WF4313/6413-Fisheries Management

Class 17

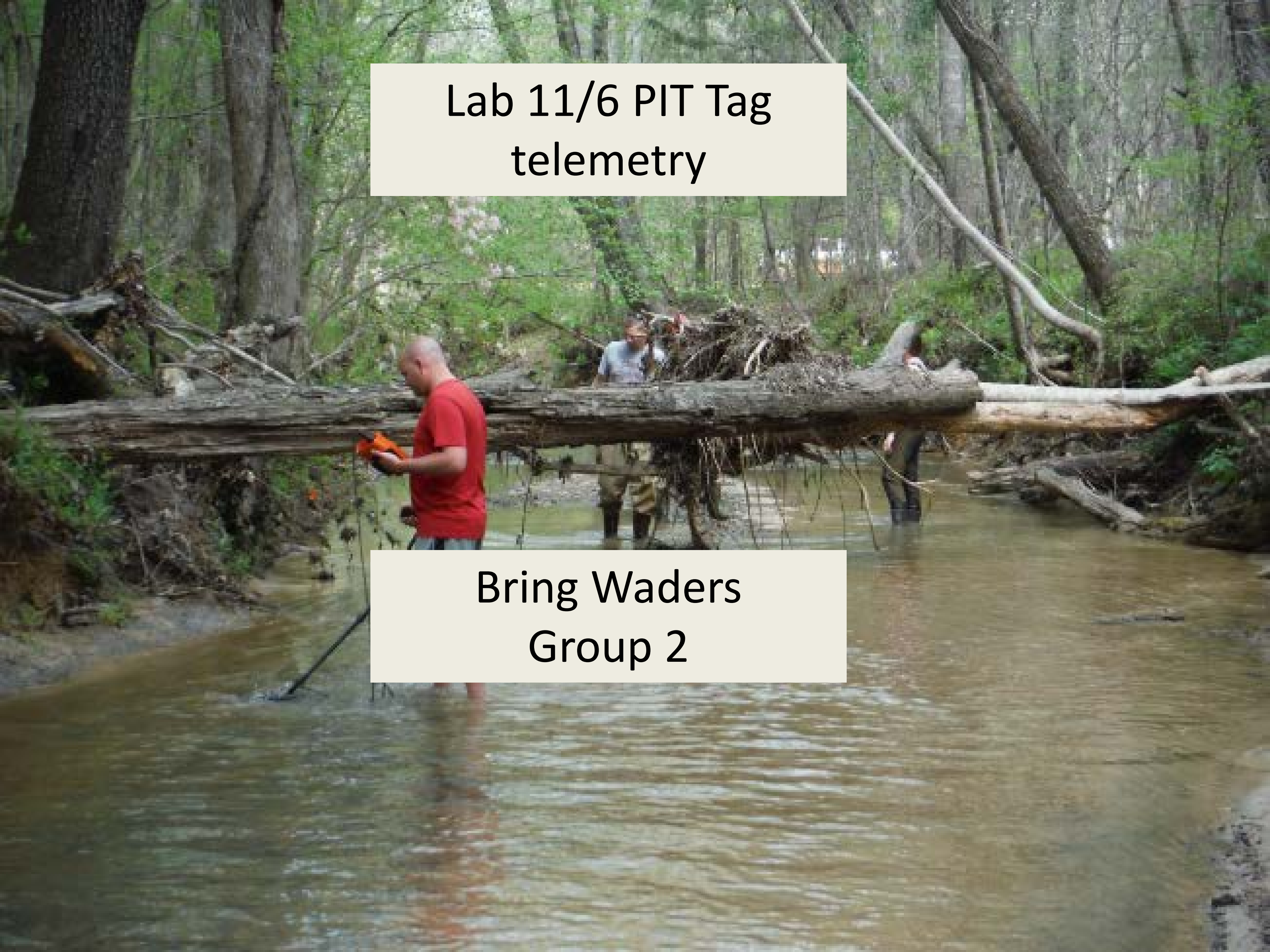
Announcements

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 = Group 1 will do what group 2 did
- November 27th & December 4th ???

** Contingent on van availability

Lab 11/6 PIT Tag telemetry



Bring Waders
Group 2

Interested in chasing more lamprey? Opportunities to assist on an undergraduate research project.

Madtom Hotels Update

Madtom Hotels Update

Why is this important?

- If listed as threatened a conservation stocking plan will be developed

Management alternative(s)

- Stock varying levels of madtoms

How to monitor the effectiveness of stocking?

- Madtoms are hard to catch: rare, cryptic
- Will use cavities: make hotels!

But will hotels index abundance?

- Behavior? Territorial, will 1 madtom keep out all others from the hotel?
- Stock known densities of madtoms and see of hotel use by PIT tag detection is **correlated** with madtom density.

