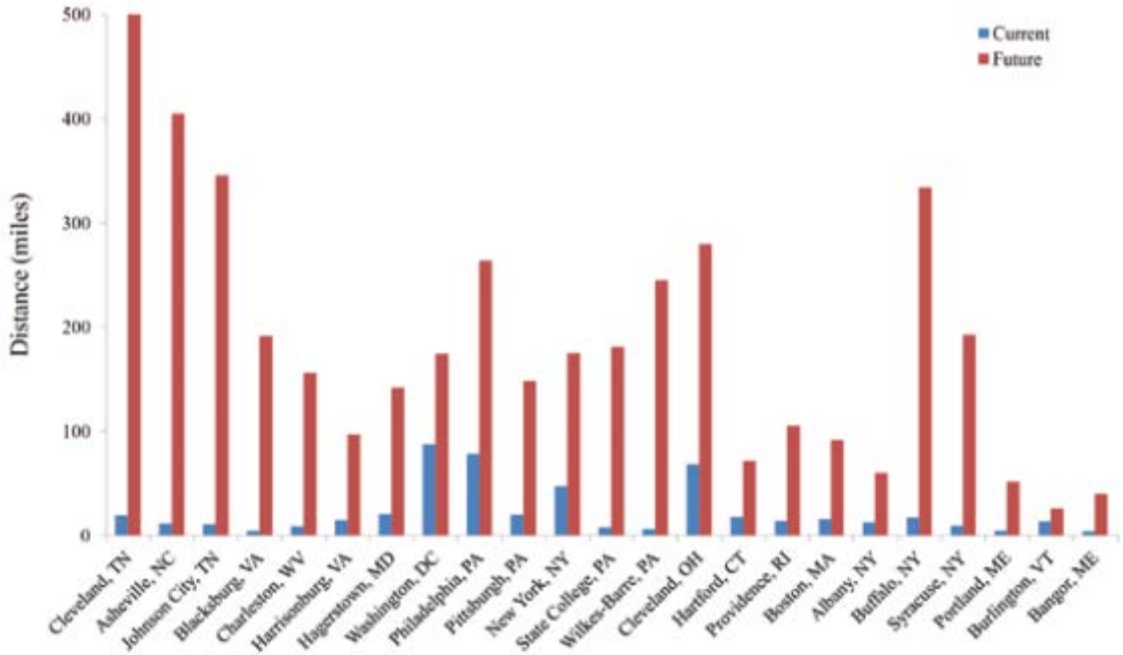
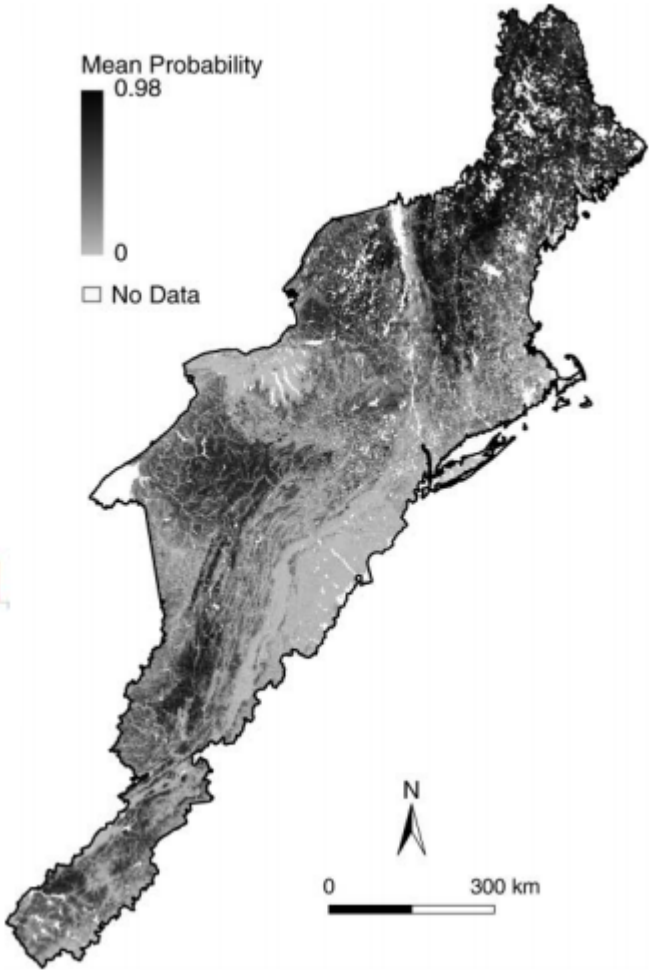
Effect on fisherman





Transport thermal barriers

food for thought

Truckin': Salmon Take A Long, Strange Trip To The Pacific Ocean

MARCH 26, 2014 3:21 AM ET

RICHARD GONZALES

Listen to the Story

Morning Edition

3:57

+ Playlist Download Embed Transcript

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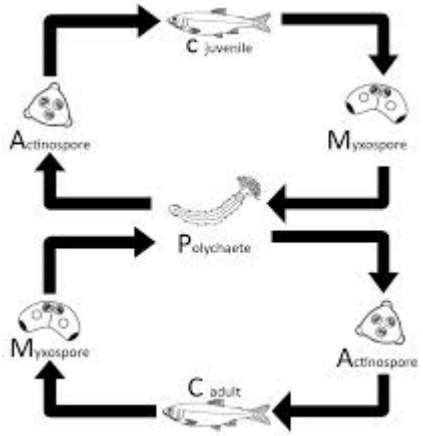
Comment

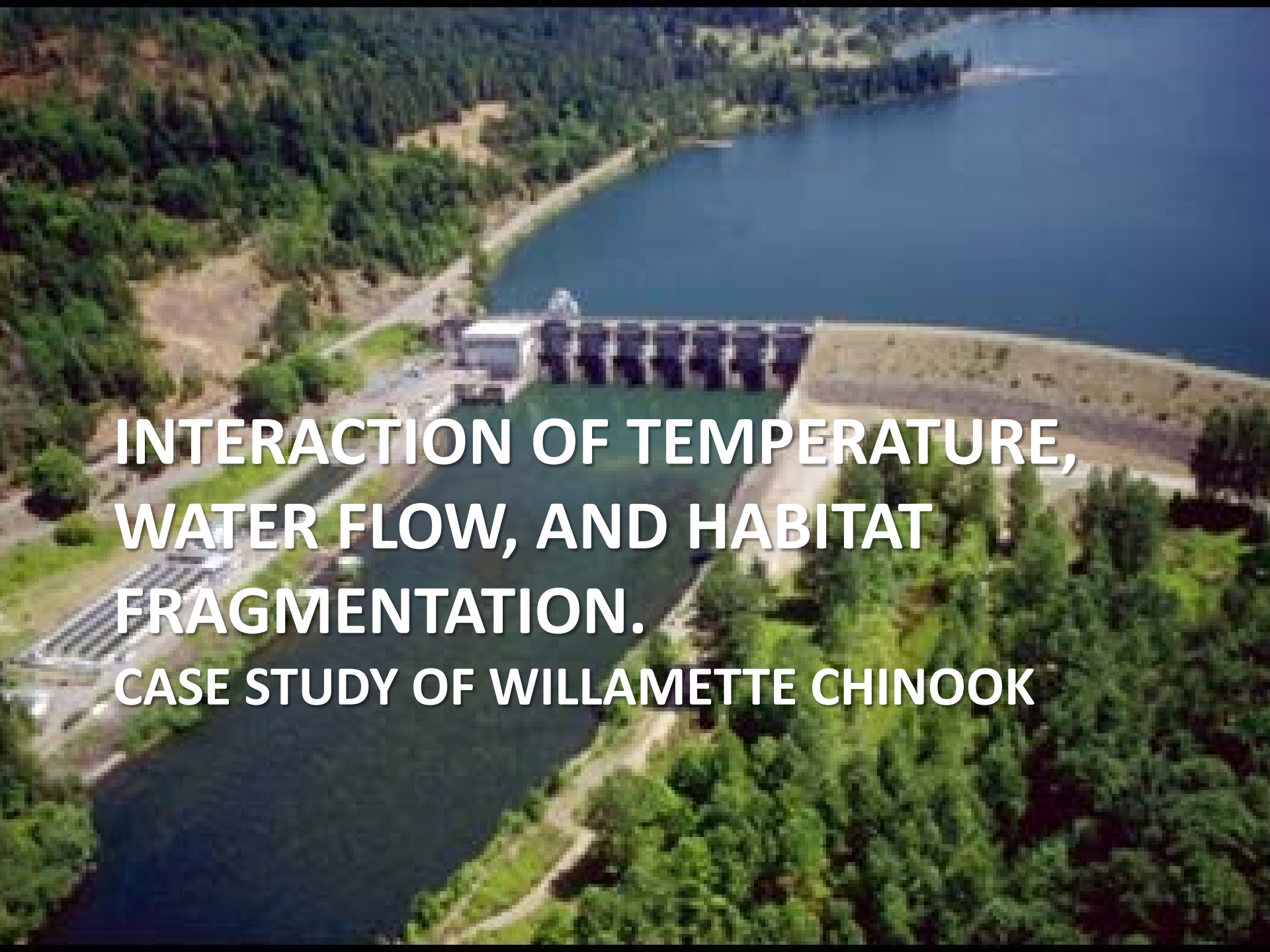
Pacific Or Bust: Fingerling Chinook salmon are dumped into a holding pen Tuesday as they are transferred from a truck into the Sacramento River in Rio Vista, Calif. From here, they'll be towed downstream for a bit, then make their own way out

