WF4313/6413-Fisheries Management

Class 20

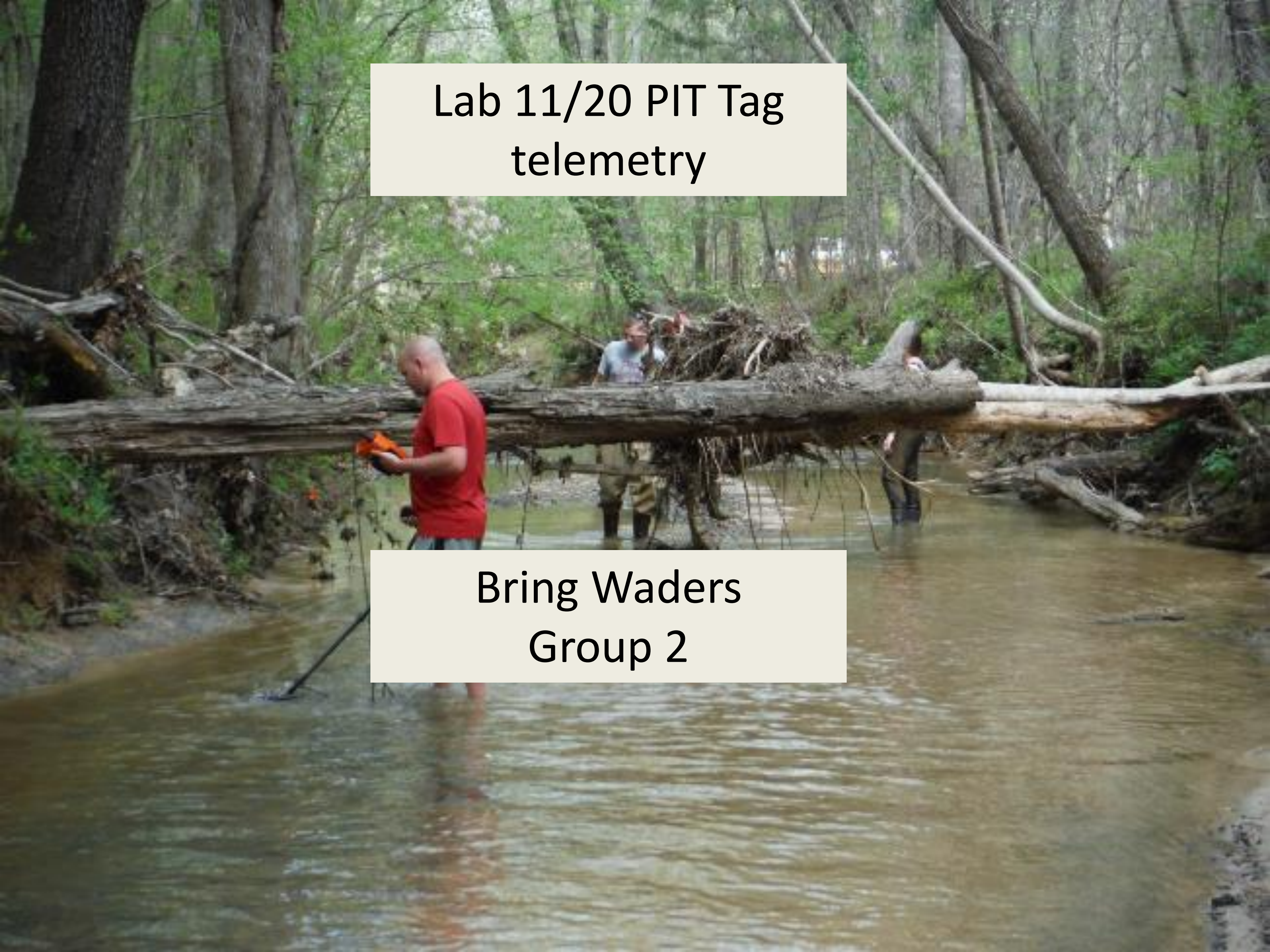
Announcements

Revised Schedule**

- ~~October 30 = Group 1 @ Panther Creek~~
- ~~November 6th = Group 2 we'll do something~~
- ~~November 13th = NO LAB… ☹~~
- ~~Exam II = November 14th~~
- November 20th = PIT Tag Telemetry
- November 20th by 5pm – article to brief
- November 27th & December 4th ???

** Contingent on van availability

Lab 11/20 PIT Tag telemetry



Bring Waders
Group 2


Briefs are important!


