Attendance

WF4313/6313-Fisheries Management

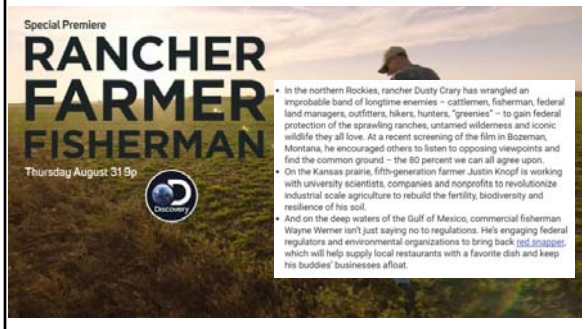
Class 4 – Fisheries History

Announcements

Announcements

1. Lab tomorrow at 1 pm

Announcements



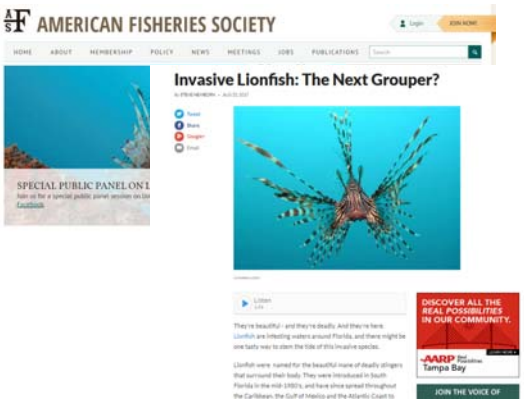
Student Subsection – September 5th@5pm TH118

In the news

Wanted: Illegal Fish Dumpers

The Department of Wildlife is offering a bounty for purveyors of invasive fish

In a seemingly unprecedented maneuver, the Nevada Department of Wildlife is offering $10,000 for information on the person responsible for releasing these predators in the lake. Officials hope to catch the criminal or criminals—and impress on residents how threatening invasive species can be.



Class Topics

1. Importance of history
2. Legacy effects
3. Time periods in fisheries management

History Matters

"No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be.... Isaac Asimov (1920 - 1992)

History of exploitation & management of fish stocks

- Hunting gathering societies
  - Dependent on aquatic sources of protein
  - Human populations cycle with good and poor years
- Anadromous Salmon
  - Easy to exploit

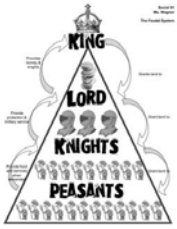
Meengs, C. C., and R. T. Lackey. 2005. Estimating the size of historical Oregon salmon runs. Reviews in Fisheries Science 13:51-66.

European Settlement

- Unexploited state
- Value system → more formal management
- Christianity and abstinence days – more than half the calendar in 13th century

Who owned resources?

- Confusion in Colonial times
- European model
  - Aristocracy and nobility held property rights
- Democracy
  - Public terrestrial, riparian, and freshwater resources open by public trust doctrine
- Philosophy
  - natural resources were fuel for economic development



What gives you the right…

- Management authority
  - Federal mandate in 1871-Authorized the US Commission on Fish and Fisheries
  - Purpose:
    1) Determine reasons for declines of fisheries in New England and Great Lakes
    2) Develop fish culture

History of exploitation and management of fish stocks

- Colonial exploitation (pre 1800s)
  - Perceived fish stocks as limitless

History of exploitation and management of fish stocks

- Mid 1800s
  - Fisheries were unlimited

History of exploitation and management of fish stocks

- Technological improvements
  - Gear
  - Boats
  - Knowledge
- Lead to declines in fish populations
  - Restrictions on gear, days to fish
  - Early 1700s in New England
  - Establishment of state and federal agencies

History of exploitation and management of fish stocks

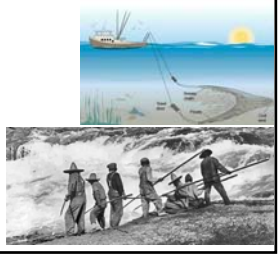
- 1900s. Science based management
  - Commercial
  - Recreational

every fish population had the potential to produce a harvestable surplus and the largest surplus that could be harvested annually. from that population (maximum sustainable yield) could be estimated by rigorous scientific analysis (stock assessment)-Lackey 2005