Disease


Klamath River agreement
An agreement to resolve distribution of water, restore habitat and remove four hydroelectric dams on the upper Klamath River to boost the watershed's salmon population is in peril.
Roseburg
Oregon
Klamath River Basin
Crater Lake
Upper Klamath Lake
Medford
Klamath Falls
Dams
Yreka
Lower Klamath Lake
Clear Lake
Klamath River
Pacific Ocean
California
Trinity River
Trinity Lake
Oregon
Detailed
Nevada
Redding
Calif.
Source: EPA, U.S. Dept. of the Interior, Google Maps, ESRI
Graphic: Los Angeles Times
© 2010 MCT


NO WATER
NO BARLEY
NO BEER?


C juvenile
Actinospore
Myxospore
Polychaete
Myxospore
Actinospore
C adult



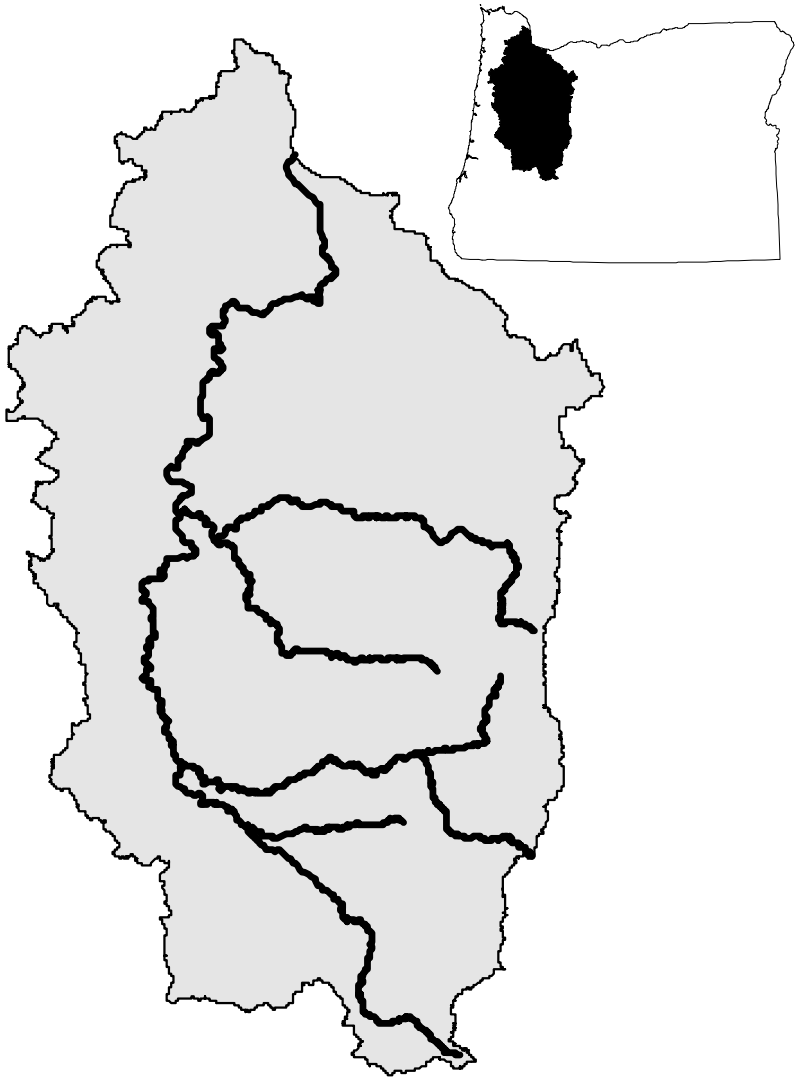
INTERACTION OF TEMPERATURE, WATER FLOW, AND HABITAT FRAGMENTATION.

CASE STUDY OF WILLAMETTE CHINOOK

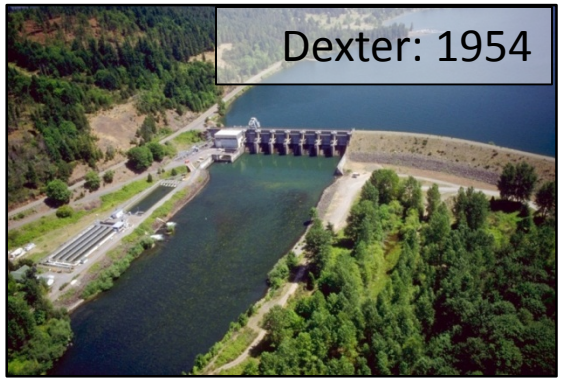
Willamette basin spring Chinook

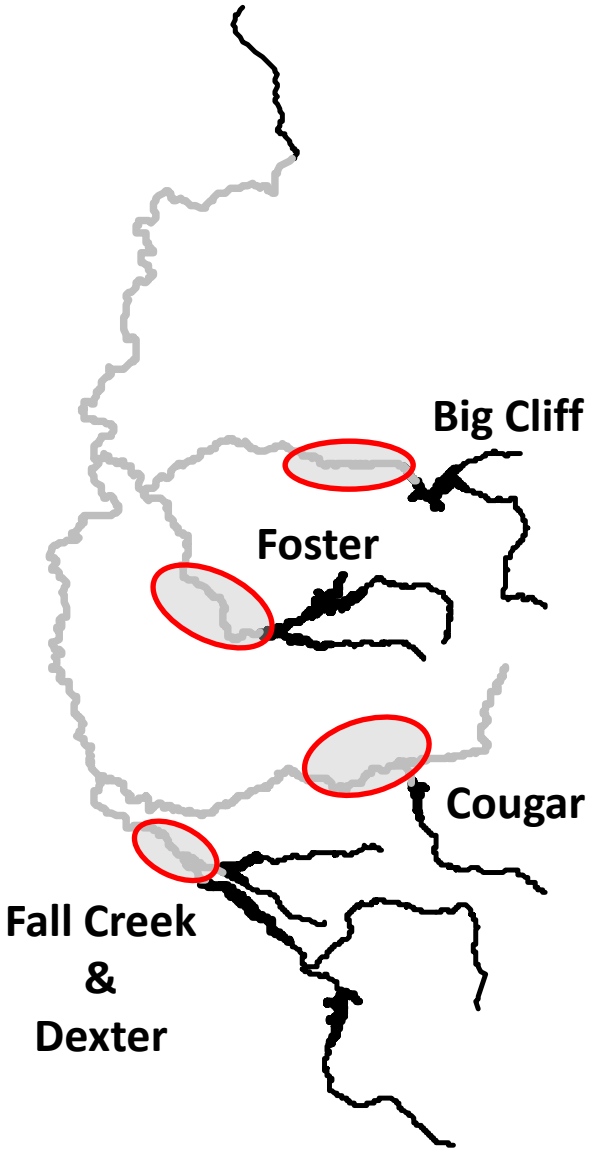
Anadromous species of conservation need

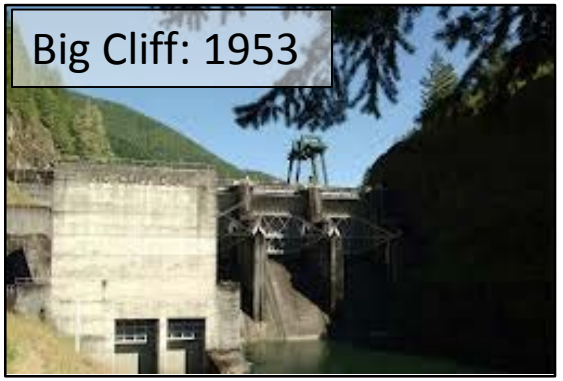
-Threatened status 1999
- Anthropogenic modifications