WHERE WE LEFT OFF

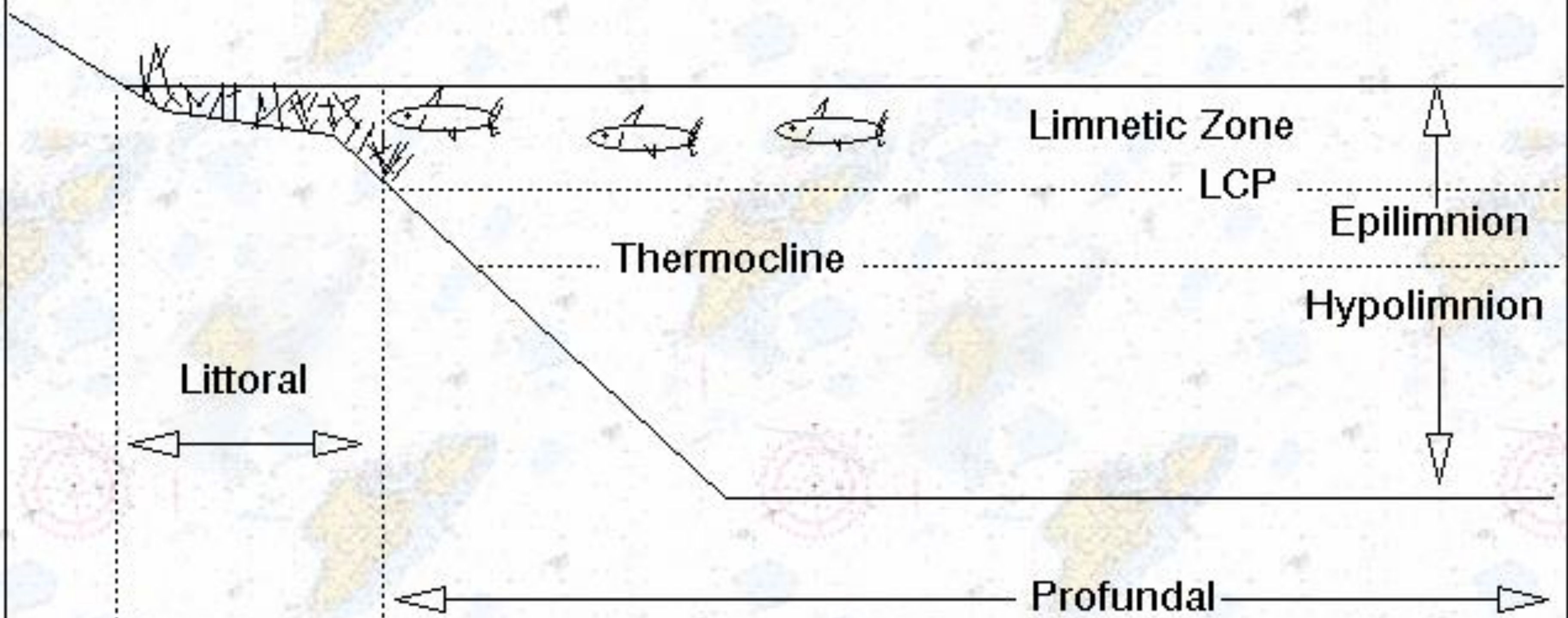
Stream habitat types

- Water
- Spawning
- Rearing & foraging
- Growing
- Migratory
- Cover

Lentic habitat: major types

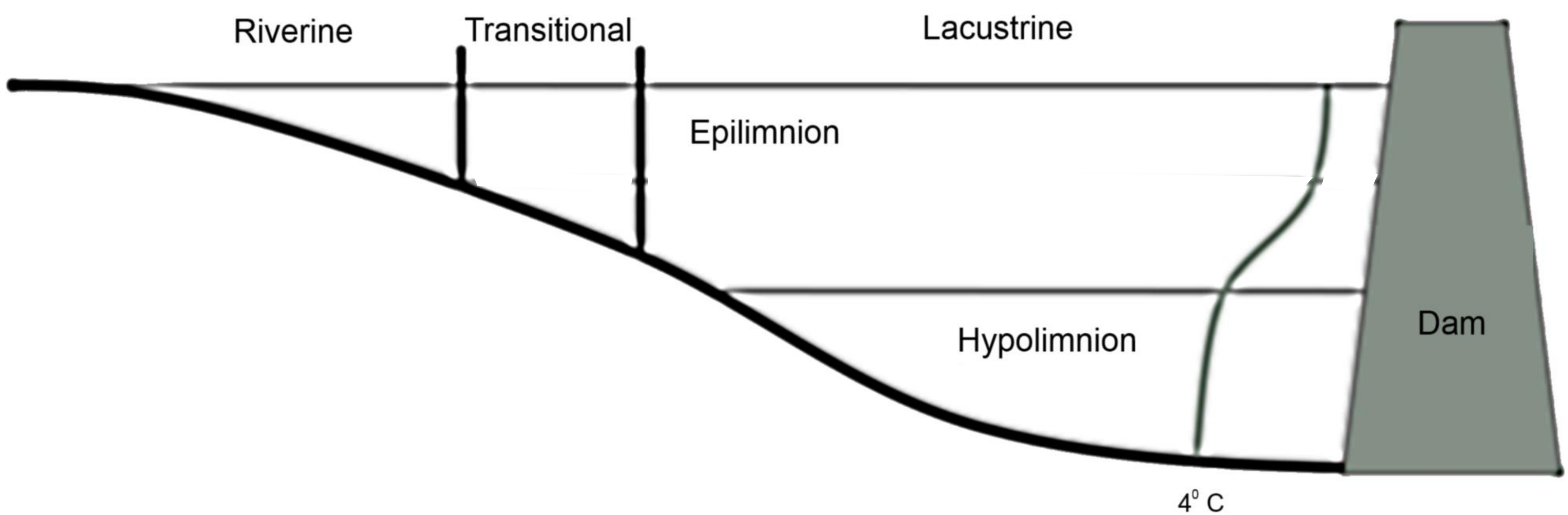
1. Glacial lake
2. **Oxbow lakes**
3. Reservoirs
4. Circque lakes
5. Terminal lakes
6. Sinkhole lakes

Zonation in a Lake

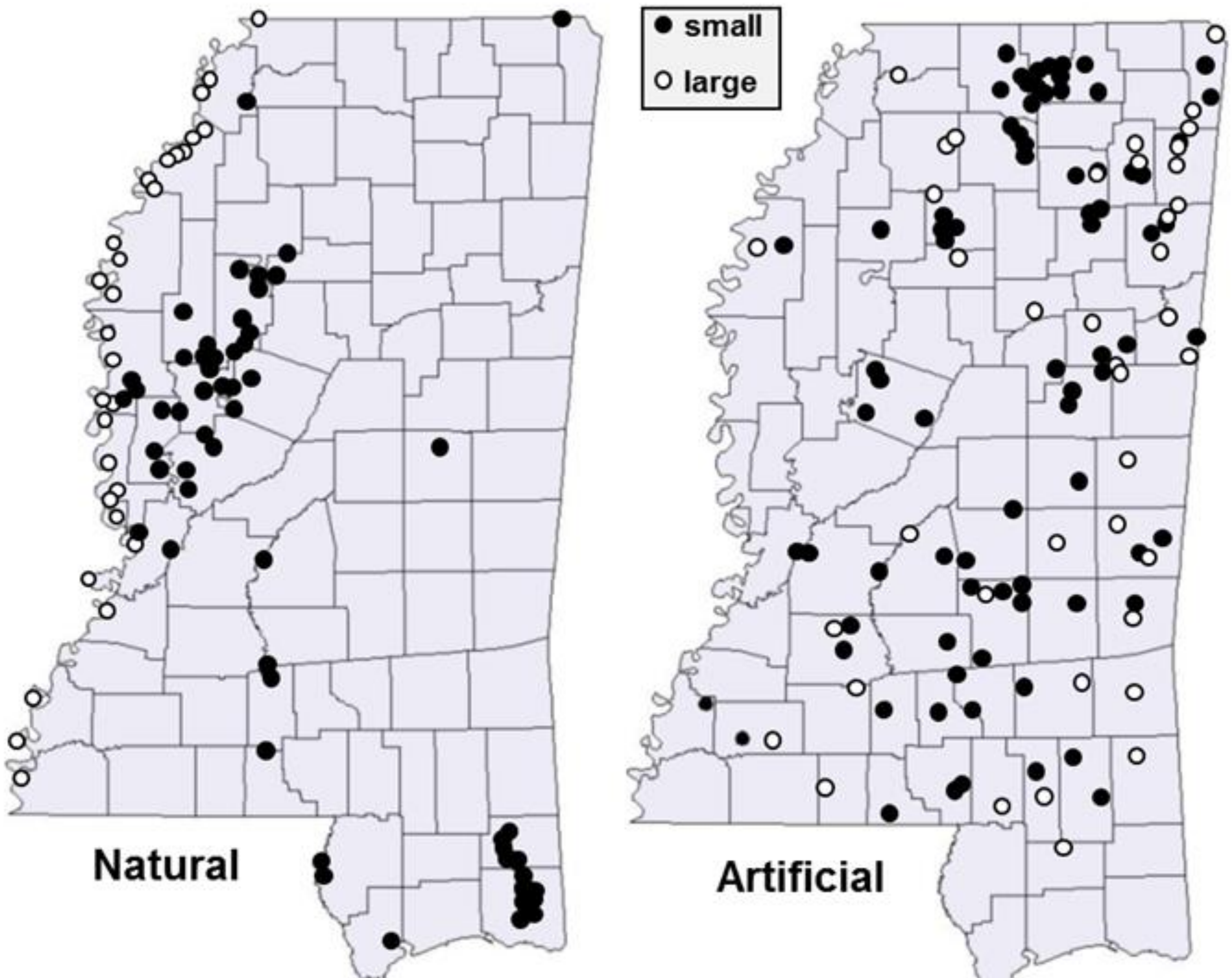


The profundal and littoral zones include both the benthic surface and the water above.

Reservoir habitat



MDWFP State lakes



Only lakes ≥ 4 ha (2.5 acres) accessible to the public and monitored by MDWFP are shown.

Elements of a FMP

- Introduction
- Goals and objectives
- Actions
- Monitoring results
  - Fish: electrofishing, trap netting
  - Fishery: creel
  - Habitat and facilities
- Discussion of monitoring

Forming Objectives…

- What are some objectives for LMB angler satisfaction?
- What are some actions to achieve those objectives?
- What are the expected outcomes of those actions?
- How can you monitor the outcomes of the actions?

INVASIVE & INTRODUCED SPECIES MANAGEMENT

Early fish introductions

- 1800-1950
- Revitalize commercial fishing post civil war by importing European sportfishes
  - Common carp
  - Brown trout
- US Fish Commission formed to explore introductions

18 play

Note: Time series reflects NAS data and may not accurately reflect actual species spread.

Second wave fish introductions

- 1950-1975
- advent of intercontinental jet cargo aircraft in the early
- live fish could be rapidly transported from one continent to another
- Ornamental fish
- Ramsey (1985) estimated over 100 million fish were imported by air annually during the early 1980s

