Trout conservation and management in North America:

Sea-run cutthroat trout, Puget Sound, Washington

Brown trout, Snake River, Wyoming

Ireland: 84,421 sq km

A large coastline, many small and large loughs, rivers, estuaries, and other aquatic habitats. Geological variation, long history of land-use, and plenty of complexity to keep any scientist busy for a whole career.

Washington: 184,666 sq km

Ireland: 84,421 sq km

Goals of this presentation:

1. A (very) brief introduction to the cast of characters in North America because trout (and char) diversity is much greater than in Europe, and this affects conservation
2. Key differences and similarities in trout ecology
3. Where are we, and how did we get there? A litany of problems, and interactions among problems
4. Looking forward: some reasons for optimism
5. Some broad concepts to consider, ponder, etc.

Greater diversity of “trout” in North America than Europe

Salvelinus alpinus, Arctic char: circumpolar, largely lacustrine, anadromous or not

Salvelinus malma, Dolly Varden: Pacific Rim, largely riverine or anadromous, sometimes adfluvial

Salvelinus confluentus, bull trout: NA Pacific coast and interior. Mostly riverine or adfluvial, can be anadromous.

John McMillan

Salvelinus namaycush, lake trout: northern North America, lacustrine but sometimes anadromous in the Arctic

Salvelinus fontinalis, brook trout: eastern North America, riverine, lacustrine, adfluvial, anadromous

Hans Berge

Oncorhynchus mykiss, rainbow trout: Pacific Rim to Russia

Can be riverine (often heavily spotted) or adfluvial (often very silvery)

O. mykiss, steelhead (when anadromous: not as genetically distinct as was once thought)

Todd Seamons

O. clarkii, Cutthroat trout: western North America with many subspecies

John McMillan

O. clarkii behnkei, Snake River fine-spotted cutthroat trout

O. clarkii lewisi, westslope cutthroat trout

O. clarkii henshawi, Lahontan cutthroat trout

www.imgarcade.com

www.keepcalmandflyfish.com

Many other subspecies of rainbow and cutthroat trout, golden trout, Hila trout, Apache trout, etc.

Many populations have been affected by hybridization with introduced rainbow trout.

Some important differences and similarities (as I see them)

1. Greater native salmonid diversity in western North America than Europe

Five Pacific salmon species

Plus

Rainbow, cutthroat, and related trout species

Plus

Dolly Varden, bull, lake, and Arctic char

Vs.

Atlantic salmon, brown trout, and Arctic char

Differences and similarities

1. Greater salmonid species diversity in North America than Europe
2. Considerable intra-species diversity in North America and Europe

Great diversity of isolated rainbow and cutthroat trout forms

and

Great diversity of isolated brown trout forms

Differences and similarities

1. Greater salmonid species diversity in North America than Europe
2. Considerable intra-species diversity in North America and Europe

Less (or less studied?) diversity within basins

Vs.

Diversity of co-occurring brown trout forms (ferox, gillaroo, sonaghan), well appreciated by anglers and scientists

Differences and similarities

1. Greater salmonid species diversity in North America than Europe
2. Considerable intra-species diversity in Europe and North America
3. Critical role of Pacific salmon in trout ecology along the coast

Trout density, body size, growth rate, movements, etc. all are strongly affected by the availability of food from Pacific salmon: eggs, flesh, fry, and smolts, and insects that eat dead salmon (maggots, caddis flies).

Juvenile salmonids as small as 70 mm or less readily eat water-hardened sockeye salmon eggs. Fry as small as 50 mm eat soft eggs.