Limited natural reproduction

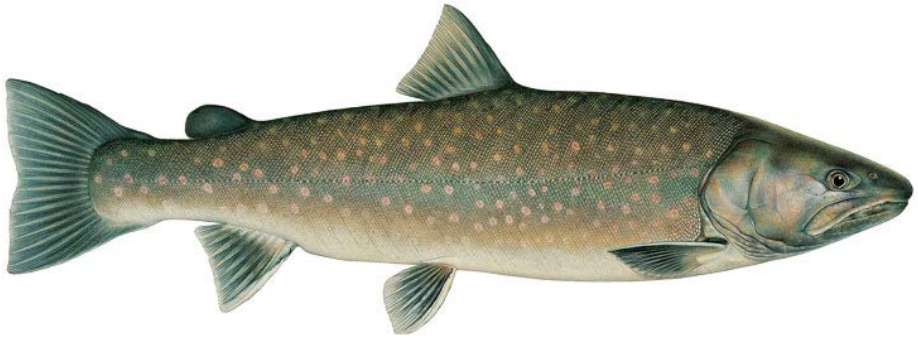


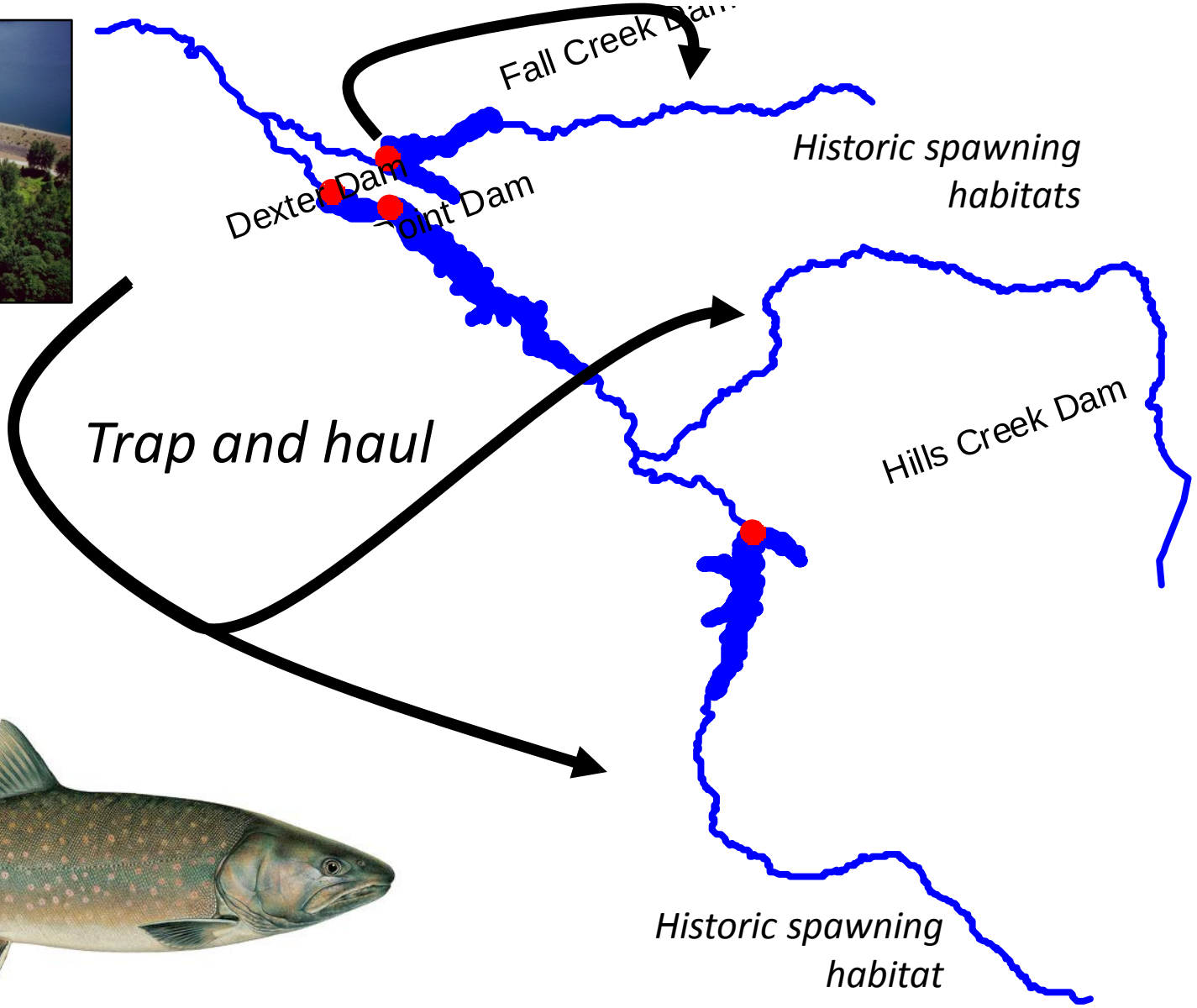




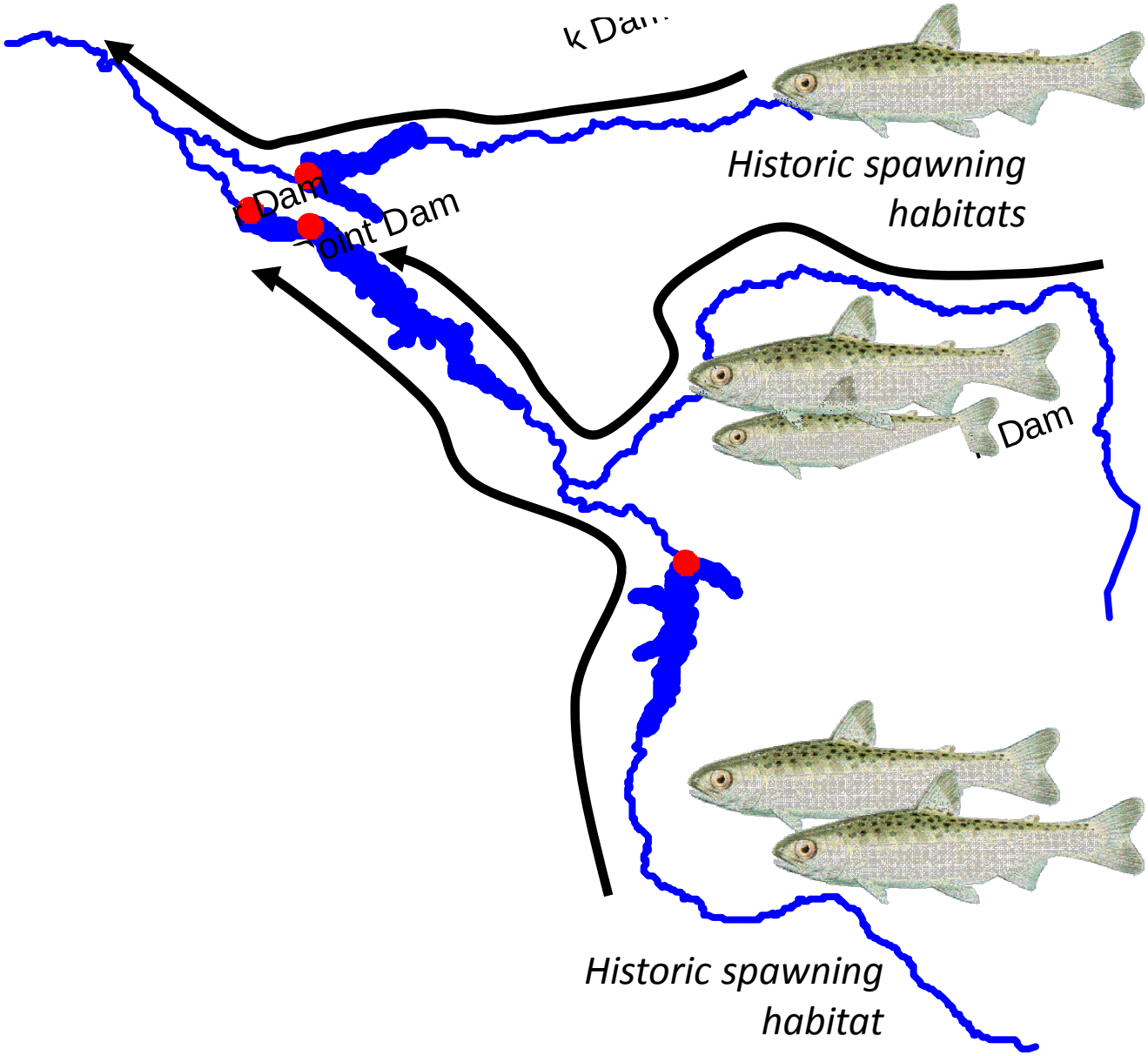
www.nwd-wc.usace.army.mil

Natural production

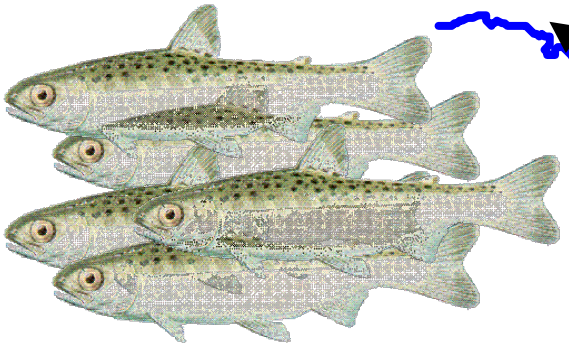