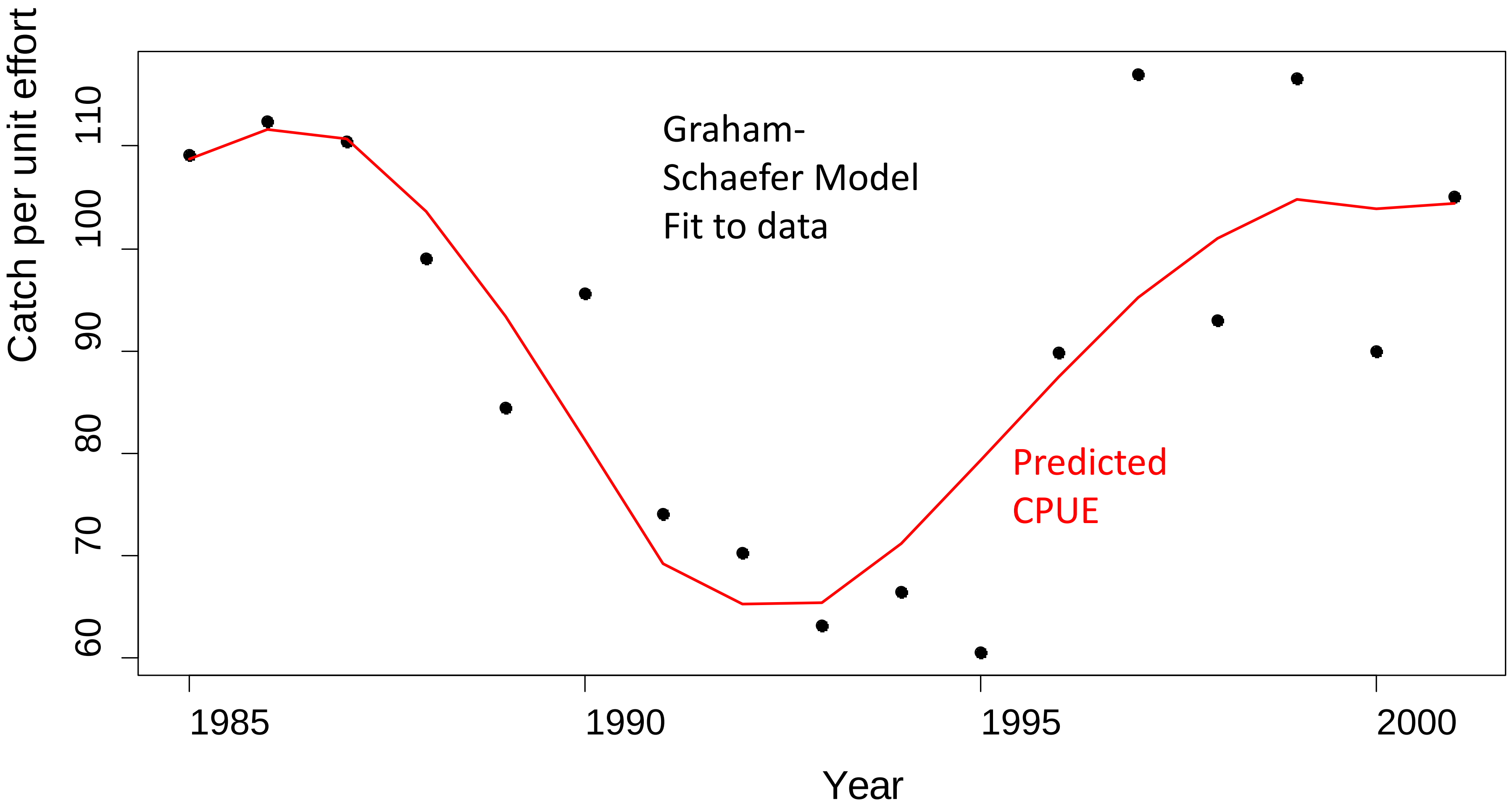
WHERE WE LEFT OFF

Suppose we have data over time

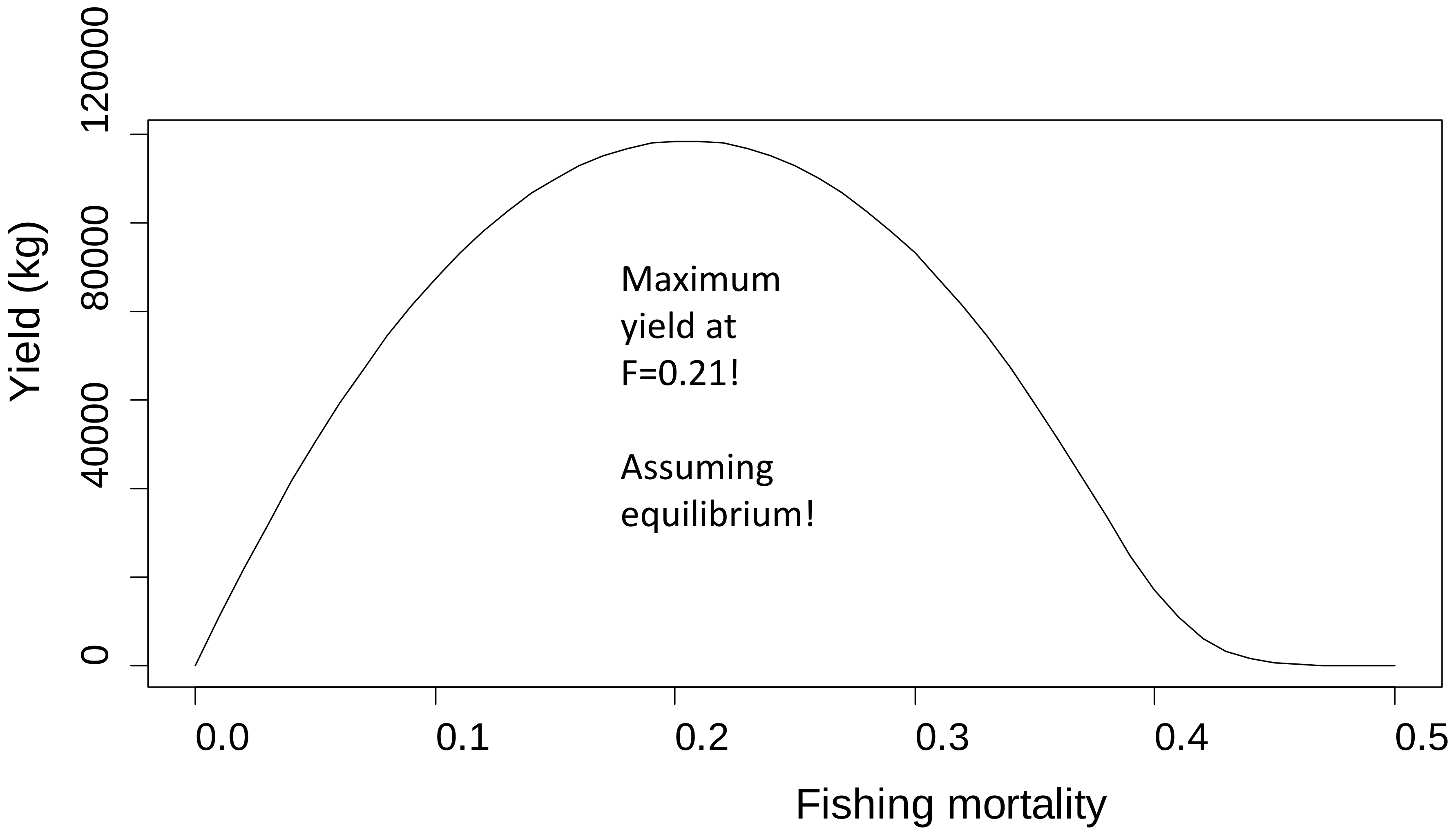
year	effort	catch	cpe
1985	825	90000	109.09091
1986	1008	113300	112.40079
1987	1411	155860	110.46067
1988	1828	181128	99.08534
1989	2351	198584	84.46789
1990	2074	198395	95.65815
1991	1877	139040	74.07565
1992	1566	109969	70.22286
1993	1139	71896	63.12204
1994	893	59314	66.42105
1995	1029	62300	60.54422
1996	727	65343	89.88033
1997	658	76990	117.00608
1998	953	88606	92.97587
1999	1012	118016	116.61660
2000	1203	108250	89.98337
2001	1034	108674	105.10058