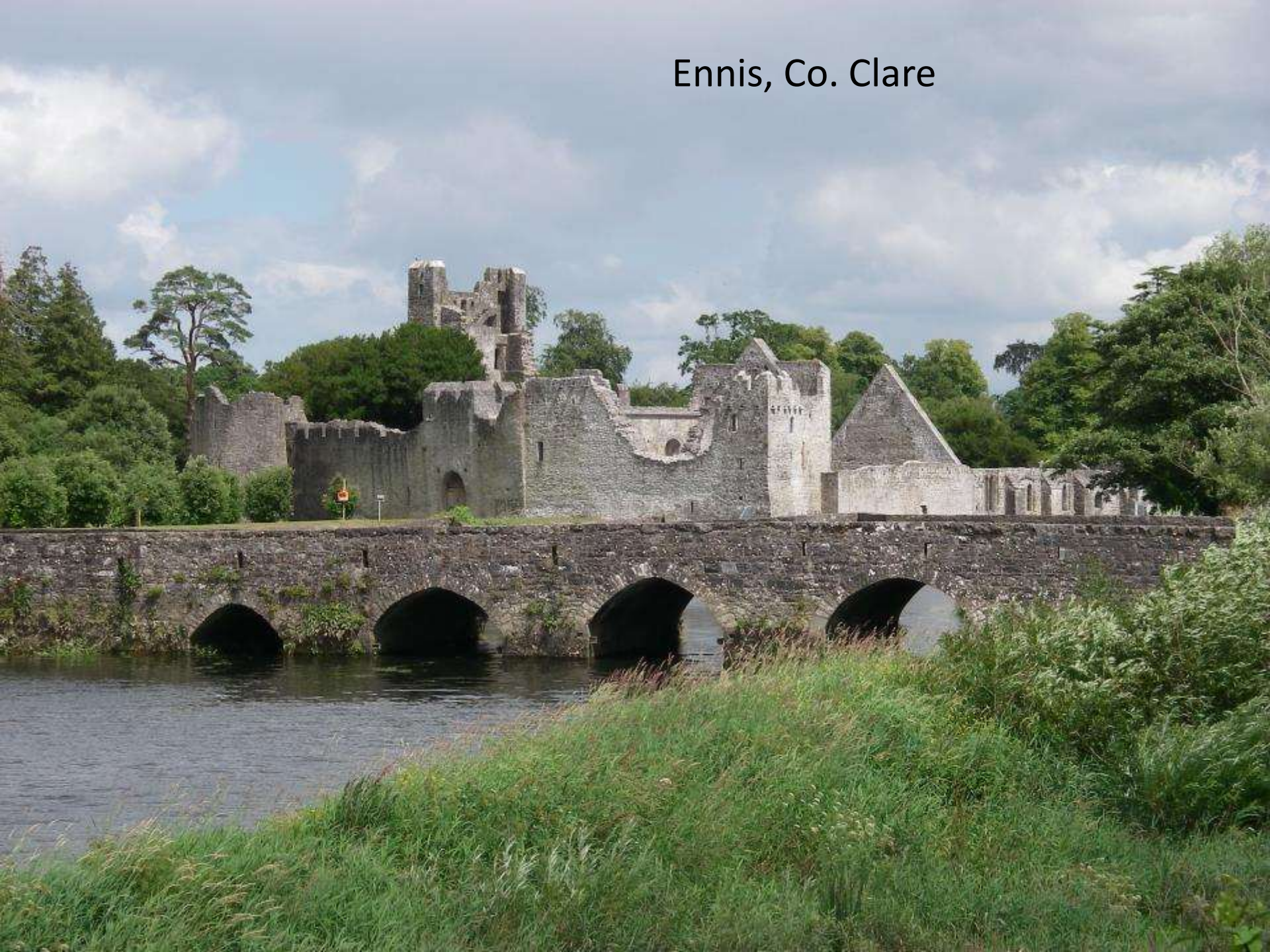
Adults can have up to 1000 eggs, eaten one at a time, in their stomachs.