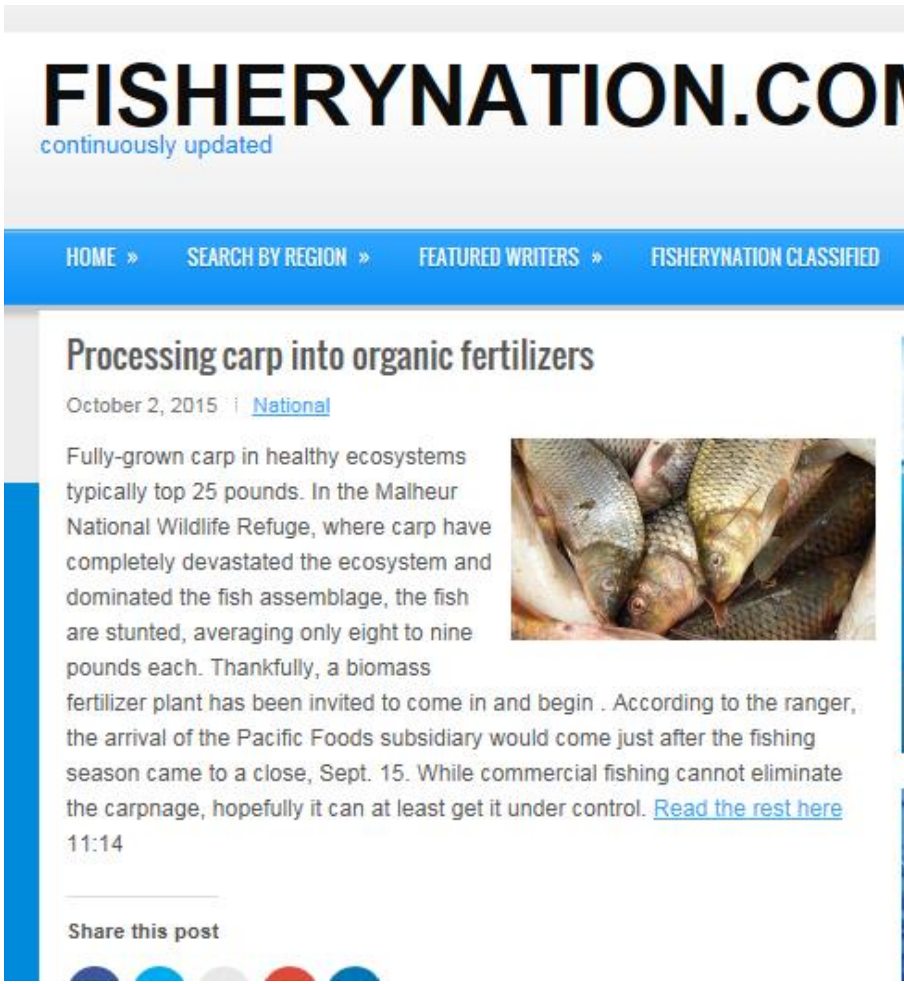
Third wave aquatic spp. introductions

- 1975 to present day
- 3 species of Asian carps were imported into North America
  - biological control of nuisance phytoplankton in sewage treatment ponds
  - enhancement of water quality in aquaculture ponds
  - potential as food fishes

Third wave <u>aquatic spp.</u> introductions

- Zebra and quagga mussels
- Controlling invasive mussels cost electric power generating facilities on the Great Lakes alone an estimated US$10–30 million annually between 1989 and 2004!

Applied Management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Processing carp into organic fertilizers

October 2, 2015 | National

Fully-grown carp in healthy ecosystems typically top 25 pounds. In the Malheur National Wildlife Refuge, where carp have completely devastated the ecosystem and dominated the fish assemblage, the fish are stunted, averaging only eight to nine pounds each. Thankfully, a biomass fertilizer plant has been invited to come in and begin . According to the ranger, the arrival of the Pacific Foods subsidiary would come just after the fishing season came to a close, Sept. 15. While commercial fishing cannot eliminate the carpnage, hopefully it can at least get it under control. Read the rest here 11:14

Share this post

Why is carp management important?

Management Objectives

- Refuge: Duck Use Days
- Carp have a negative effect on water quality and macrophytes
- Ducks do not use poor areas if they don’t have to
- Don’t meet management objectives…

Carp Suppression at Malheur NWR

Home | Background | Explore Model | Simulate | *Evaluation of potential carp suppression strategies*

Malheur National Wildlife Refuge was established on August 18, 1908 by President Theodore Roosevelt as the Lake Malheur Bird Reservation. Roosevelt set aside unclaimed lands encompassed by Malheur, Mud and Harney Lakes “as a preserve and breeding ground for native birds.” The newly established “Lake Malheur Bird Reservation” was the 19th of 51 wildlife refuges created by Roosevelt during his tenure as president. At the time, Malheur was the third refuge in Oregon and one of only six refuges west of the Mississippi.

Background and Context

Vectors of introduction

- Ballast water
- Aquaculture industry & live food fish industry
- Stocking by government agencies
- Water garden and aquarium pets
- Unauthorized stocking (Bait bucket releases)
- Recreational activities
- Research & teaching activities
- Diffusion from neighboring waters

Ballast water

THE BALLAST WATER CYCLE

HOW INVASIVE SPECIES ARE INTRODUCED INTO THE GREAT LAKES

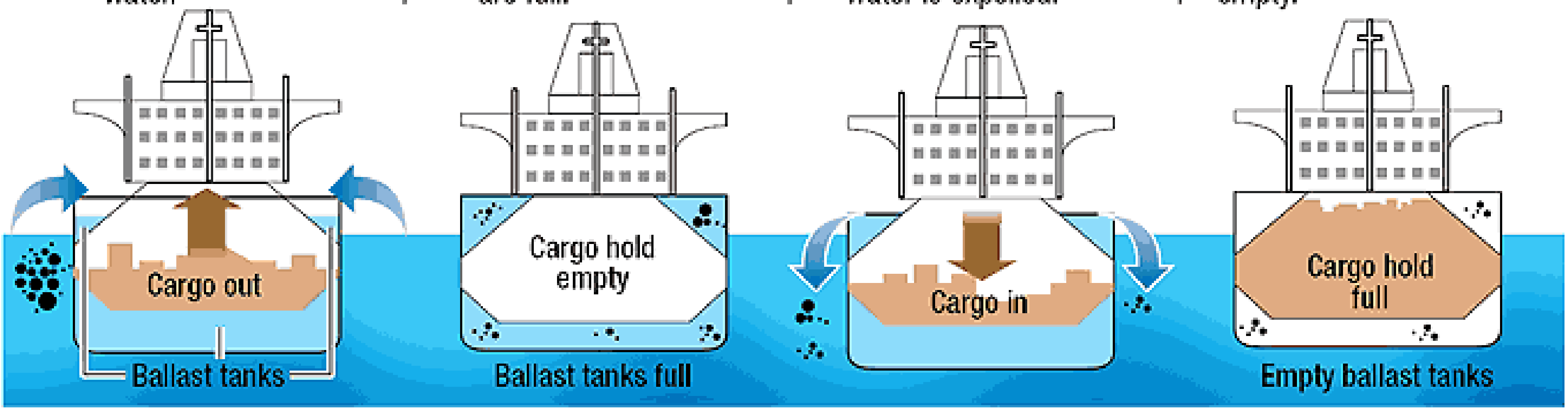
Ballast water is required to stabilize an empty ship on the open sea, but those tanks can hold more than water; they often also carry foreign species. The U.S. now requires oceangoing vessels bound for the Great Lakes to exchange their ballast at sea to expel – or kill with saltwater – any freshwater organisms that might have hitched a ride. But most ships that arrive in the lakes are loaded with cargo, don't carry ballast and are therefore exempt from the law. Even "empty" tanks can carry residual puddles and tons of muck, both of which can be teeming with life.

1 AT THE SOURCE PORT
Cargo is unloaded, ship takes in ballast water.

2 DURING THE VOYAGE
After cargo hold is emptied, ballast tanks are full.

3 AT DESTINATION PORT
As new cargo is picked up by the ship, ballast water is expelled.

4 ON THE RETURN TRIP
With a full cargo hold, ballast tanks are nearly empty.

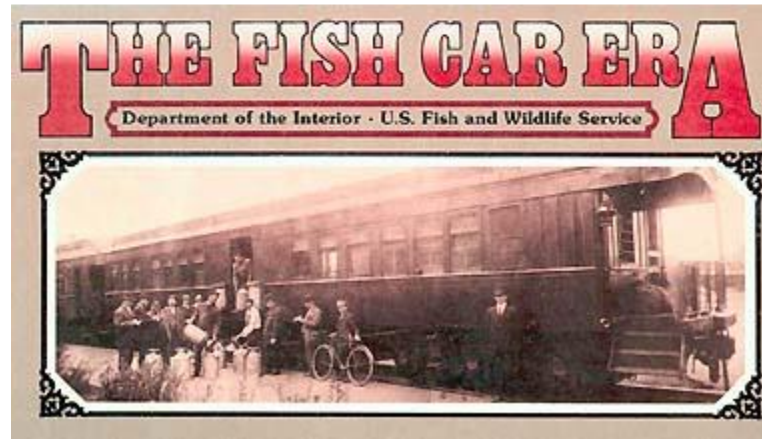


Source: International Maritime Organization

ALFRED ELICIERTO/aelicierto@journalsentinel.com

Aquaculture industry & live food fish industry

Stocking by government agencies



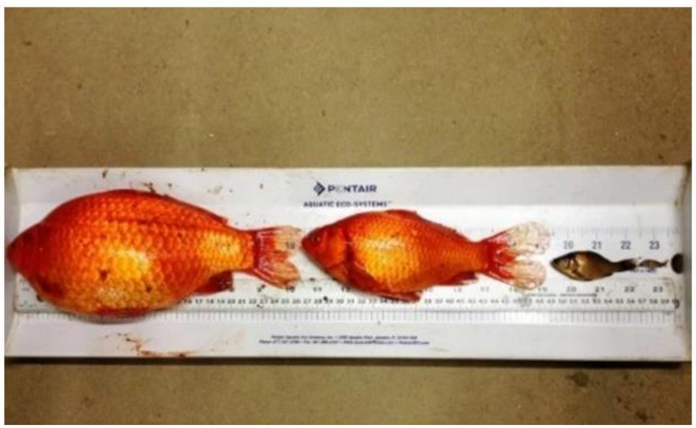
Water garden and aquarium pets

Speaking of Science

Discarded pet goldfish are multiplying and getting kind of ginormous, officials say

77

By Sarah Larimer June 25 Follow @slarimer



Most Read

1 After his car broke down, Florida church drummer shot and killed by plainclothes officer

2 The strange star that has serious scientists talking about an alien megastructure

3 Police say Corey Jones was carrying gun he purchased legally three days earlier when shot by officer

4 Becoming Nicole

5 'Haunting' murder mystery apparently

Unauthorized stocking (Bait bucket releases)

Research & teaching activities

How your science teacher may be spreading invasive species

As many as 1,000 different organisms are used in lessons — then released into wild

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LiveScience
updated 8/7/2012 5:33:00 PM ET

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Potential invasive species may get a helping hand from an unlikely source: science teachers, a new study indicates.