Catch/Effort

CPUE and predicted CPUE



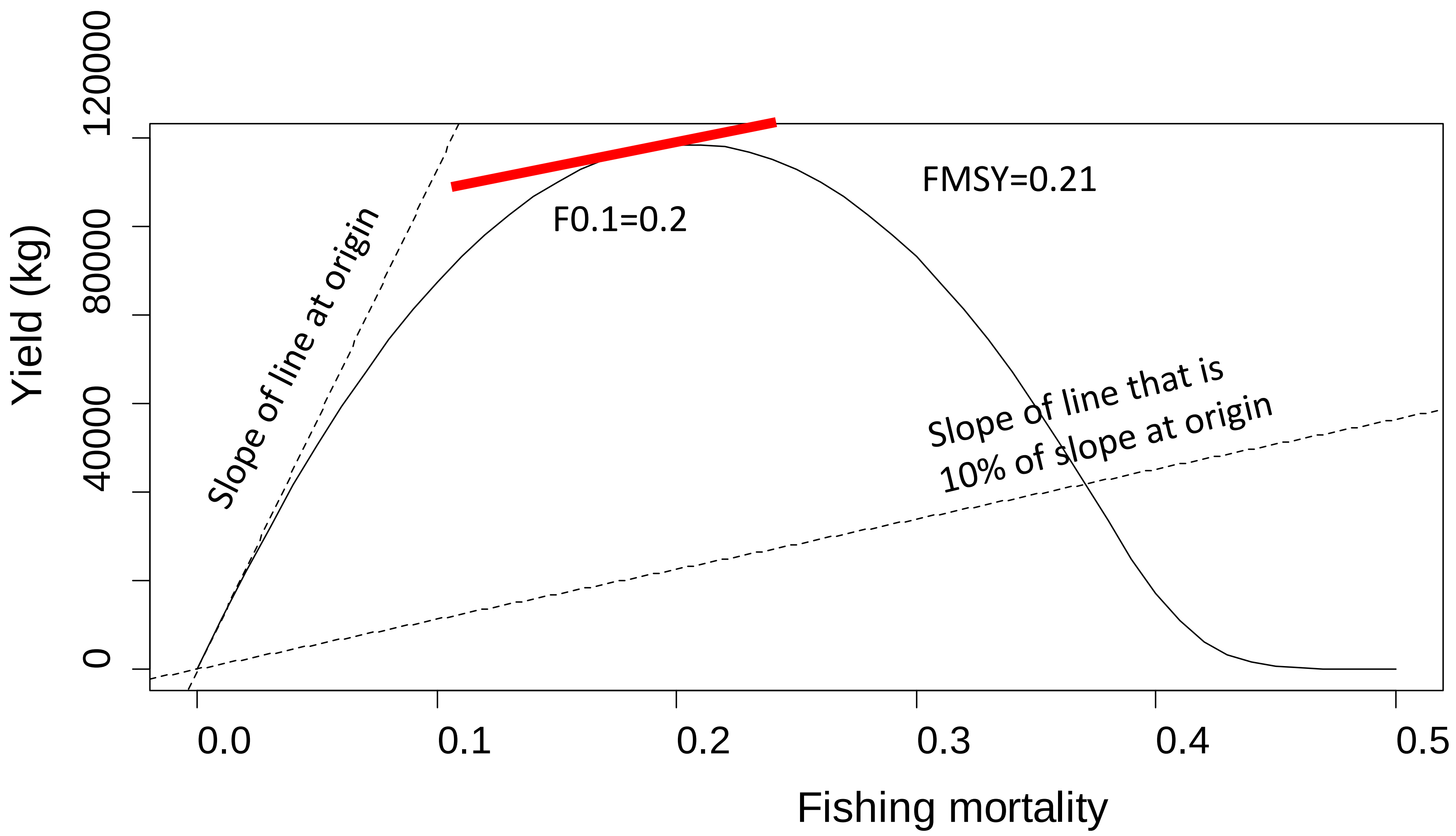
Equilibrium sustained yield



Why is this important?

- Most harvest model evaluate equilibrium yield!
- **We should harvest 706743*0.21=148416 kg**
- But it assumes equilibrium which can mess with dynamics if equilibrium is violated.
- Why? Lets explore this!