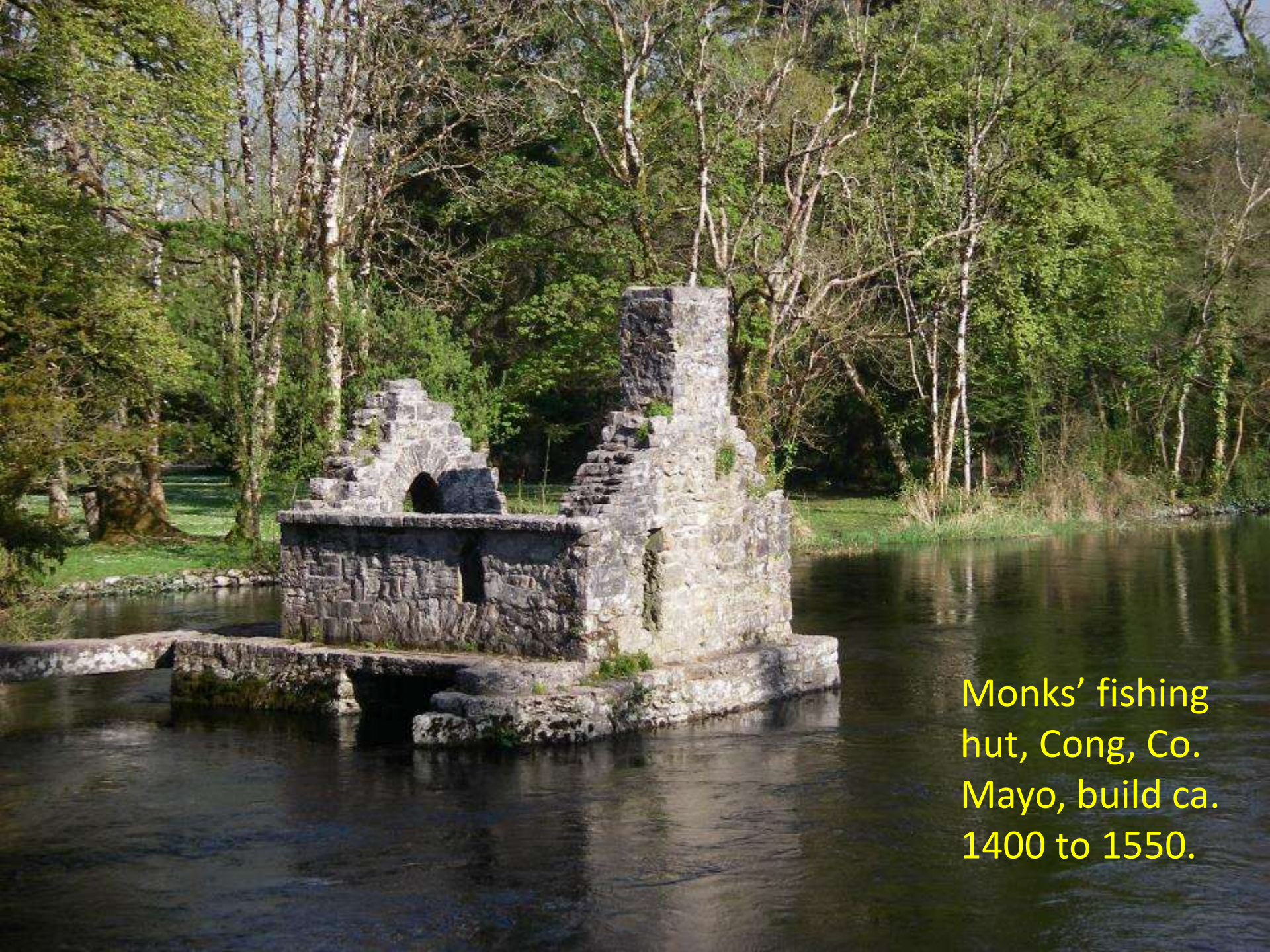
At times, fishing with anything but an egg imitation is futile.