History of exploitation and management of fish stocks

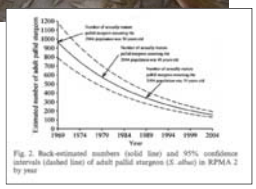
- Late 1900s. Habitat and species protection

Only rarely was overfishing the primary cause of precipitous declines in fish abundance. In fact, most endangered fish species have never been fished. Endangered species" and "species at risk" legislation directed government agencies and fisheries managers to emphasize protecting species above catch.-Lackey 2005



Commercial fishing & overexploitation

Legacy: overexploitation



Legacy: overexploitation

Skewed sex ratios
Favoring males

History of exploitation and management of fish stocks

- Culture
  - Common carp
  - Game fish
- Conservation of fish
- Manage fishers
  - Models

Johnny Fish-Seed era

- Mid 1800s to 1930

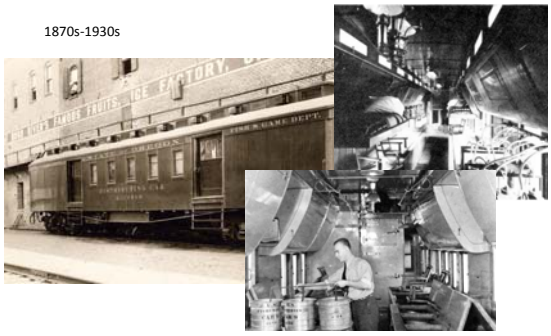
DISCUSSION ON CARP.

Dr. Bartlett: From a practical standpoint I want to say to you that the United States Fish Commission builded a great deal wiser than it knew when it introduced carp in the waters of Illinois. I am here as representative of the United States Fish Commission, and I want to say to you that the waters of Illinois have proven more acceptable to carp than many of the other waters. I want to speak of that of which I know. The work of the Fish Commission depends entirely of course upon the money they have to run their business. It is getting to be practically a matter of dollars and cents, this Fish Commission business, and ought to be in the various states, but that is particularly true in Illinois. There is, perhaps, no one here that has been a stronger advocate in years gone by of protection than myself. I early made up my mind that any law the enforcement of which would kill a fisherman was next to gospel. I have changed my mind as to that considerably and believe now in propagation rather than protection. The last legislature of Illinois enacted laws which prohibit the taking of black bass, wall-eyed pike, etc., except with hook and line during the whole season. The carp on the other hand have been subject to a little more of the open season and are permitted to be caught nine months in the year. I want to say to you briefly, however, and without giving you any reasons for it, because you all know what my reasons are, that the carp have produced in the State of Illinois more money than all other fish put together. That seems like a pretty hard statement to make, but it can be verified, and I want to say to you that there are more carp eaten on the hotel tables in the State of Illinois

Bartlett, S. P. 1901. Discussion on Carp. Transactions of the American Fisheries Society 30:114-132.

Advent of Rail: Fish Car Era

1870s-1930s



http://www.catskillarchive.com/rrextra/fishcar.Html

Truck era

- 1939 Bureau of Fisheries report put it, "The same number of fish can be carried by truck as by distribution car, to destinations within a radius of approximately 300 miles, a fourth the cost."

Common Carp spread

Legacy: Water quality

Before carp removal in Ventura Marsh

After carp removal in Ventura Marsh

Put and take era (1950s-1960s)

- Planting fingerling sized fish (put and grow) was not sufficient.
- Poor water quality
- Clean water act 1972