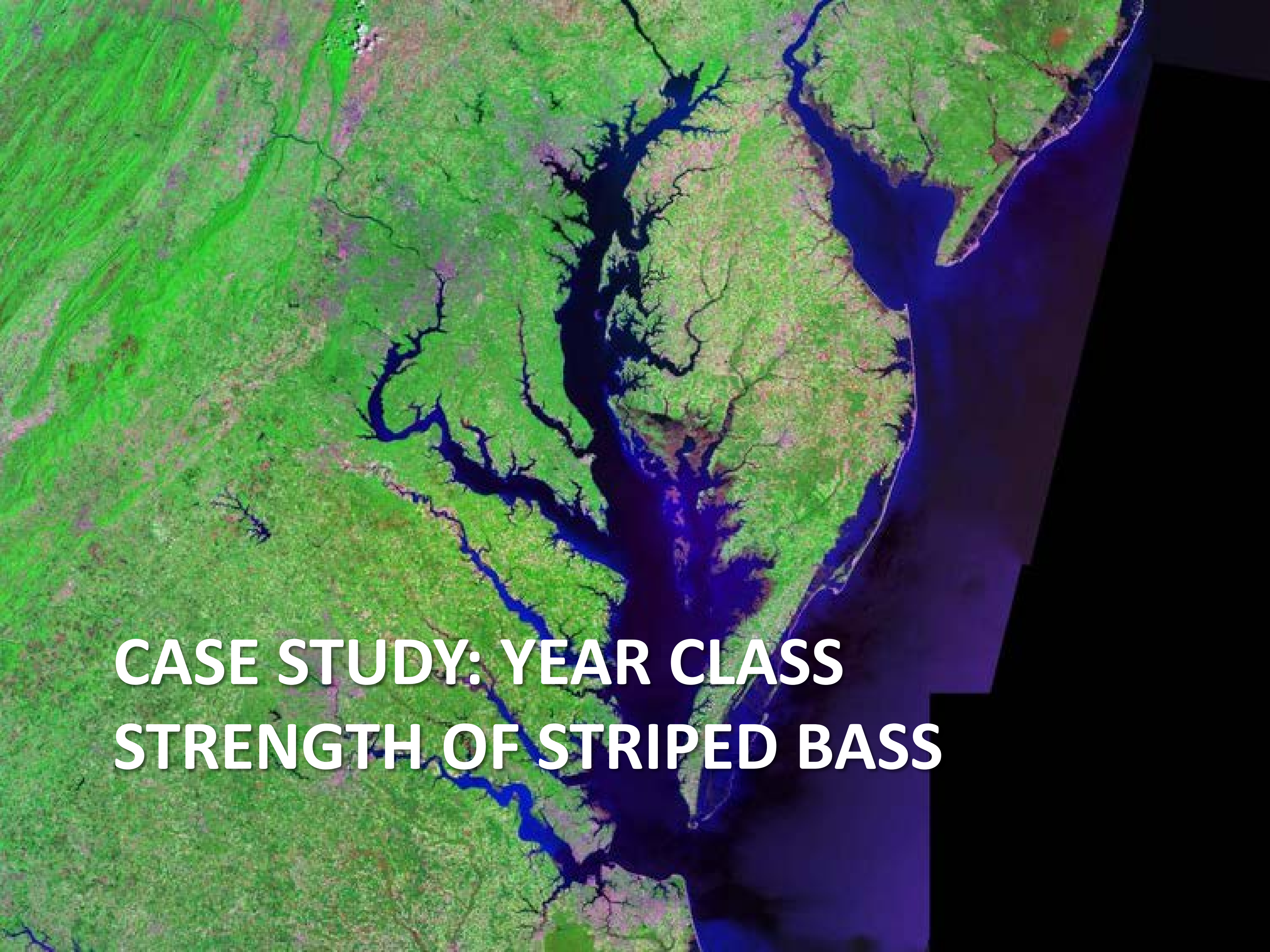
10% of slope at origin



F0.1 = 0.2

- Reduces harvest amount
- **FMSY: 706743*0.21=148416 kg**
- **F0.1: 706743*0.20=141348 kg (~5% reduction)**
- Why does F0.1 make sense?

CASE STUDY: YEAR CLASS STRENGTH OF STRIPED BASS



Stripers

Poor Striper Spawn Reported in Chesapeake

BY OTW STAFF | OCTOBER 18, 2016 | SALTWATER, STRIPERS & BLUES.