61 cm rainbow trout
71 cm Dolly Varden
Adult Dolly Varden
stomach contents

Some important basic differences and similarities

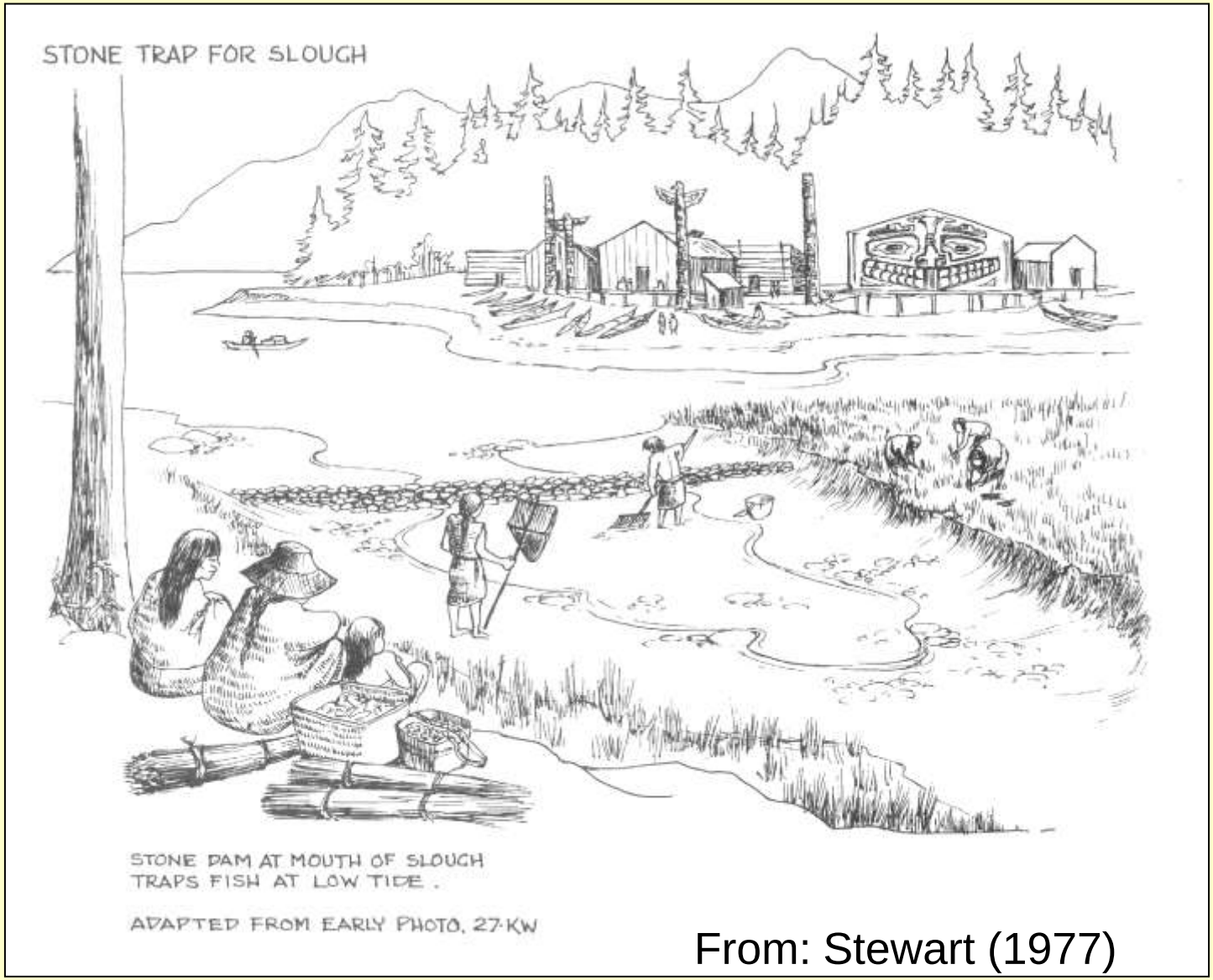
1. Greater salmonid species diversity in North America than Europe
2. Considerable intra-species diversity in Europe and North America
3. Critical role of Pacific salmon in trout ecology along the coast
4. Shorter history of human effects in eastern North America, and even shorter (but intense) period of effects on the west coast compared to Europe.