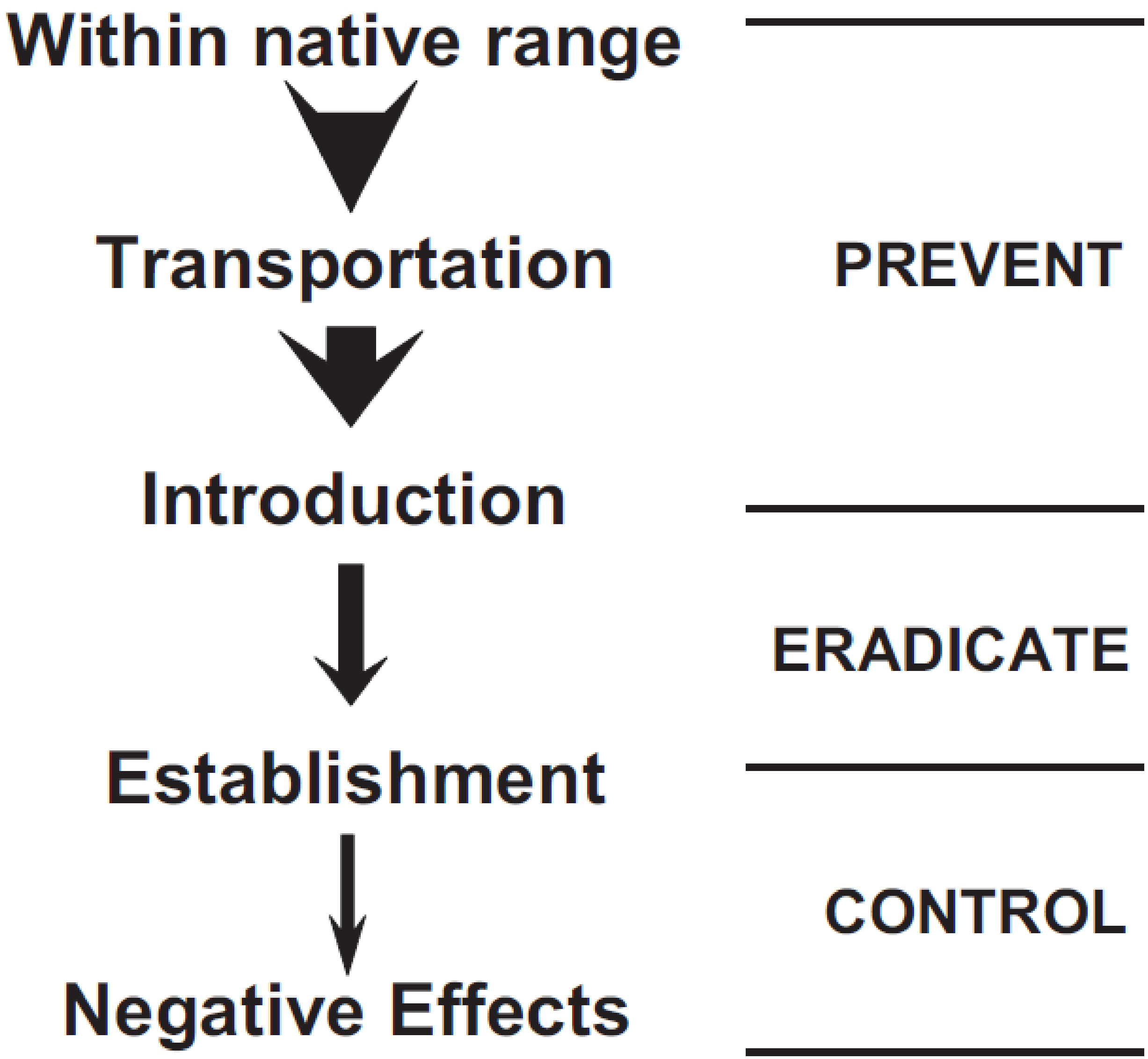
The researchers found science teachers used as many as 1,000 different organisms in their lessons, including many known or potentially invasive species such as crayfish, the waterweed elodea, mosquito fish, amphibians and red-eared slider turtles.

The study involved a survey of nearly 2,000 teachers in Florida, New York, Indiana, Illinois, Oregon, Washington, California, Connecticut, British Columbia and Ontario, as well as interviews with curriculum specialists, focus groups involving 84 teachers and information from biological supply houses.

The researchers found that while 25 percent of science teachers indicated they released their organisms into the

Diffusion from neighboring waters

Management strategies

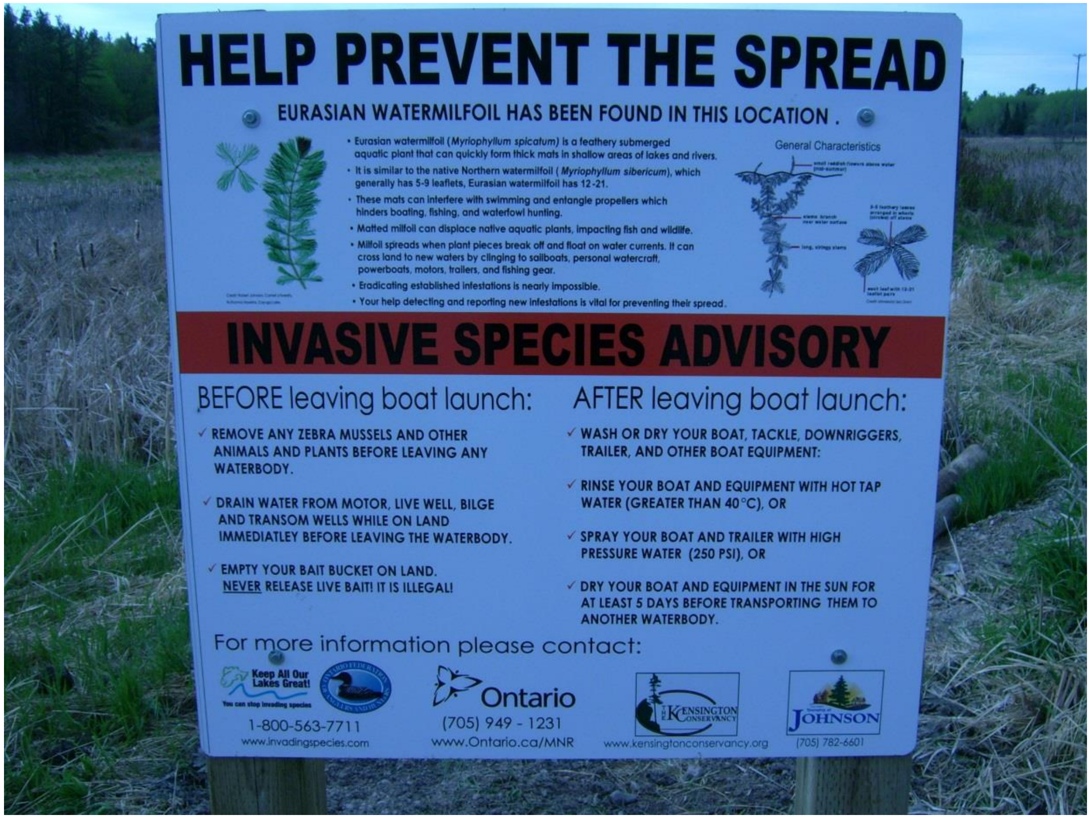


Prevent-Example

- Baitfish must be from watershed to be used
- No transport across state lines

Prevent-Example

- Eurasian water milfoil



Eradicate

- Rarely effective
- Limited to small, easily-accessible, closed systems

Eradication is best attempted almost immediately upon discovery of the new invader population (Simberloff 2009)

Successful Eradication Elements

Simberloff 2009:

1. early detection of an invasion and quick action to eradicate invader
2. sufficient resources allocated to the project from start to finish (including posteradication surveys and follow-up, if necessary)
3. a person or agency with the authority to enforce cooperation
4. sufficient study of the targeted species to suggest vulnerabilities (often basic natural history suffices);
5. optimistic,persistent, and resilient project leaders.