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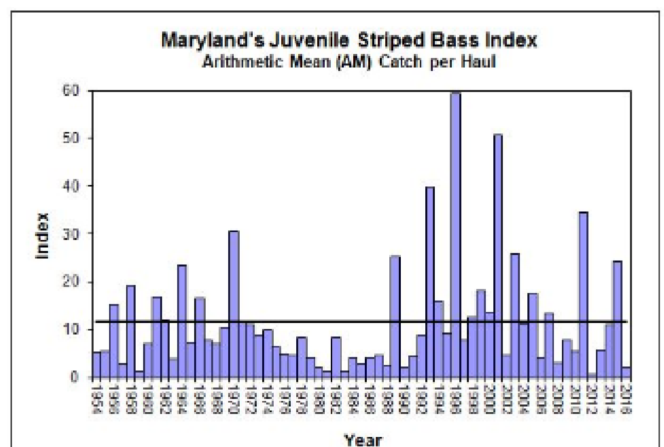
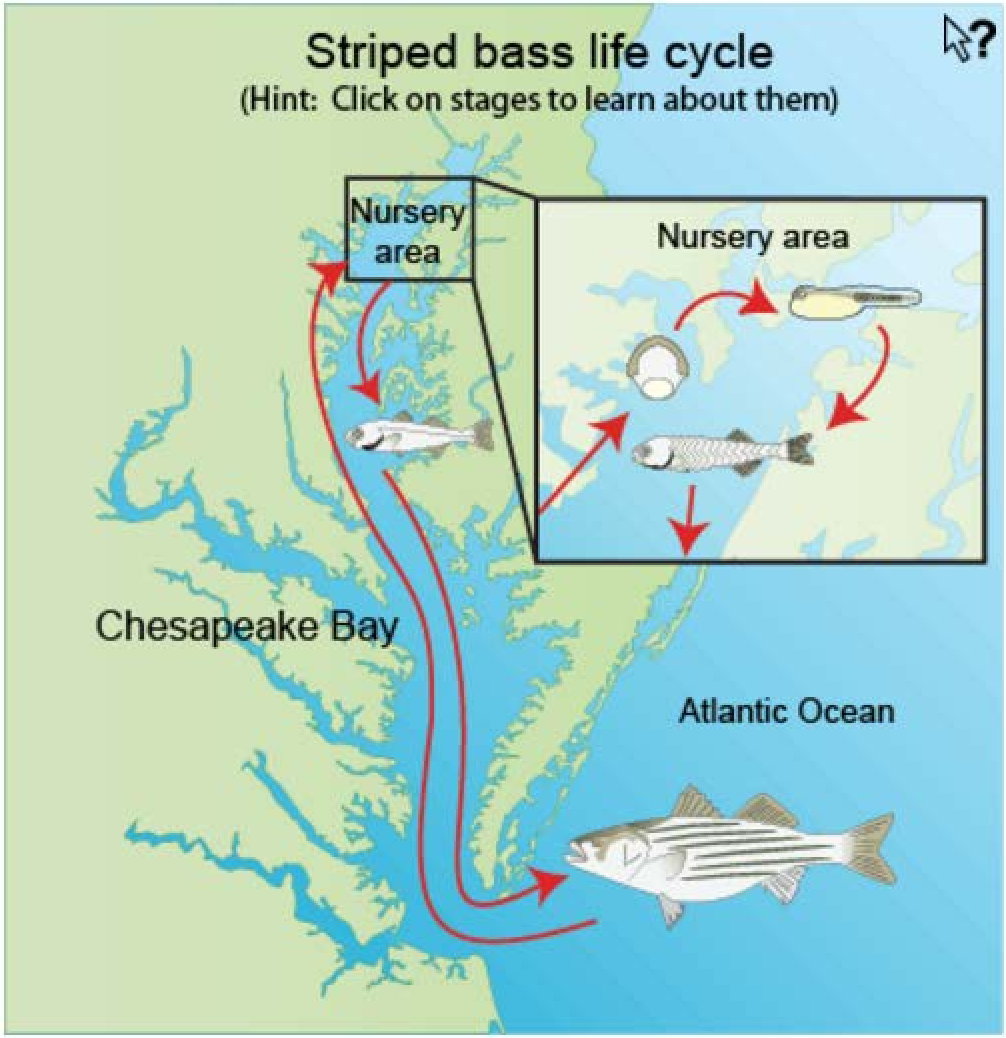
The Maryland Department of Natural Resources announced yesterday that the annual Juvenile Striped Bass Survey indicates that the 2016 striper spawn in the Chesapeake was well below average. However, it also found one-year-old striped bass from last year's very successful year-class in abundance.

Striped bass spawning success is strongly affected by environmental conditions such as rainfall and varies greatly from year-to-year, with occasional large year-classes interspersed with average or below-average year-classes.