Natural production

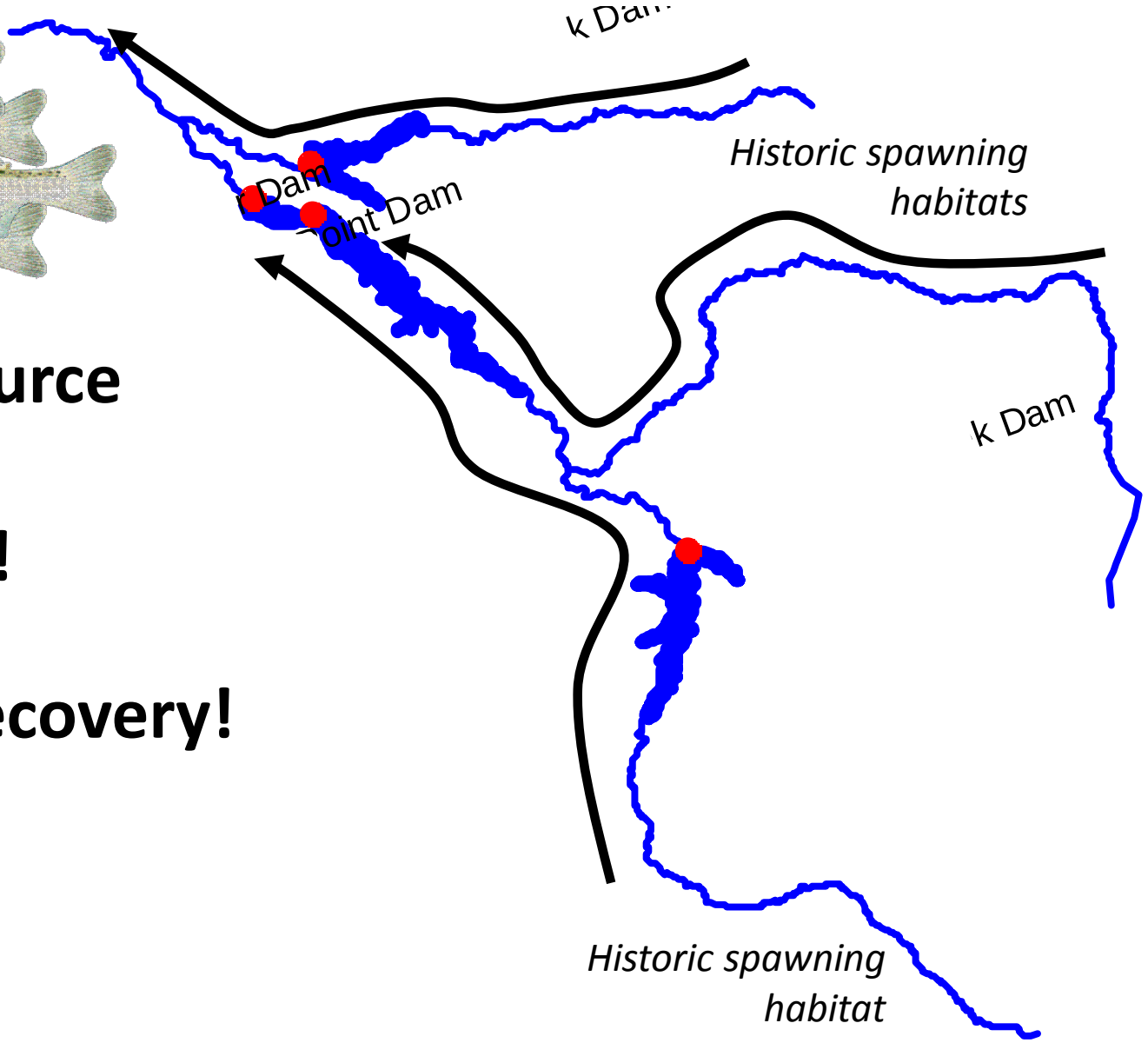


Natural production

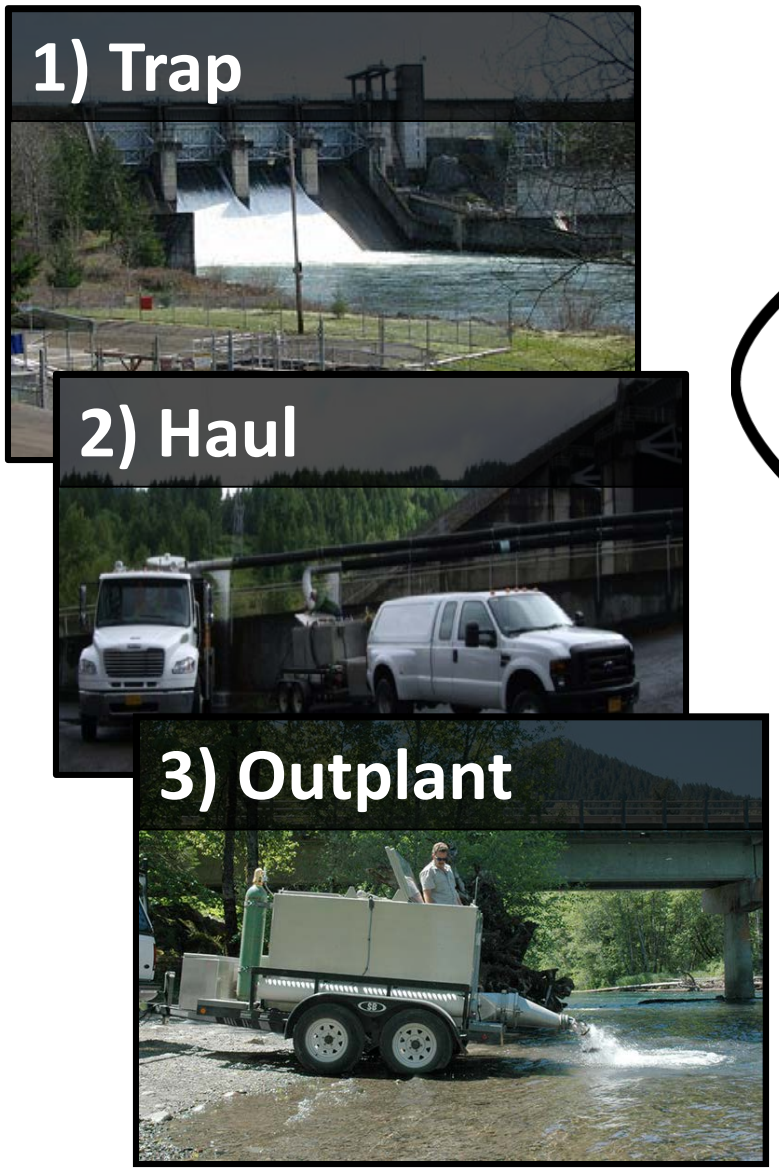


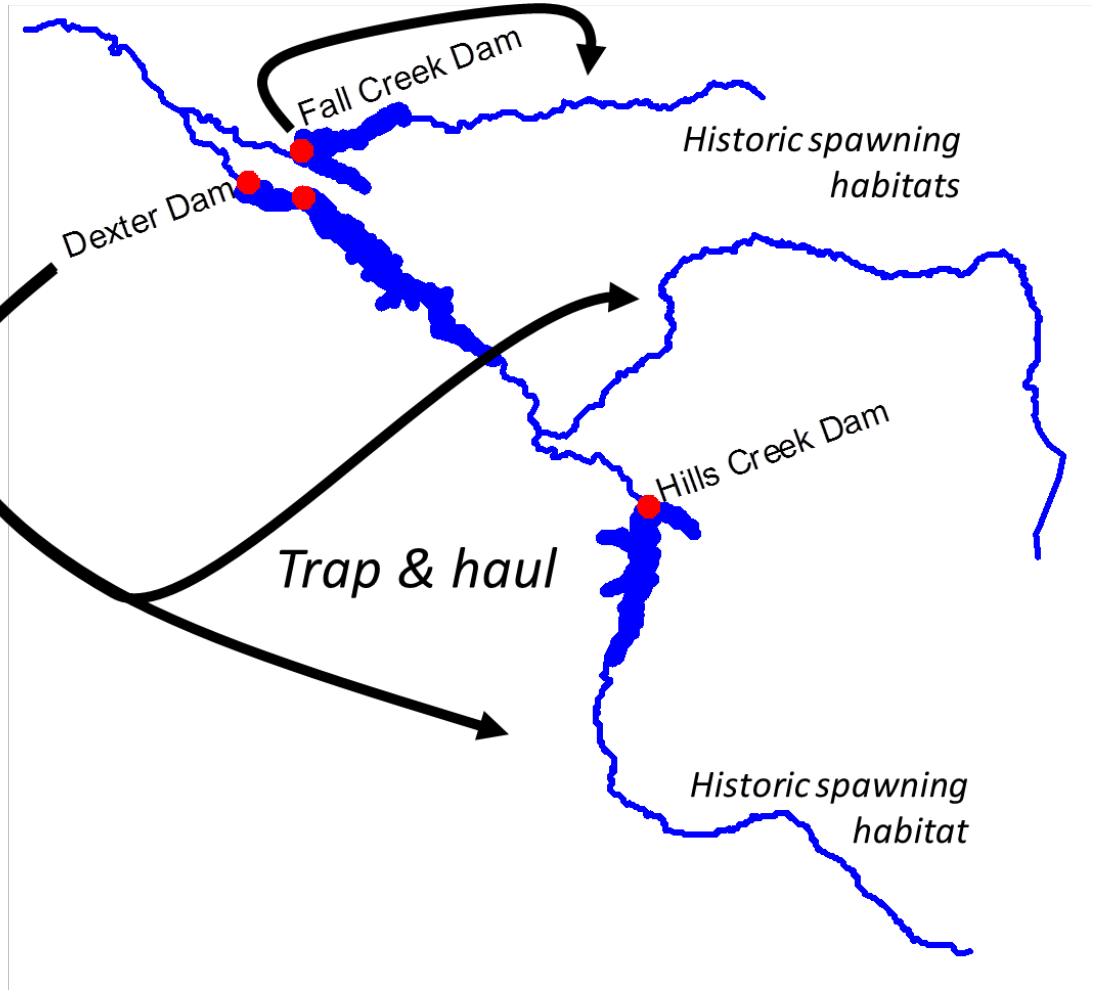
Another source of natural production!

Key to recovery!