Cuyahoga River Burns

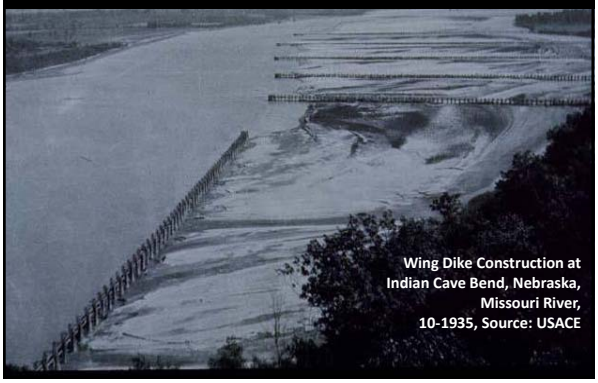
NAVIGATION AND FLOOD CONTROL ERA

Authorizations

- Rivers and Harbors Act (1899)
  - Navigation
- Flood Control Act
  - Damming

Pre 1930s

Channelizing The River

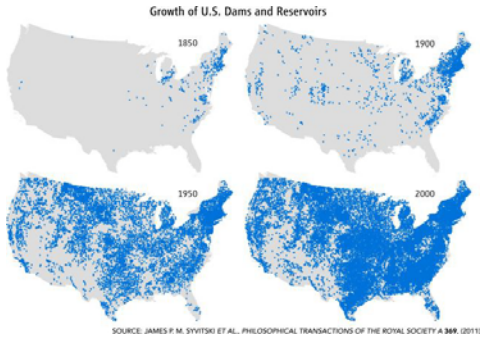


Wing Dike Construction at Indian Cave Bend, Nebraska, Missouri River, 10-1935, Source: USACE

Channelizing The River

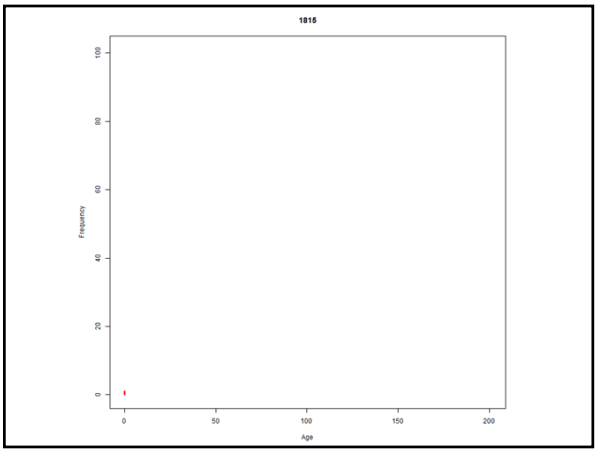
Elevated Flows

Dam Era Early to Mid 1900s



1930s-1960s

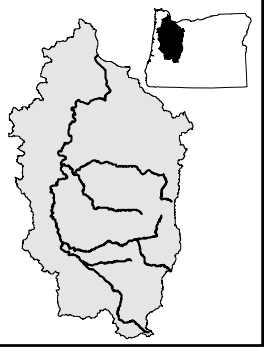
Additional Dams…



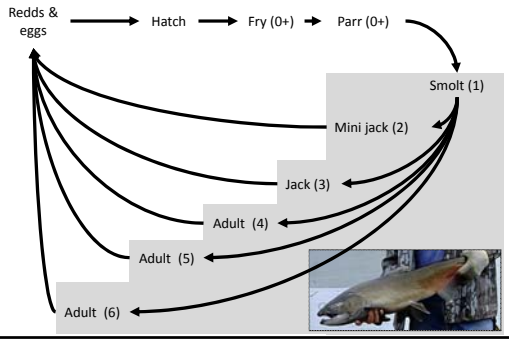
Willamette basin spring Chinook

Anadromous species of conservation need

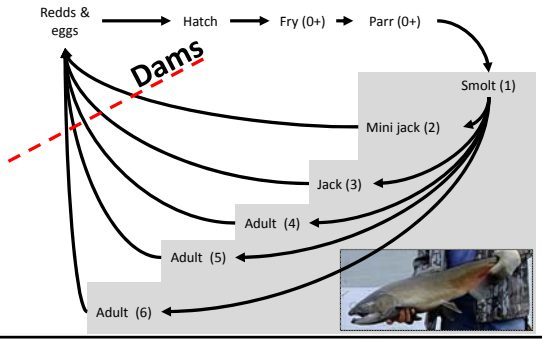
-Threatened status 1999
- Anthropogenic modifications