Ennis, Co. Clare



Monks' fishing hut, Cong, Co. Mayo, build ca. 1400 to 1550.

Native people in North America also exploited salmon but the structures were generally less permanent.



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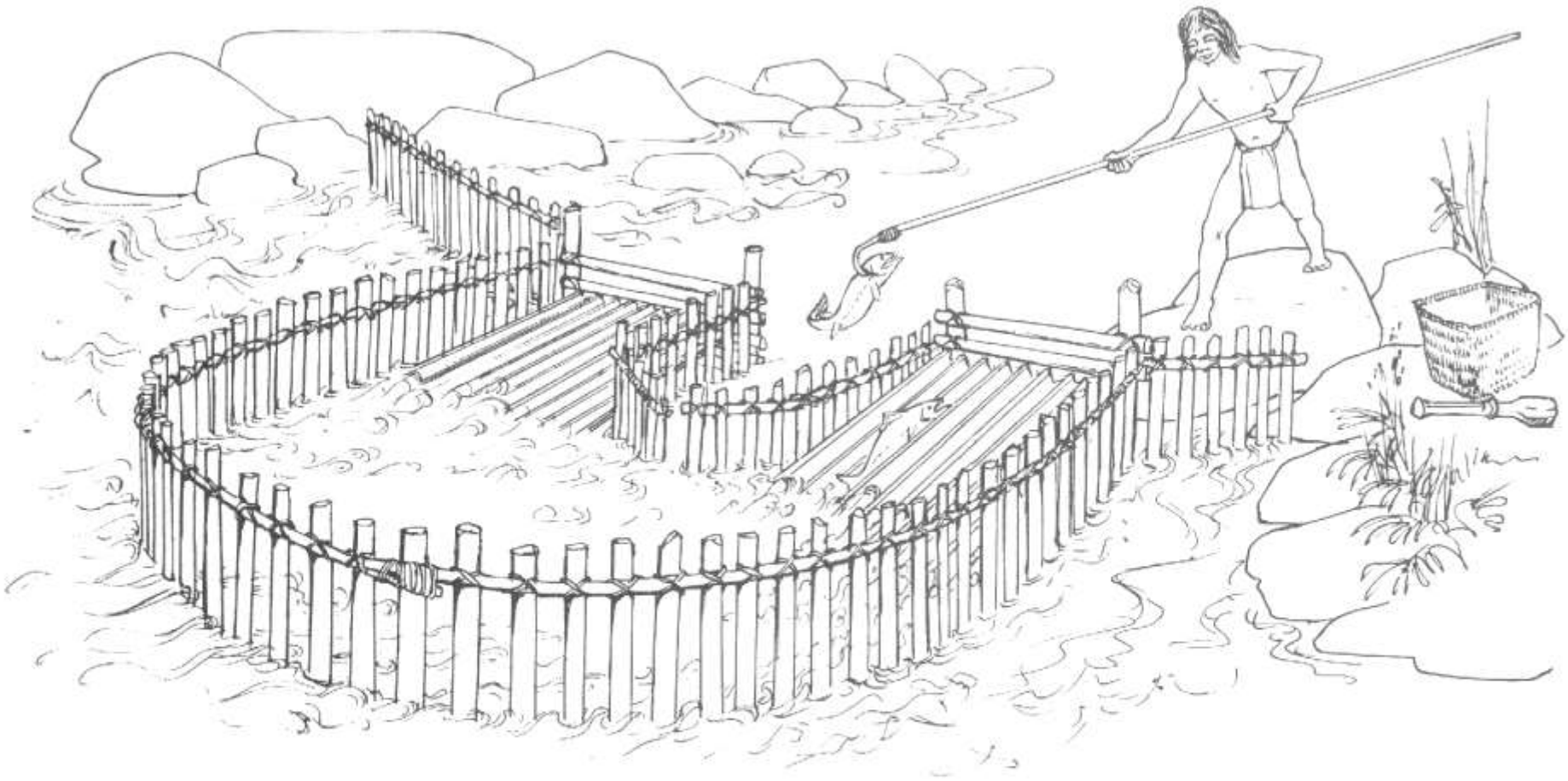