Management case study

North American Journal of Fisheries Management 26:849–860, 2006

DOI: 10.1577/M05-110.1

[Article]

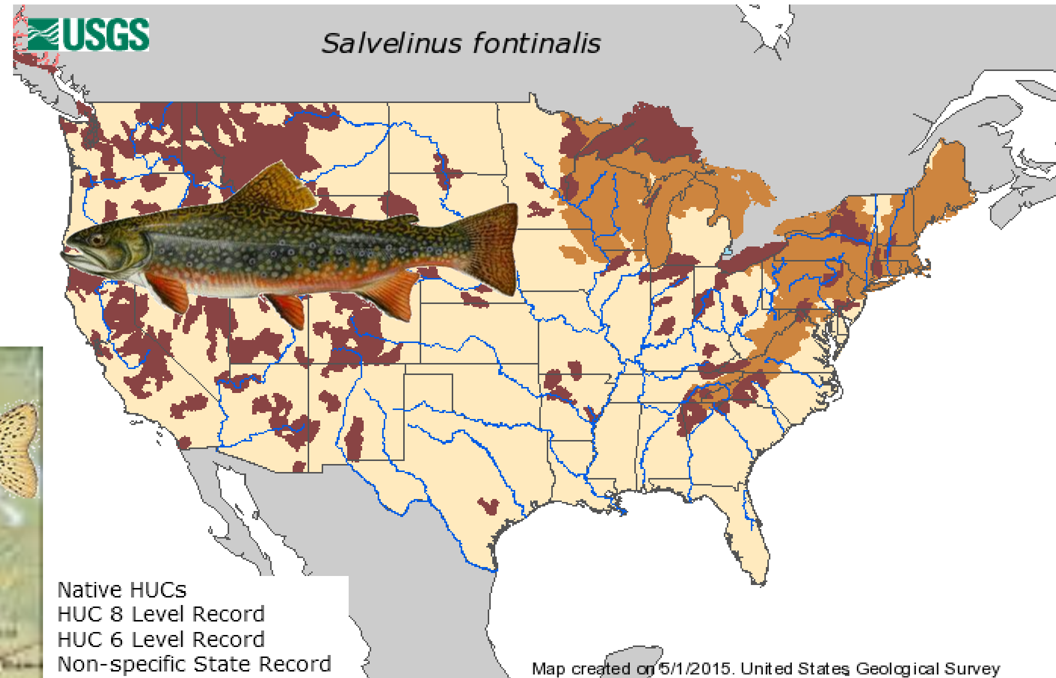
Evaluation of an Unsuccessful Brook Trout Electrofishing Removal Project in a Small Rocky Mountain Stream

KEVIN A. MEYER,* JAMES A. LAMANSKY, JR., AND DANIEL J. SCHILL
Idaho Department of Fish and Game, 1414 East Locust Lane, Nampa, Idaho 83686, USA

Abstract.—In the western United States, exotic brook trout *Salvelinus fontinalis* frequently have a deleterious effect on native salmonids, and biologists often attempt to remove brook trout from streams by means of electrofishing. Although the success of such projects typically is low, few studies have assessed the underlying mechanisms of failure, especially in terms of compensatory responses. A multiagency watershed advisory group (WAG) conducted a 3-year removal project to reduce brook trout and enhance native salmonids in 7.8 km of a southwestern Idaho stream. We evaluated the costs and success of their project in suppressing brook trout and looked for brook trout compensatory responses, such as decreased natural mortality, increased growth, increased fecundity at length, and earlier maturation. The total number of brook trout removed was 1,401 in 1998, 1,241 in 1999, and 890 in 2000; removal constituted an estimated 88% of the total number of brook trout in the stream in 1999 and 79% in 2000. Although abundance of age-1 and older brook trout declined slightly during and after the removals, abundance of age-0 brook trout increased

Brook Trout Eradication

Distribution



Approach

- 2-pass depletion
- Physically remove brook trout captured
- 1998-2002
- Very intensive

Expected effects

What would we expect for a massive removal of the population?

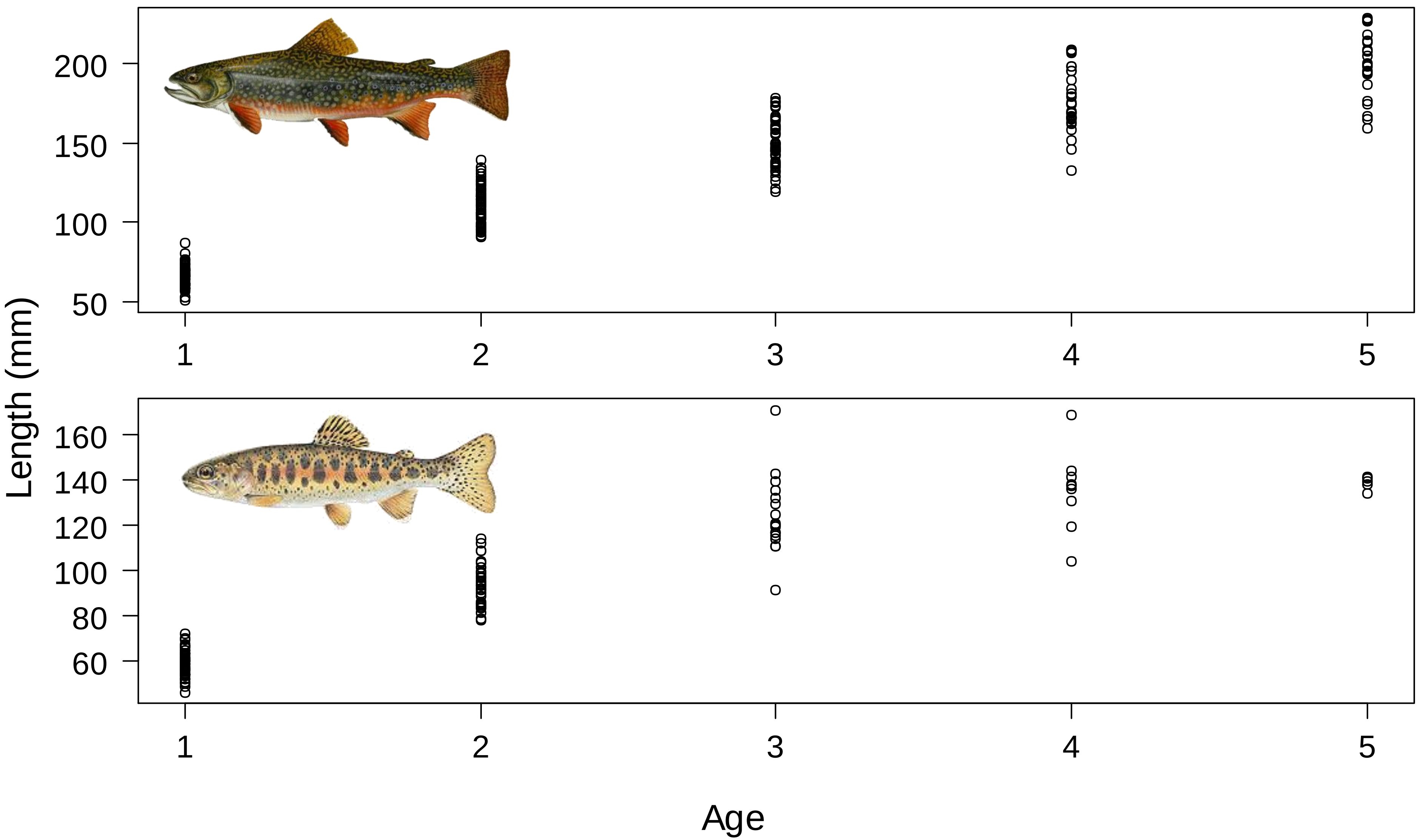
Abundance?

Size structure?