http://www.onthewater.com/poor-striper-spawn-reported-chesapeake/



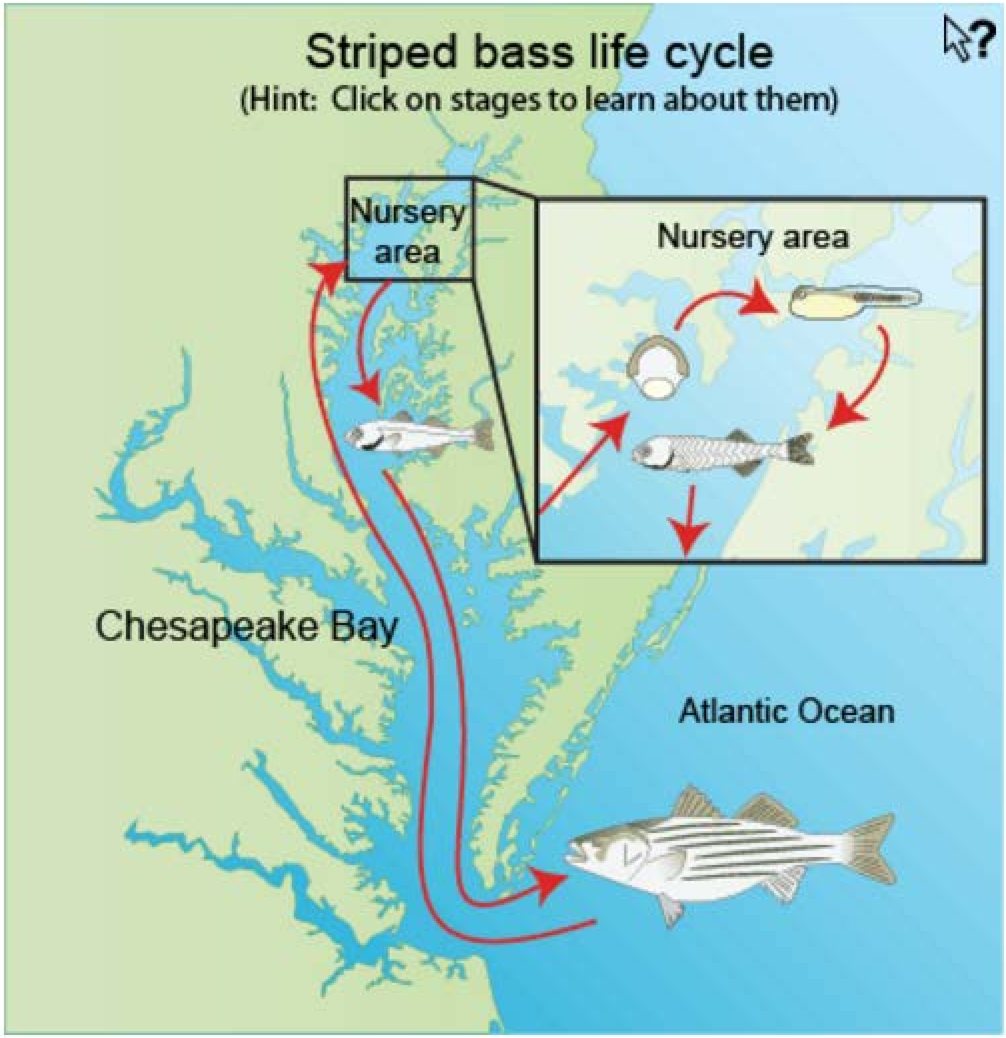
Egg

Striped bass egg as seen under a microscope.

A striped bass egg is the size of one grain of rice.

Striped bass eggs hatch about 29-80 hours after they are fertilized, depending on water temperature. Older and larger striped bass tend to produce more eggs than younger and smaller striped bass. In addition, striped bass females which weigh 10 pounds or more produce eggs that are larger, have greater amounts of yolk, and have a greater chance of hatching than eggs produced by smaller females.

http://teachoceanscience.net/teaching_resources/education_modules/fish_and_physics/learn_about/



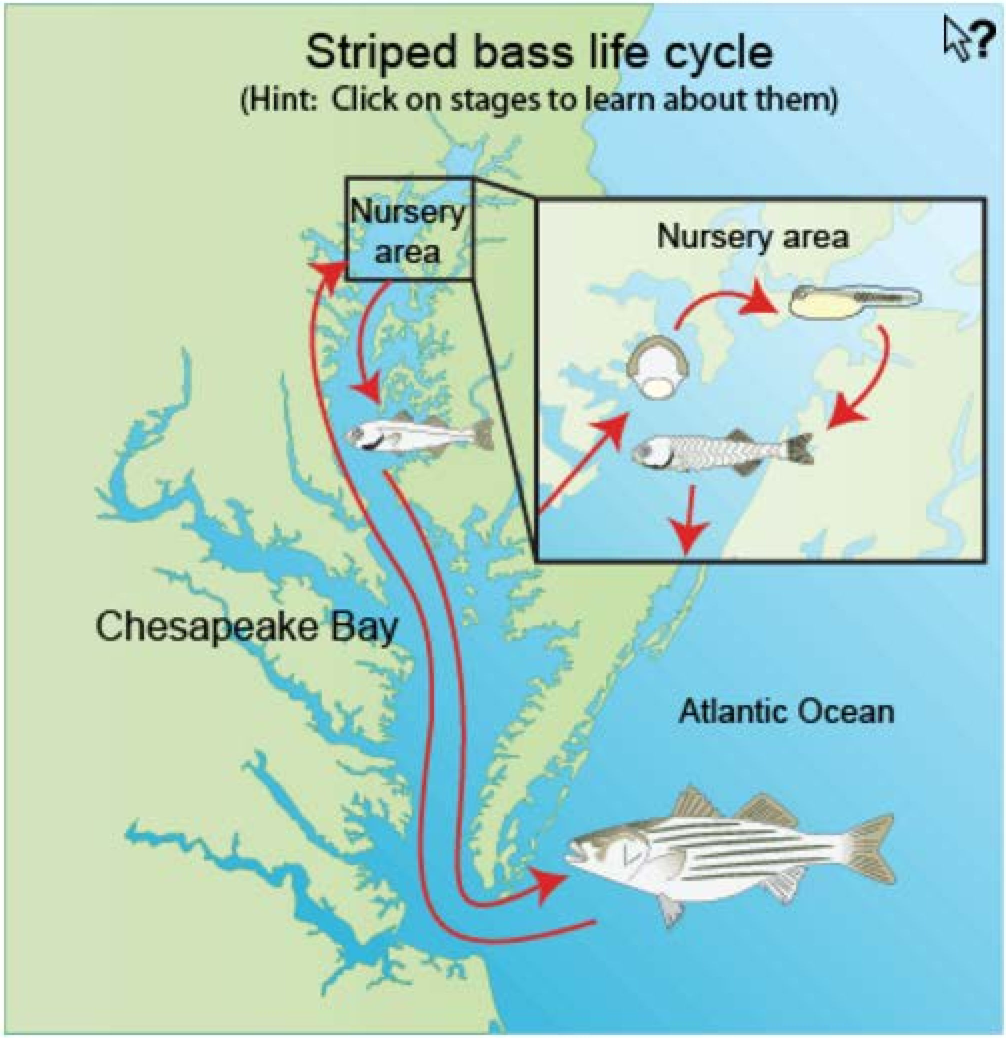
Yolk-sac Larvae

Yolk-sac larvae as seen under a microscope.