Reintroduction above dams



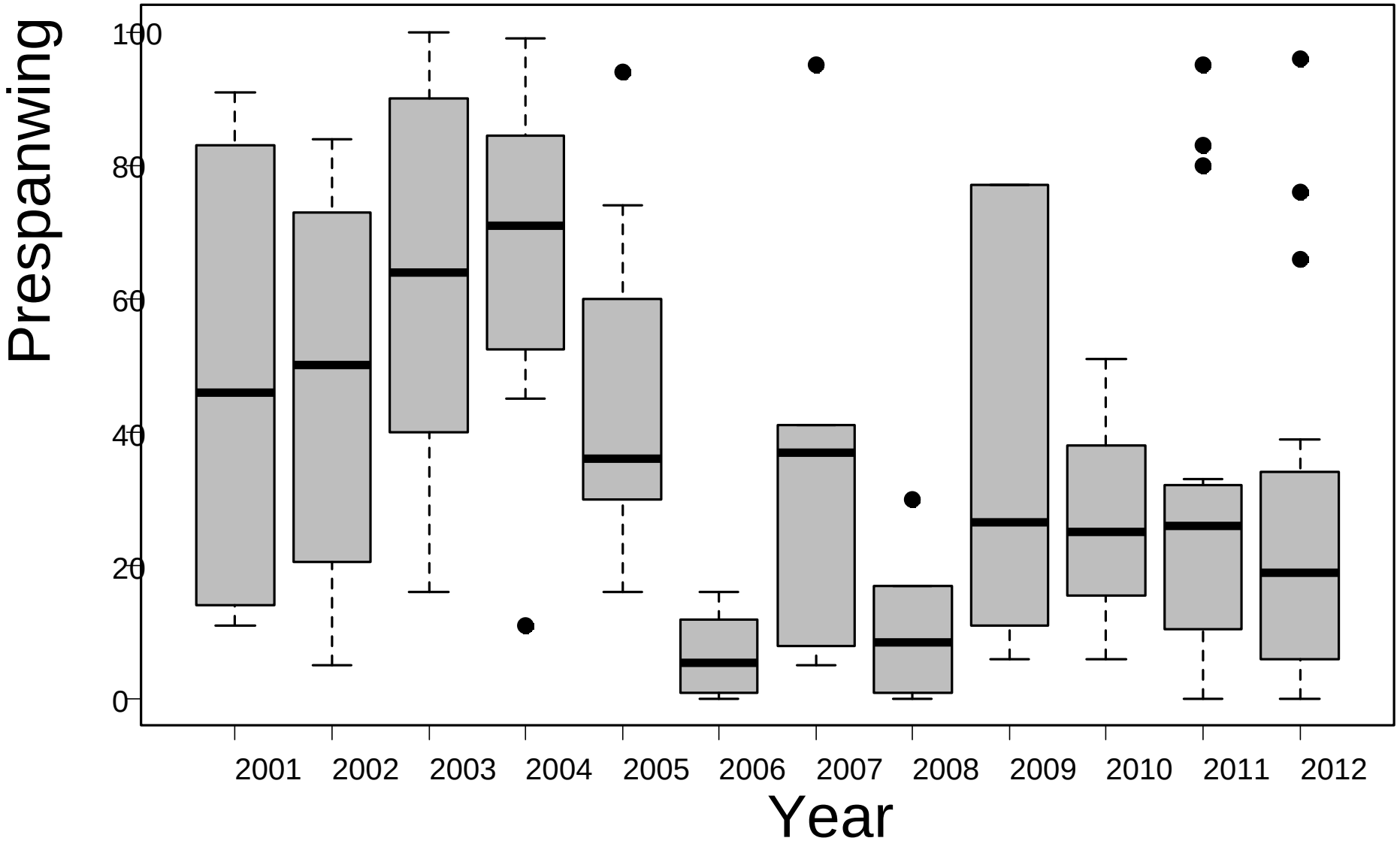


Problem: Prespawn mortality (PSM)

In excess of 90% in some years

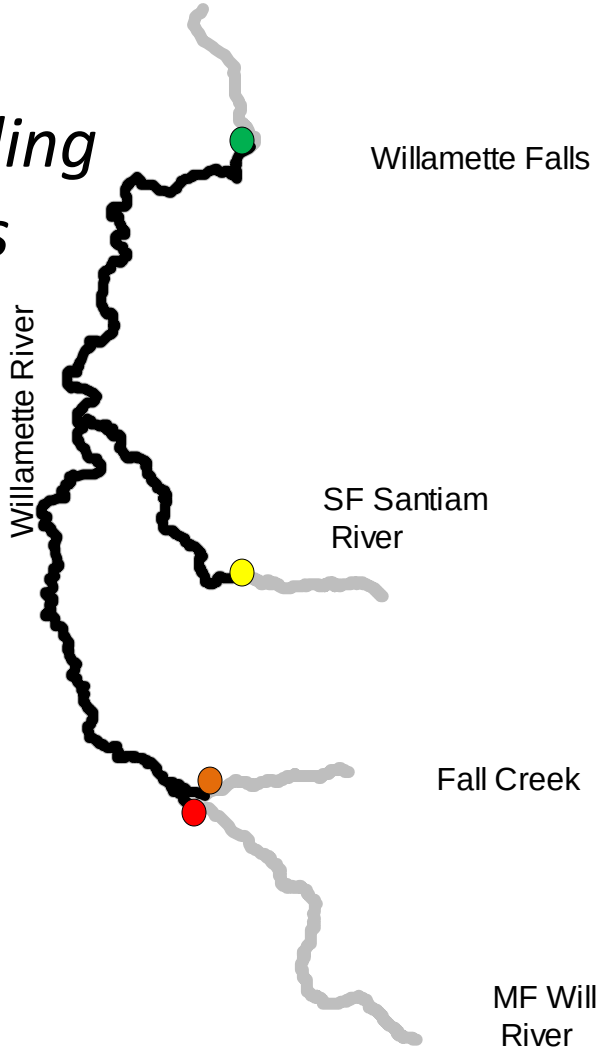
—*Temperature*

Prespawning mortality (PSM)