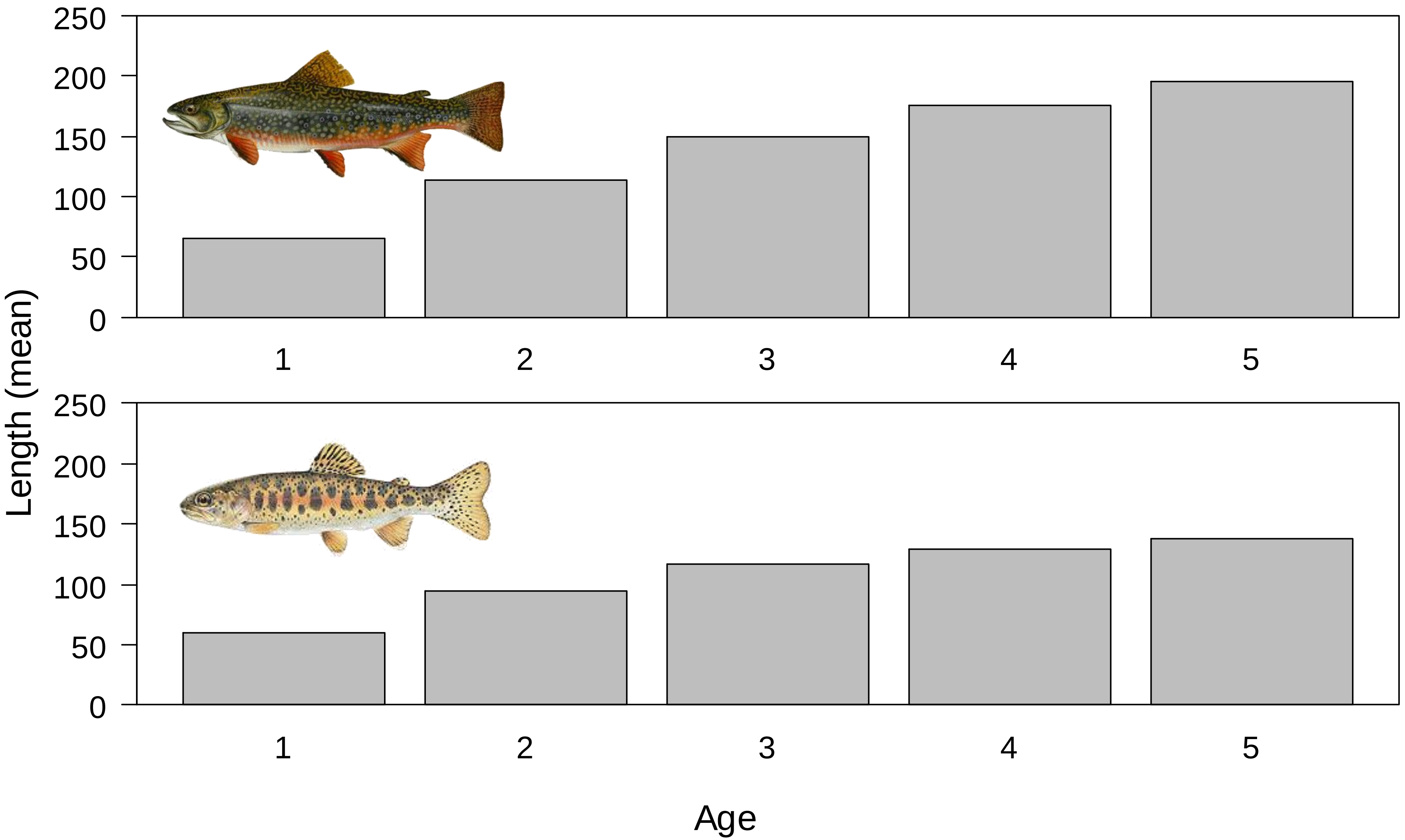
Age structure?

Others?

Age Structure



Age Structure



Effect of removal?