Stewart (1977)

Some important basic differences and similarities

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3. Critical role of Pacific salmon in trout ecology along the coast
4. Shorter history of human effects in eastern North America, and even shorter (but intense) period of effects on the west coast compared to Europe.
5. Greater prevalence of “raw land” and natural ecological processes

Interactions between salmon, trout, and wildlife

The importance of beaver in aquatic ecology, including trout

Interactions between salmon, trout, and wildlife

Complex ecological effects of ecosystems with predators (wolves and bears) and ungulates (deer, elk, moose, caribou)

Where are we, and how did we get here?

1. Extensive transplants within NA (with help from Europe)

- First brook trout from the east to the west, then rainbows from west to east, browns from Europe.
- Complex consequences: brook trout cannot resist non-native trout in their own range but compete well (e.g., with native cutthroat) outside their range.
- Transfers are regarded by scientists as a bad thing but still practiced by agencies, and illegally by anglers.

Themes: Where are we, and how did we got here?

1. Extensive transplants within NA (with help from Europe)
2. Conservation transplants

If a species is depleted and there is available, suitable habitat devoid of the species, should we transplant them there? What are the guidelines?

Juvenile bull trout: Ryan Simmons

Themes: Where are we, and how did we get here?

1. Extensive transplants within NA (with help from Europe)
2. Conservation transplants
3. Heavy fishing on native species, sub-species, and populations

The evolution of fisheries management from “put and take” fisheries to those sustained by natural reproduction, with “catch and release” being the trend. However, this is by no means universal; anglers and managers vary greatly.

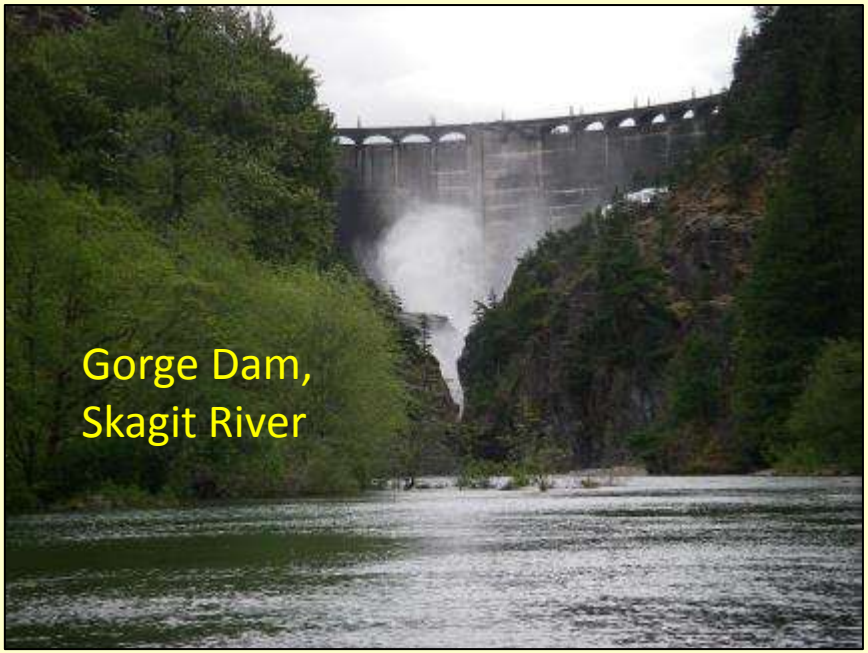
Anglers lined up to catch rainbow trout just leaving the stocking truck:
Green Lake, Seattle, WA.

Protective regulations (catch and release, keep wild fish in the water, single, barbless hooks, no bait, etc.) and practices (soft nets, etc.).

Themes: Where are we, and how did we get here?

1. Extensive transplants within NA (with help from Europe)
2. Conservation transplants
3. Heavy fishing on native species, sub-species, and populations
4. Dams, reservoirs, and the re-plumbing of NA

Thousands of dams – many needed but some not;
some staying and some being demolished.