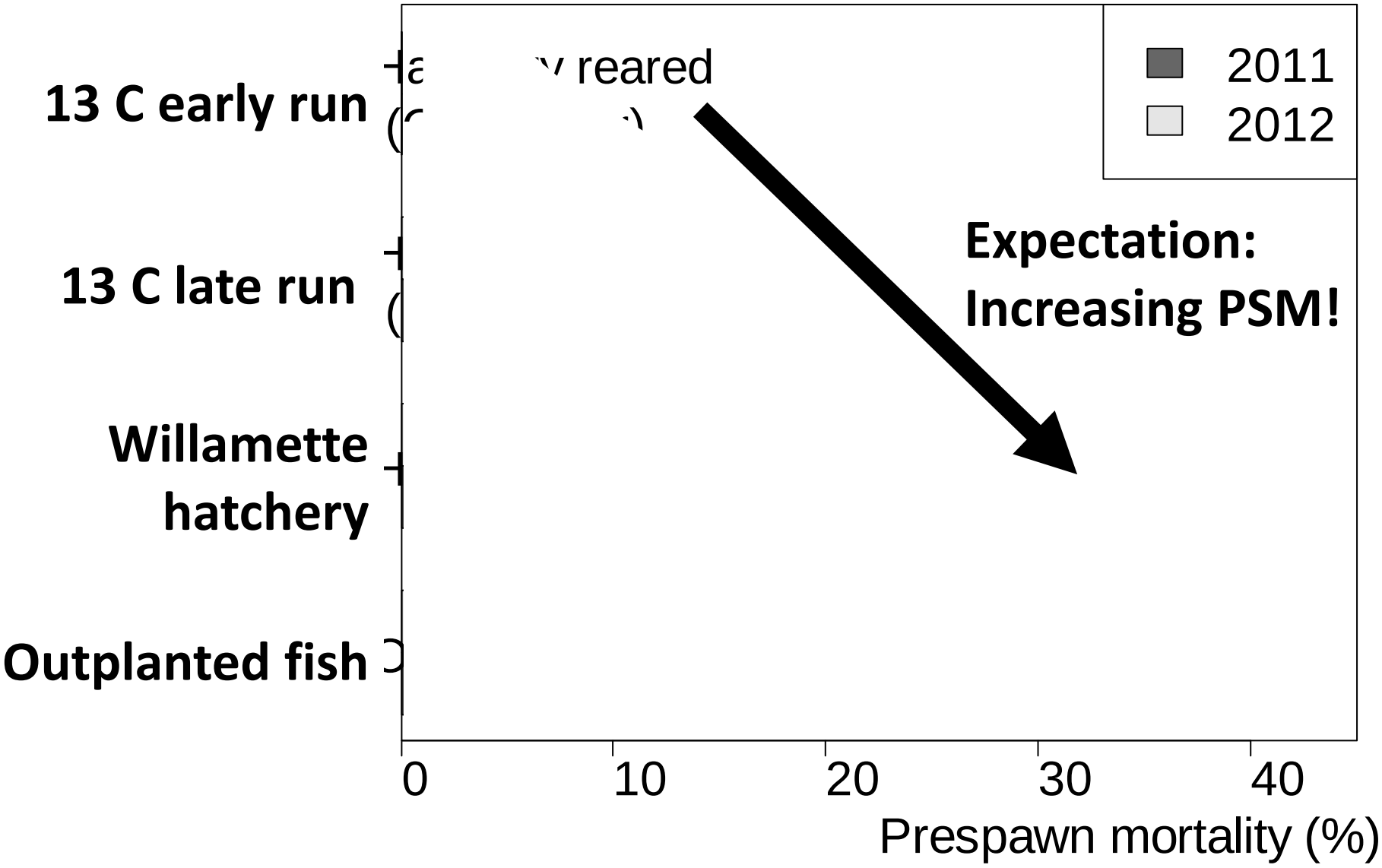


Holding in cool pathogen free water

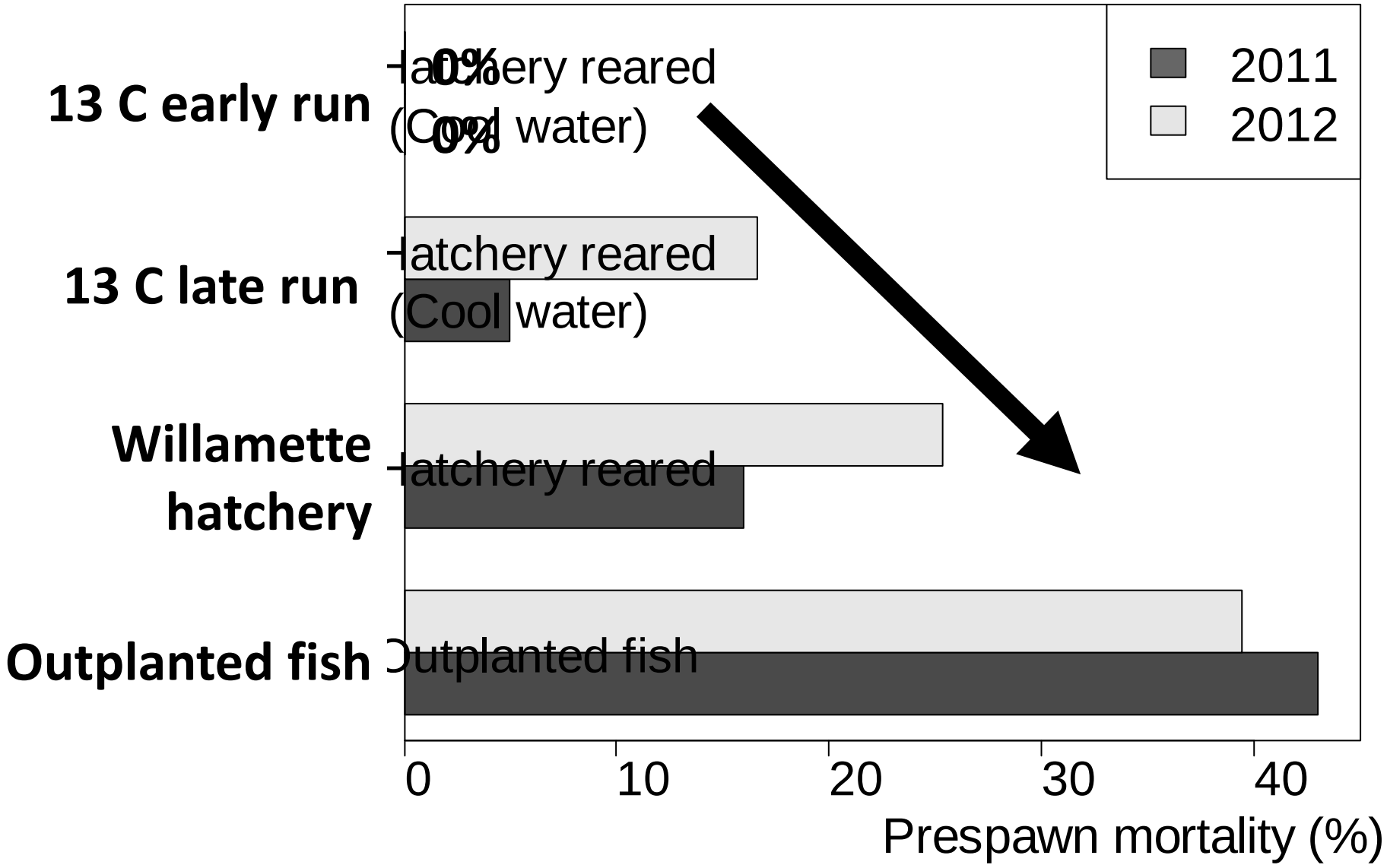
Annual holding experiments at ~ 13C



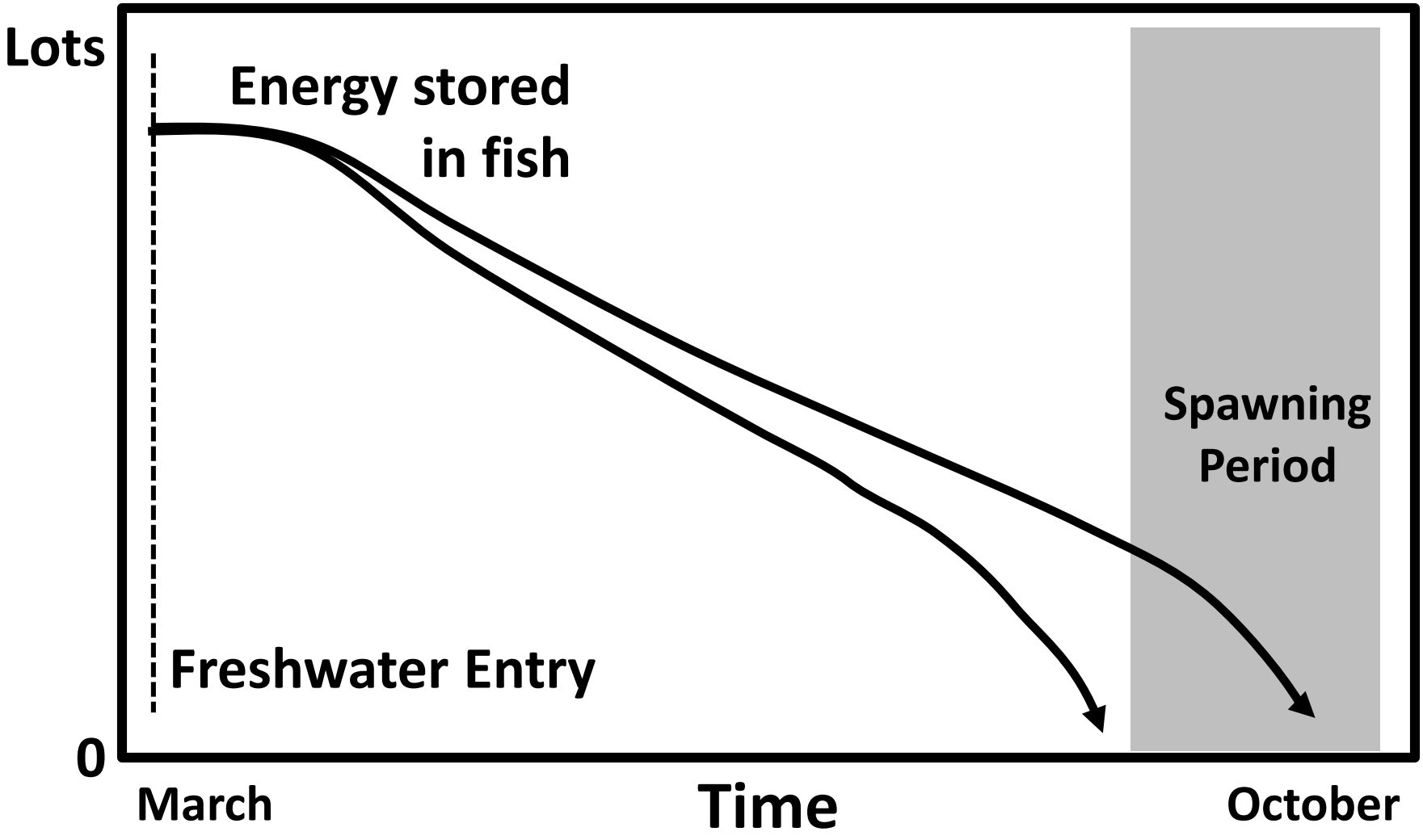
PSM and thermal exposure



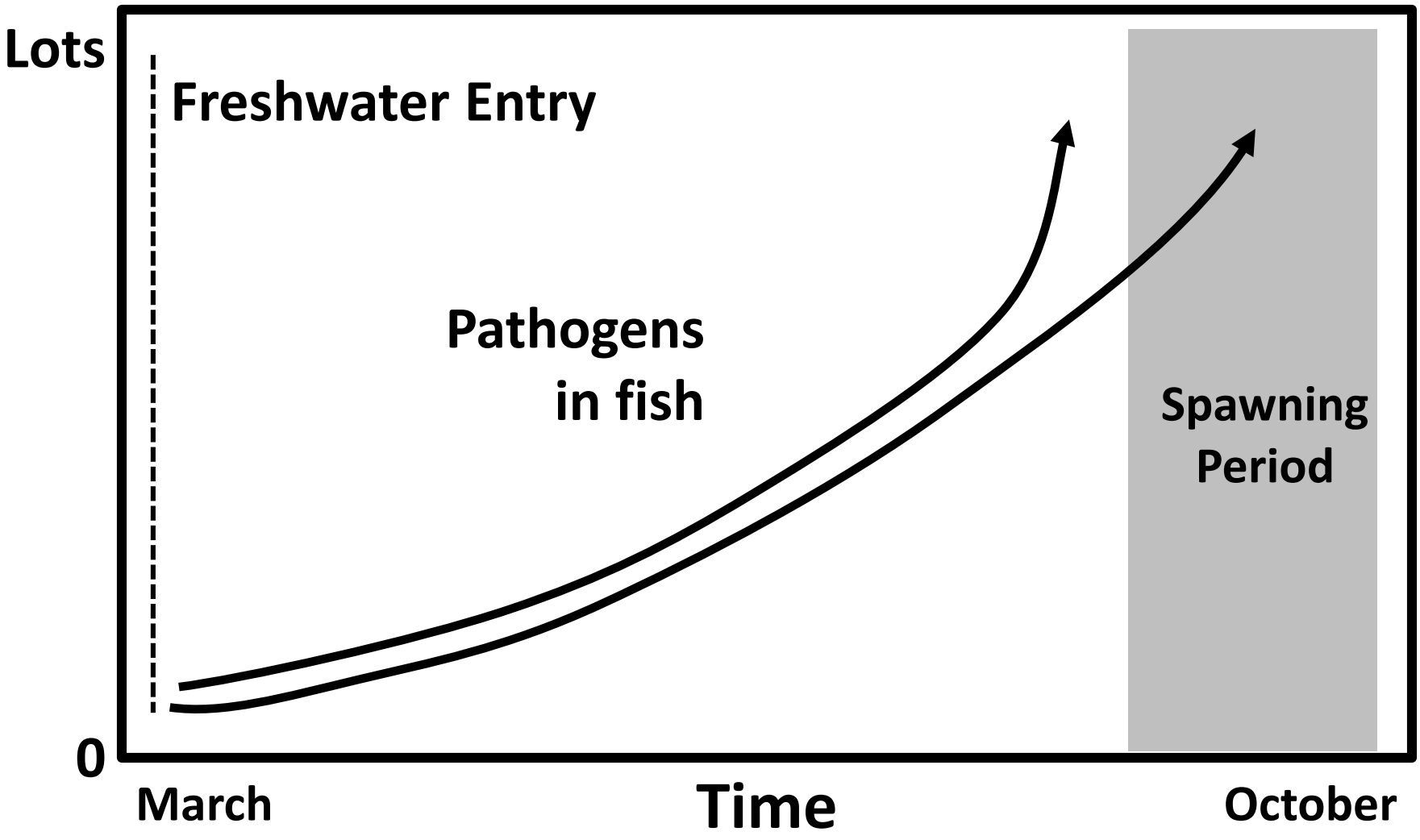
PSM and thermal exposure



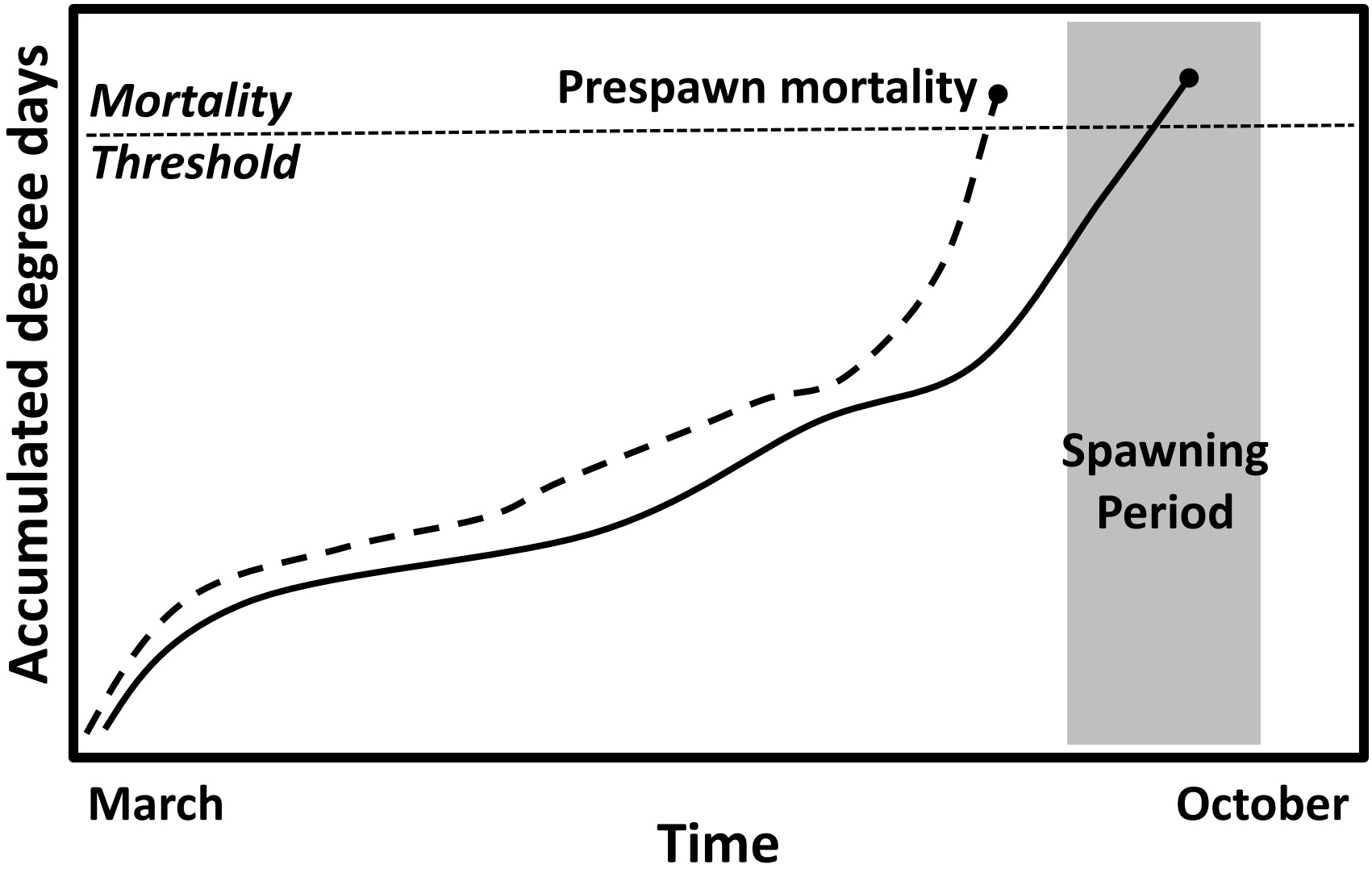