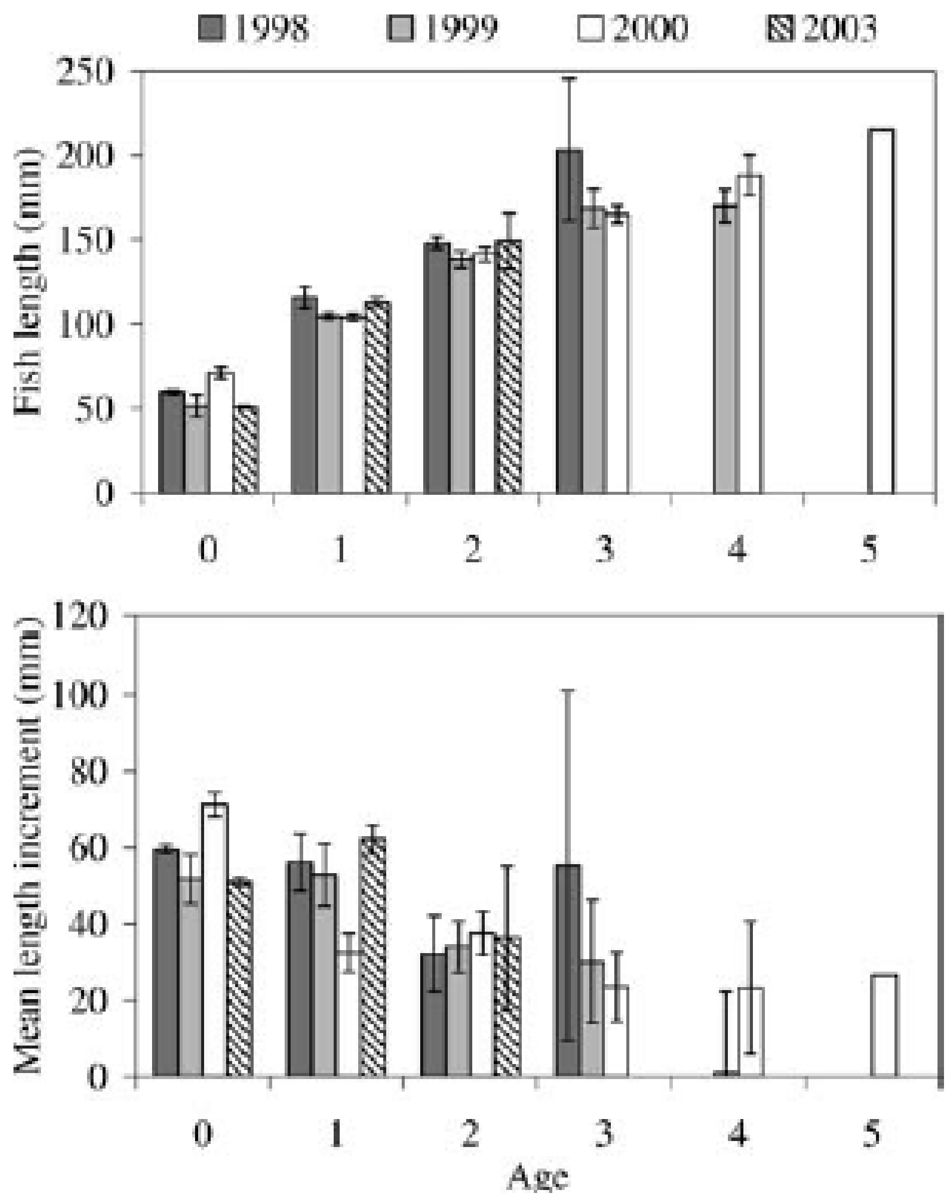
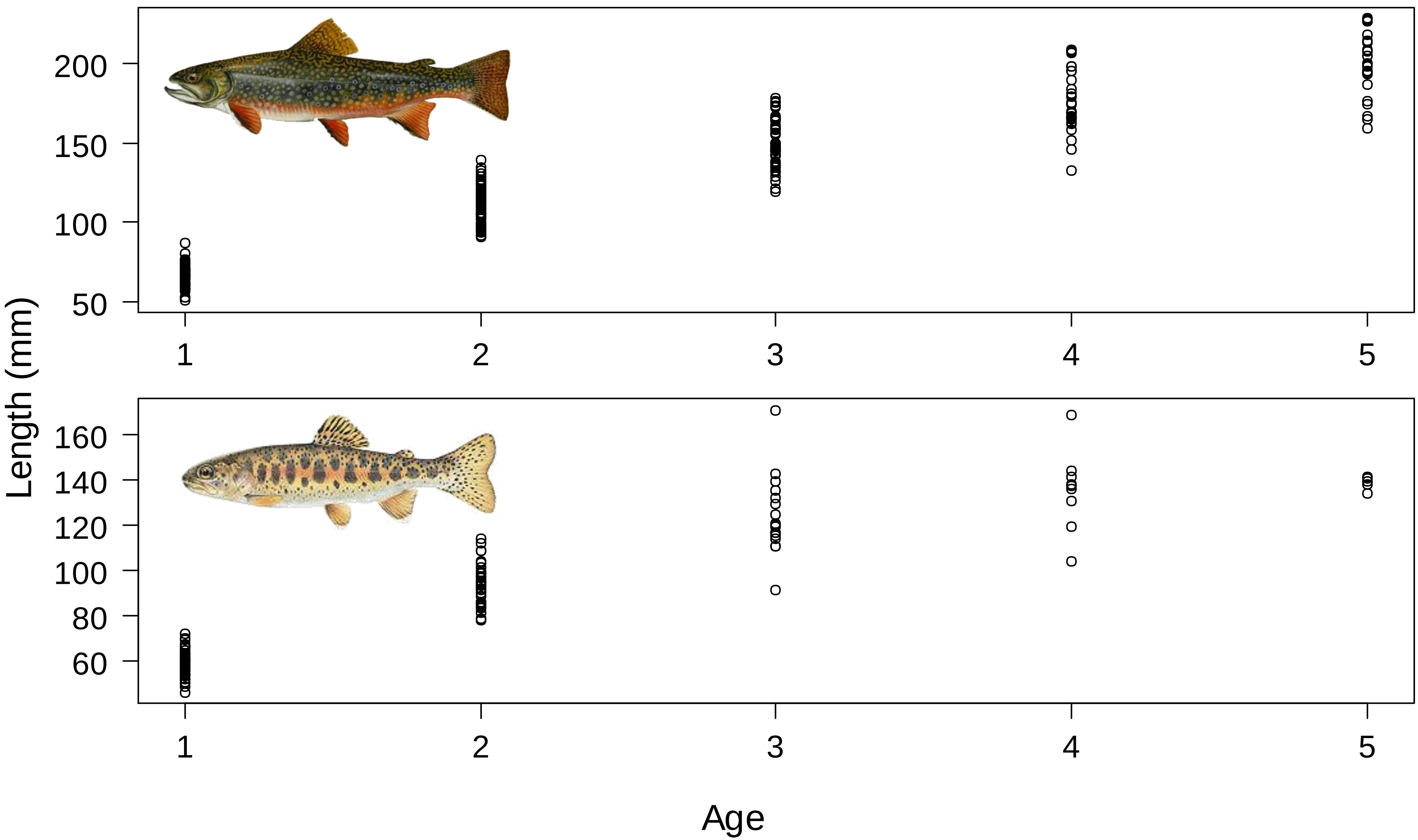
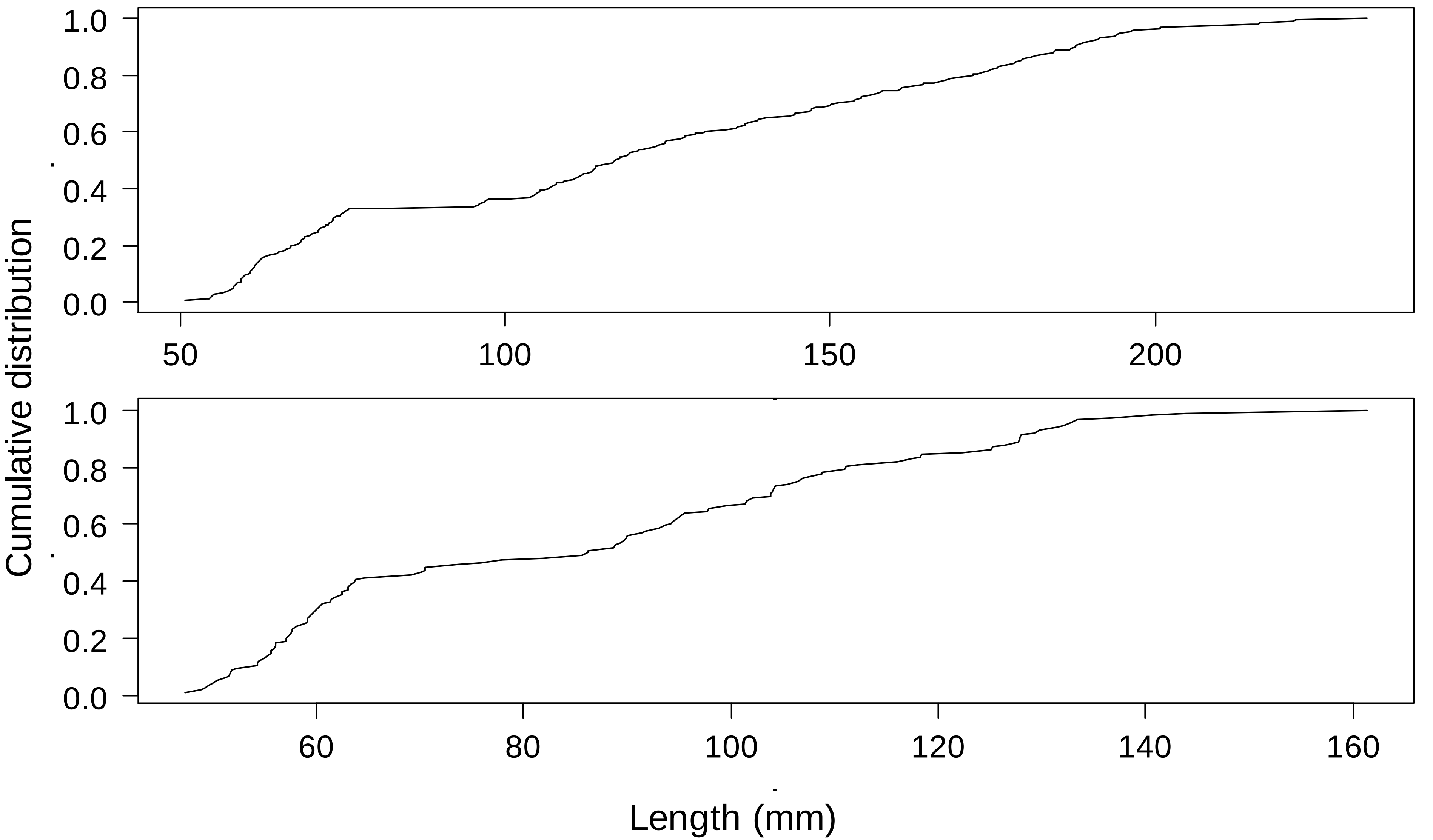


FIGURE 3.—Mean (±95% CI) length at age and length increment for nonnative brook trout removed by electrofishing in Pike's Fork, Idaho, during 1998–2000 and 2003.