Lower Elwha Dam being demolished, 2011: John McMillan

Culverts are less obvious but much more common than large dams, and can hinder or prevent adult and juvenile fish passage. Improved culvert design and replacement connect populations.

High Country News

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5. Habitat degradation: logging, agriculture, urbanization

More protective logging regulations are the trend in the west but suburban and urban sprawl are great problems. Forested land is converted to shopping malls, runoff increases, etc.

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7. Disease management

How to deal with whirling disease? Stock more fish, or let the fish evolve resistance? Greater effects on native (rainbow and cutthroat) than brown trout. Etc.

Ecological pests such as didymo, New Zealand mud snails, and other hitch-hikers

www.nwcouncil.org

Alaska has banned the use of felt-soled wading boots to help prevent transfer of invasive organisms.

www.fws.gov

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8. Climate

Complex effects of temperature, quantity and nature of precipitation (snow vs. rain), timing and volume of runoff, etc.

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6. Hatchery programs and the loss of genetic diversity
7. Disease management
8. Climate
9. Fishery management: public access vs. private control

Things are very different on our side of the pond in terms of licensing, public access, etc.!

Some new(ish) concepts to consider:

- BioComplexity: many populations, out of sync with each other. Big producers in one period may do poorly later, and vice versa

Some new(ish) concepts to consider:

- BioComplexity: many populations, out of sync
- Portfolio concept: diversity is good

Like diverse stock portfolios, think of fish (species, rivers, lakes, forms, etc.) and value the diversity

Some new(ish) concepts to consider:

- BioComplexity: many populations, out of sync
- Portfolio concept: diversity is good
- Coupled human and natural systems: fishery management is as much about people as fish

Scientists, managers, and anglers are all in this together.

Sometimes one group leads and others follow (reluctantly?) but the leaders change so respect each other.

Some new(ish) concepts to consider:

- BioComplexity: many populations, out of sync
- Portfolio concept: diversity is good
- Coupled human and natural systems: fishery management is as much about people as fish
- The rising tide does not lift all boats:

Populations will respond differently to changing climate so plan for variation and manage around it rather than trying to guarantee stability.

What does it take for a population to be “viable?”

McElhany et al. 2000: The “viable salmonid population” concept

1. Numerical abundance
2. Abundance trend
3. Spatial diversity
4. Life history diversity

Habitat is fundamental to all fish and wildlife production

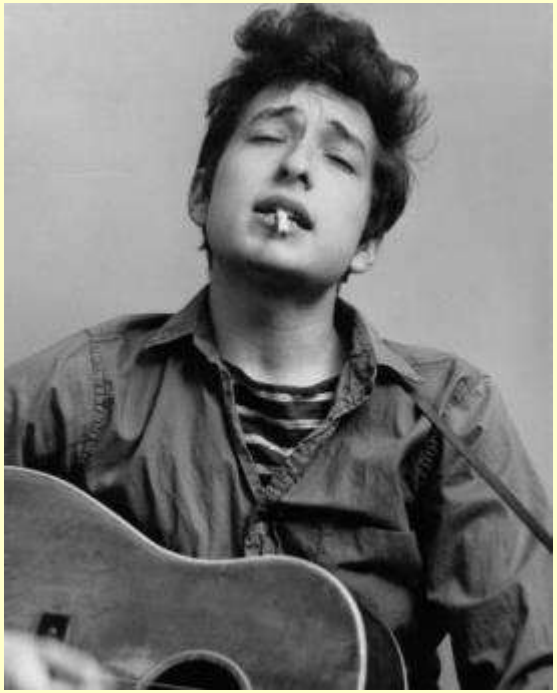
Protection works better than restoration:

Keep Humpty Dumpty on the wall!