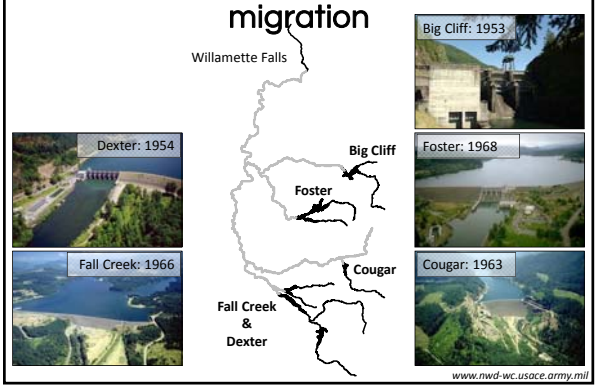
Spring Chinook life history



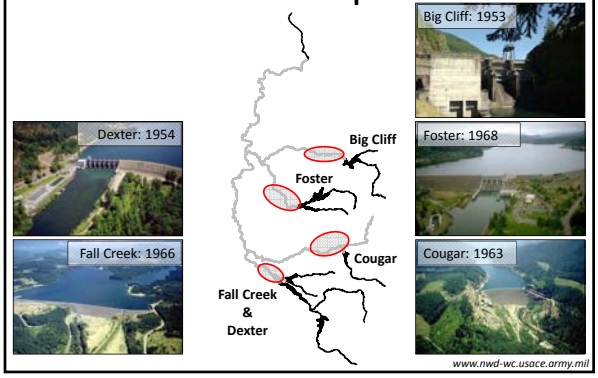
Spring Chinook life history



1950-60s Barriers to adult migration



Limited natural reproduction

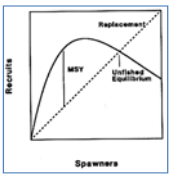


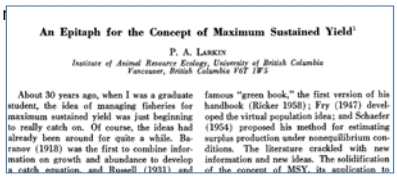
Holistic era 1960s to present

- Look at the whole picture
- Need to manage
  - Fishing
  - Habitat
  - Nuisance species
  - Multiple species management

Maximum sustainable yield

- Allow some fish to grow before harvesting at a level to promote the greatest long term yield
- Ineffective due to dependencies on exploited forage
  - Bass eat bluegill, both are harvested (Forbes 1887)





An Epitaph for the Concept of Maximum Sustained Yield[1]

P. A. Larkin

Institute of Animal Resource Ecology, University of British Columbia Vancouver, British Columbia V6T 1W5

About 30 years ago, when I was a graduate student, the idea of managing fisheries for maximum sustained yield was just beginning to really catch on. Of course, the ideas had already been around for quite a while. Baranov (1918) was the first to combine information on growth and abundance to develop a catch equation, and Russell (1931) and famous "green book," the first version of his handbook (Ricker 1958); Fry (1947) developed the virtual population idea; and Schaefer (1954) proposed his method for estimating surplus production under nonequilibrium conditions. The literature crackled with new information and new ideas. The solidification of the concept of MSY, its application to

Optimum sustained yield

- Failures in management using MSY
  - ~75% of fisheries resources are fully or overexploited
  - Estimates of collapse of global fisheries by 2048
- Optimum sustained yield (OSY)
  - Broader goals and policies than fishery yield
- Integrated view of aquatic systems
- More holistic view

Nuisance fish considerations

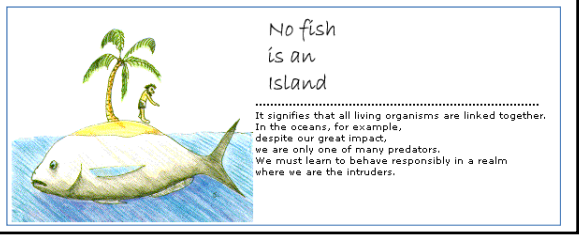
- Sea lamprey control in Great Lakes

Push for holistic management

- Magnuson Stevens Act- National Standard
  - (1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the ***optimum yield*** from each fishery for the United States fishing industry.
  - (2) Conservation and management measures shall be based upon the best scientific information available.
  - (3) To the extent practicable, ***an individual stock of fish*** shall be managed as a unit throughout its range, and ***interrelated stocks*** of fish shall be managed as a unit or in close coordination.