Race against time



Race against time



Race against time



Example management alternatives

Hypothesized to reduce PSM

1. Trap → outplant: prioritize brood stock
2. Trap → outplant: proportional allocation
3. Trap, hold @ hatchery →outplant

Hold

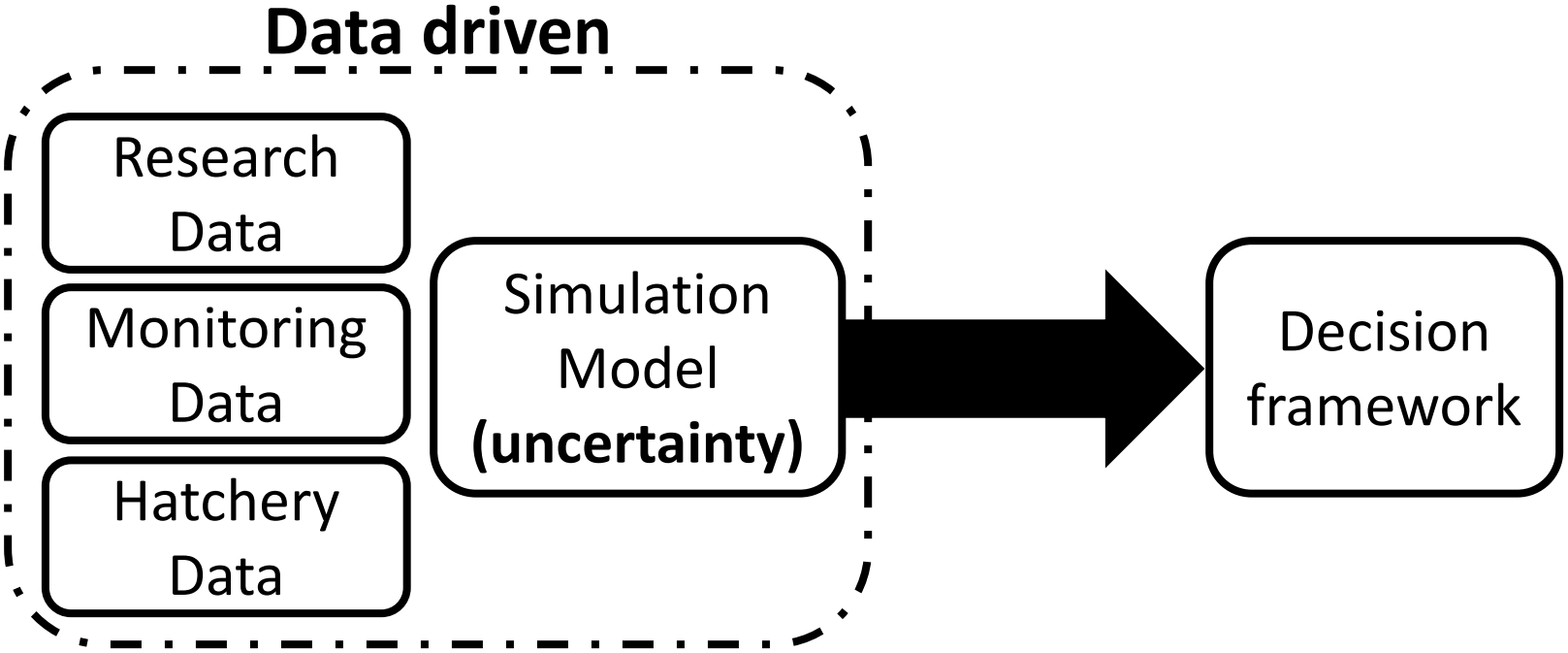

Outplant

How do we decide?

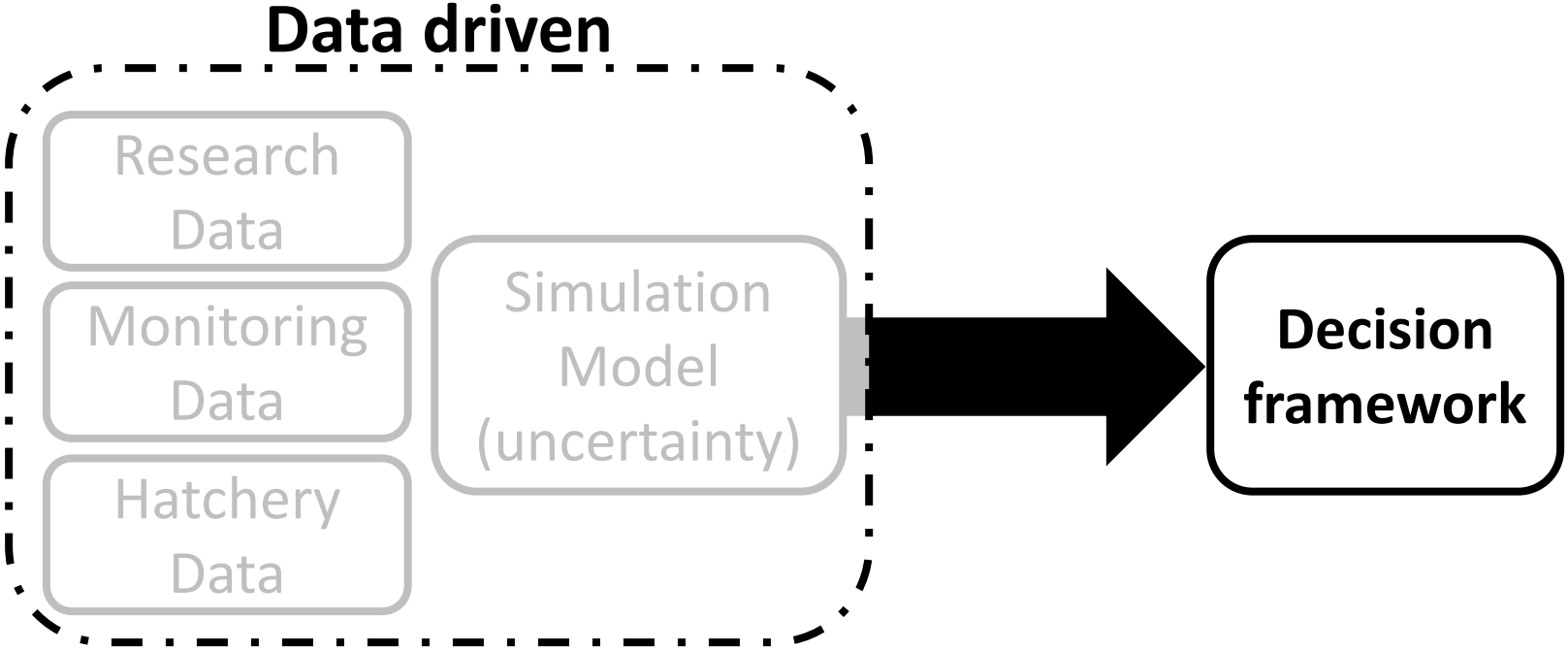
A decision framework

Structured decision making approach

1. **Simulation model**
2. **Decision model**



How do we decide?



What are decision models?

Focus on decision

1. Optimal decision
2. Account for uncertainty
3. Sensitivity of decision
4. Inform Research & Monitoring

An example

What is the optimal decision?