Restoration works better than replacement

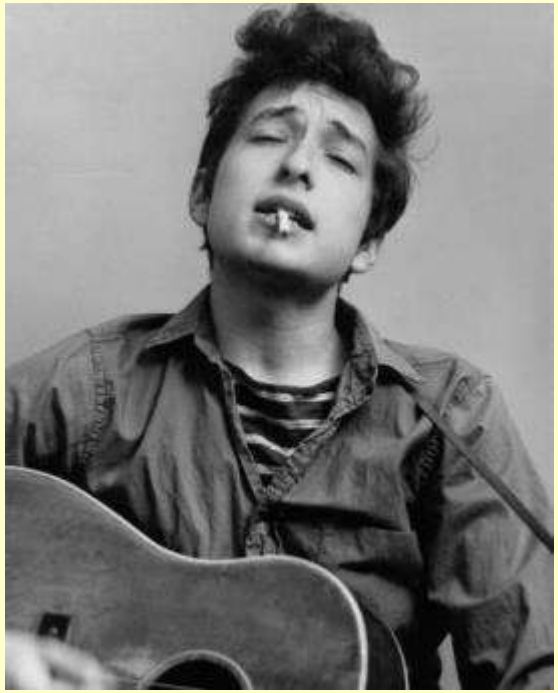
Overall,
Bob Dylan was right:

- The times they are a’ changing.



Bob Dylan:

- The times they are a’ changing.
- You don’t need a weatherman to know which way the wind blows.




Morgan Bond


KEEP
CALM
AND
FISH
ON

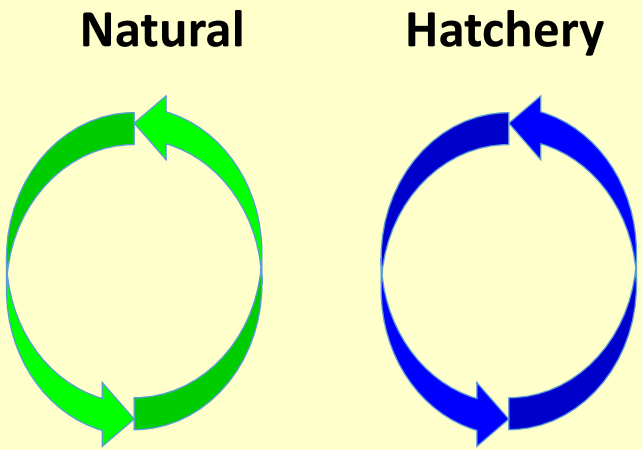
Segregated vs. Integrated management

Segregated:

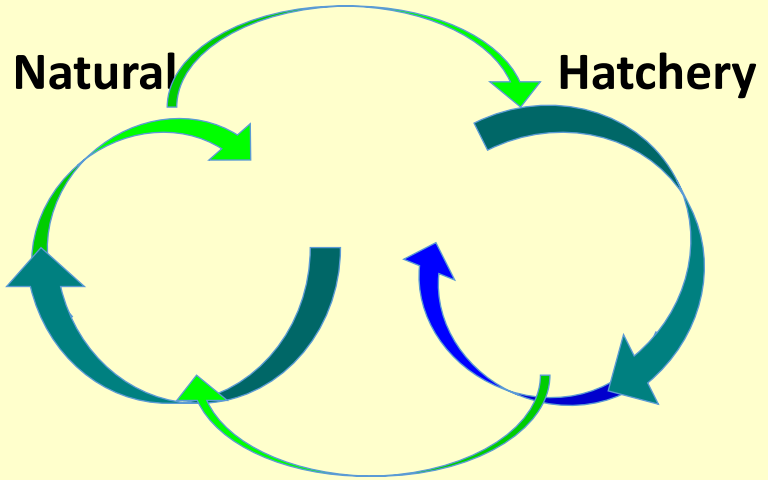
- hatchery-origin broodstock
- limited gene flow
- harvest is the goal

Integrated:

- natural-origin broodstock
- intentional, regulated gene flow
- harvest + conservation goals



Ideally, 2 genetically separate populations



Gene flow between hatchery and wild environments

Courtesy of Barry Berejikian