"No fish is an island"

- Optimum sustained yield (OSY) attempts to integrate a broad range of goals not just fishery yield (biodiversity, function)



Development of ECOPATH

- Mass balance
  - Conservation of mass

A holistic view of aquatic systems

- Heir to Odum
  - 24 attributes
- Ecosystem level functions

$$B_i(P/B)_i\ EE_i = \sum(Q/B)_i DC_{ij} B_j + C_i + BA_i + NM_i,$$

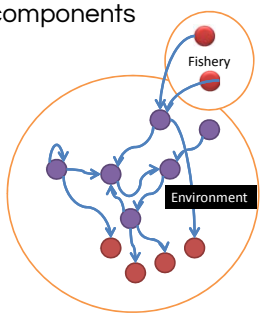
Attribute/function	Symbol	Unit	Odum attribute
1 Net primary production	P_n	g/m²/year	
2 Respiration	R	g/m²/year	
3 System size (sum of flows)	T	g/m²/year	
4 Primary production/respiration	P_n/R	-	
5 Deviation of P_n/R	Trnx	-	1
6 Primary production/Nemass	P_n/B	year	2
7 Biomass supported (a)	B/T	year	3
8 Biomass supported (b)	$B/(P_n+R)$	year	
9 Net production	$P_n - R$	g/m²/year	
10 Connectance	C	-	5
11 System omnivory index	SOI	-	5
12 Dominance of detritus	Dom.Det	-	5
13 System biomass (excl. detritus)	B	g/m²/year	
14 Flow diversity	H	-	8–9
15 Average organism size	B/P	year	13
16 Finn's cycling index	FCI	-	15
17 Predatory cycling index	PCI	-	
18 Nutrient regeneration	FCI – PCI	-	
19 Path length	PL	-	16
20 Straight-through path length	SPL	-	
21 Residence time	$B/(R+EXP)$	year	18
22 Nutrient conservation	G_{ns}	-	21
23 System overhead	O	-	
24 Schrödinger ratio	B/R	-	23
25 Information content of flows	I	bits	24
26 Energy-based ascendency	A	-	
27 Relative ascendency	A/C	%	
28 Entergy Odum/based ascendency	A_e	%	
29 Internal redundancy	Redund	%	
30 Exergy	EX	-	
31 Structural exergy	EX_s	-	

Use of ECOPATH

- 169 countries
- >7000 users
- NOAA top ten break through

ECOPATH Levels of organization

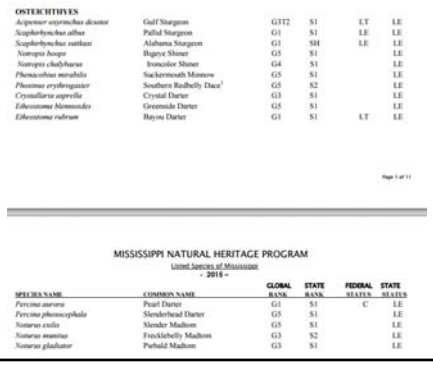
- Populations- biotic components
- Communities
  - Consumers
  - Primary Producers
  - Detritus
- Ecosystem
  - Fishery
  - Environment
    - Forcing functions



Restoration & Conservation Era

- 163 Threatened & endangered fishes

In Mississippi



OSTEICHTHYES

Acipenser oxyrinchus desotoi	Gulf Sturgeon	GT2	S1	LT	LE
Scaphirhynchus albus	Pallid Sturgeon	G1	S1	LE	LE
Scaphirhynchus suttkusi	Alabama Sturgeon	G1	SH	LE	LE
Notropis boops	Bigeye Shiner	G5	S1		LE
Notropis chalybaeus	Ironcolor Shiner	G4	S1		LE
Phenacobius mirabilis	Suckermouth Minnow	G5	S1		LE
Ploxomus erythrogaster	Southern Redbelly Dace[1]	G5	S2		LE
Crystallaria asprella	Crystal Darter	G3	S1		LE
Etheostoma blennioides	Greenside Darter	G5	S1		LE
Etheostoma rubrum	Bayou Darter	G1	S1	LT	LE

MISSISSIPPI NATURAL HERITAGE PROGRAM

Listed Species of Mississippi

- 2015 -

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
Percina aurora	Pearl Darter	G1	S1	C	LE
Percina pharcephala	Slenderhead Darter	G5	S1		LE
Noturus exilis	Slender Madtom	G5	S1		LE
Noturus munitus	Frecklebelly Madtom	G3	S2		LE
Noturus gladiator	Pwhald Madtom	G3	S1		LE

Recovery of the Oregon Chub

- Endangered 1993
- Unlisted 2015, first fish ever!