Age Structure



Cumulative length distribution



Effect of removal

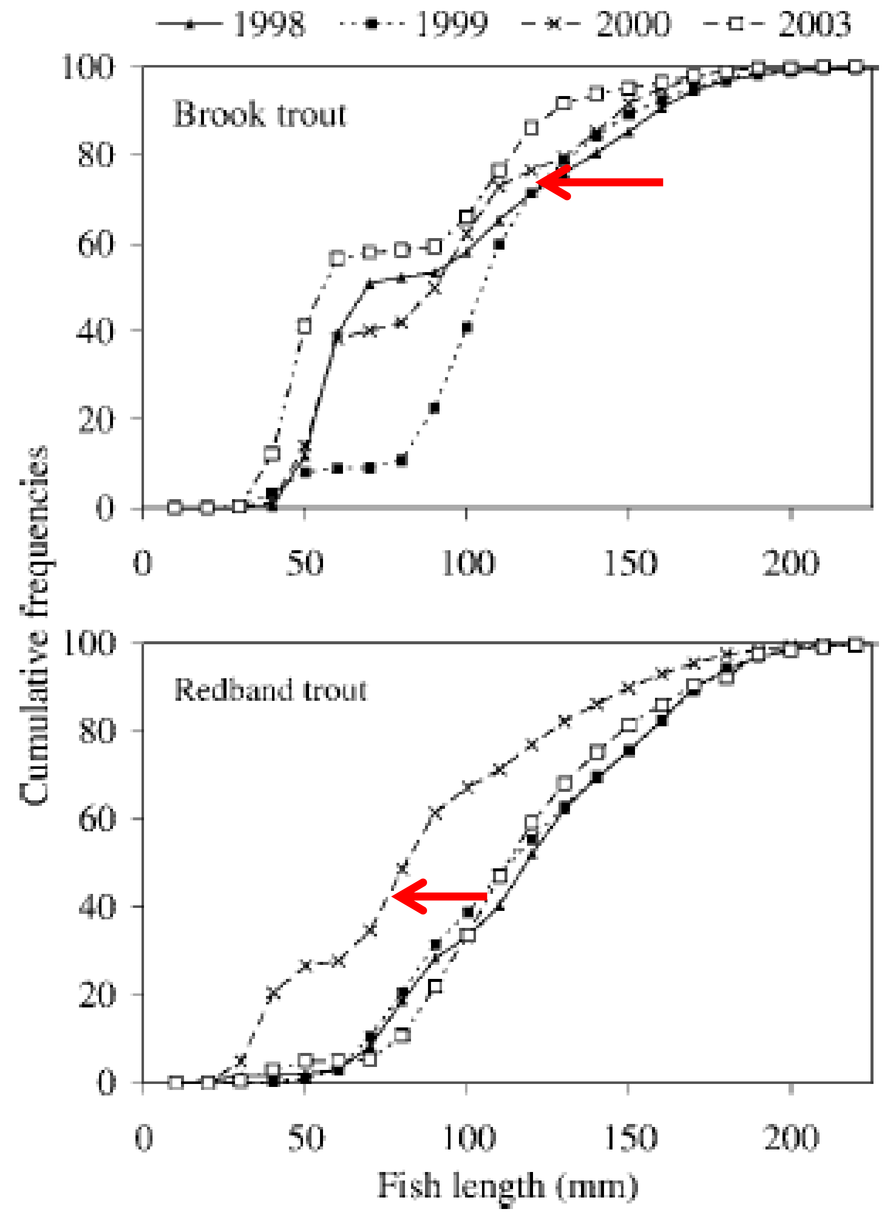


FIGURE 4.—Cumulative length frequencies of nonnative brook trout and native redband trout in Pike's Fork, Idaho, during 1998–2003. Electrofishing removal of brook trout was conducted in all years except 2001 and 2002.

Effect

- Length-weight?
- Fecundity?

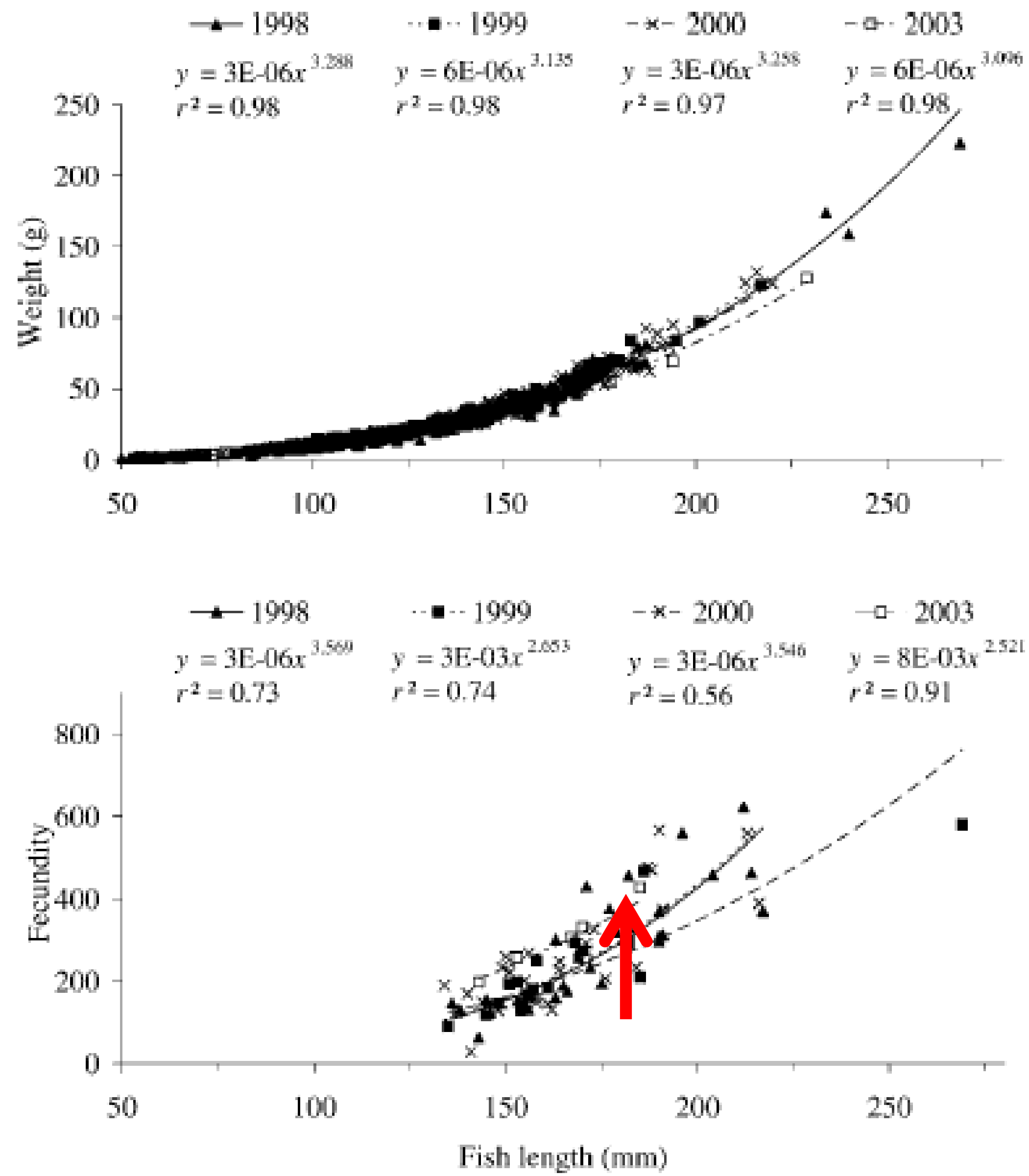


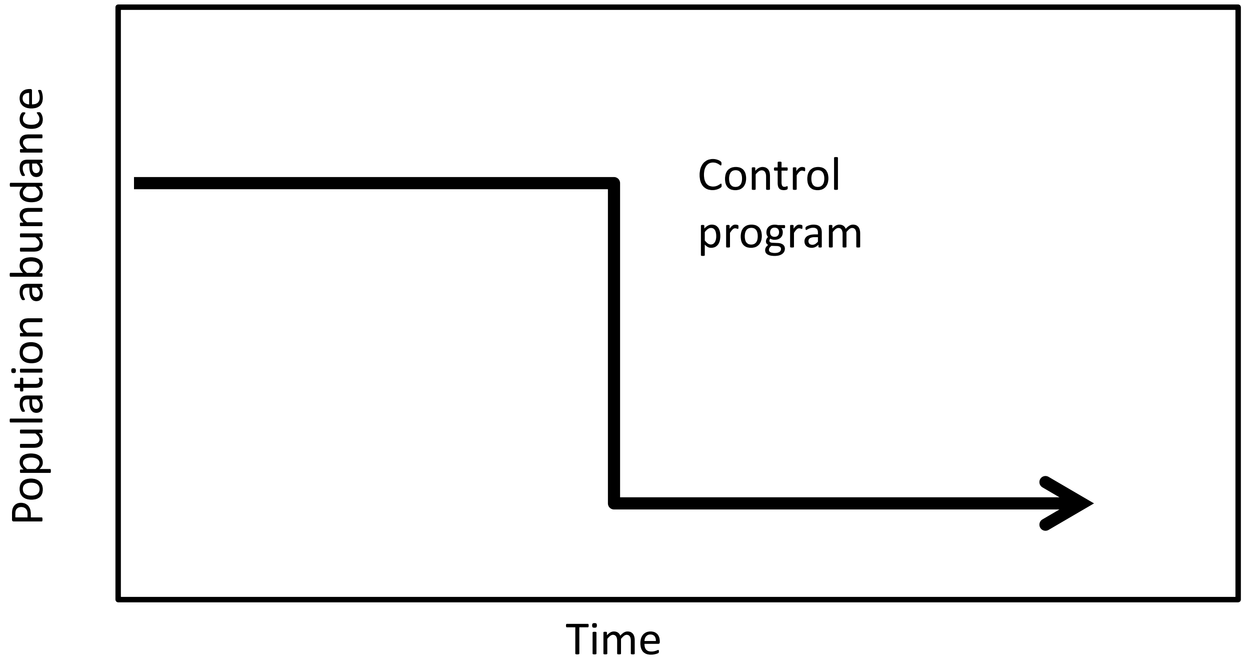
FIGURE 5.—Length–weight and length–fecundity relationships for nonnative brook trout removed by electrofishing in Pike's Fork, Idaho, during 1998–2000 and 2003. Length is total length (mm).

Take home message

- Eradication is rarely achieved, even with extraordinary efforts!
- Mental model versus real model
  - No conceptual or physical model
  - No management alternatives
  - Unintended consequences: compensation
- Control more likely than eradication

Control

- Reduce population to level that minimizes impact



Methods of Eradication & Control

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