After hatching, each larvae is about the size of a pea.

When they hatch, striped bass larvae are 2.0-3.7 mm long and have a large yolk-sac that provides them with nourishment. They don't have a mouth, bones, scales, or pigment in their eyes. As they absorb their yolk-sac, they develop eye pigment, a mouth and a gut, and immediately must begin feeding. If they don't eat, they won't have energy to grow.

http://teachoceanscience.net/teaching_resources/education_modules/fish_and_physics/learn_about/



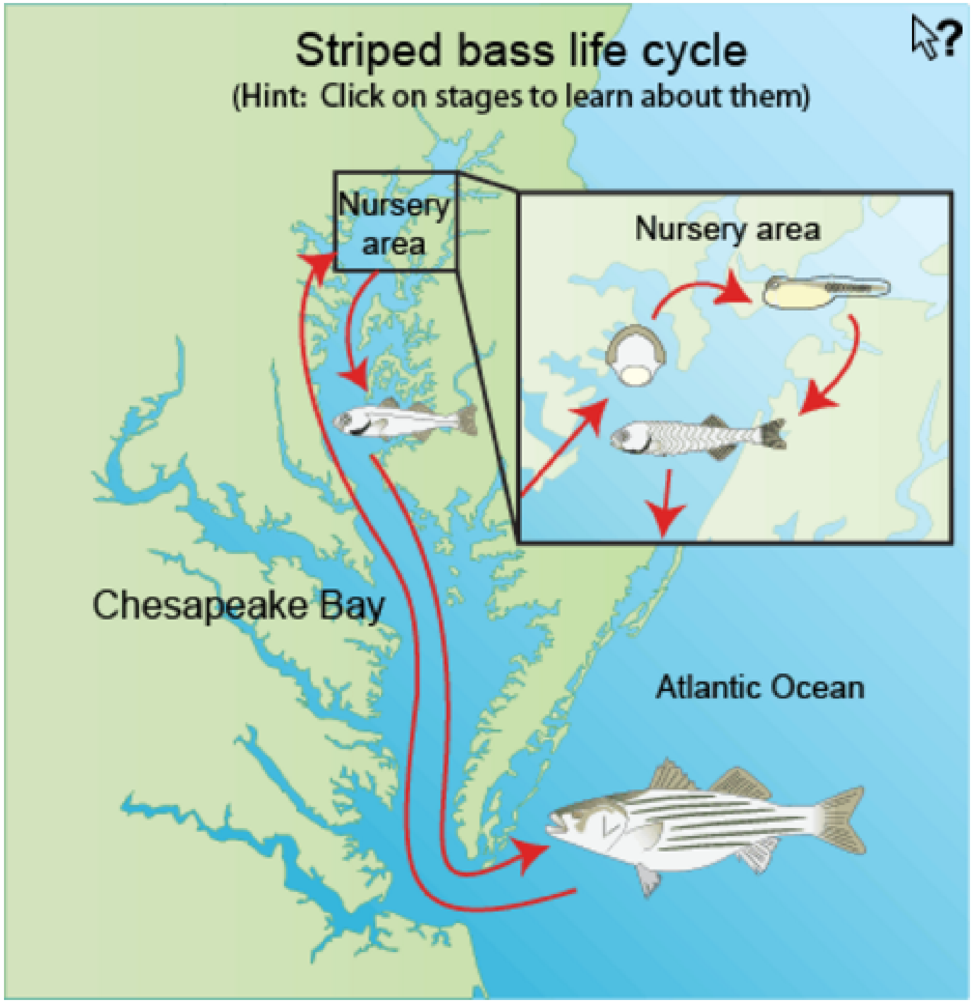
Feeding Larvae

Feeding larvae as seen under a microscope.

Larvae are about the length of a kidney bean.

Striped bass larvae begin feeding on zooplankton (tiny floating animals) about five days after hatching at a size of 5 mm. If they find enough food to eat, they start to grow soft fins and bones, longer guts, stronger muscles and better eyes. If water temperatures are warm and they have plenty of food, they grow faster than if water temperatures are cooler. If temperatures are too hot (> 23°C or 73.4°F) or too cold (< 11°C or 51.8°F), they will die.

http://teachoceanscience.net/teaching_resources/education_modules/fish_and_physics/learn_about/



Juvenile

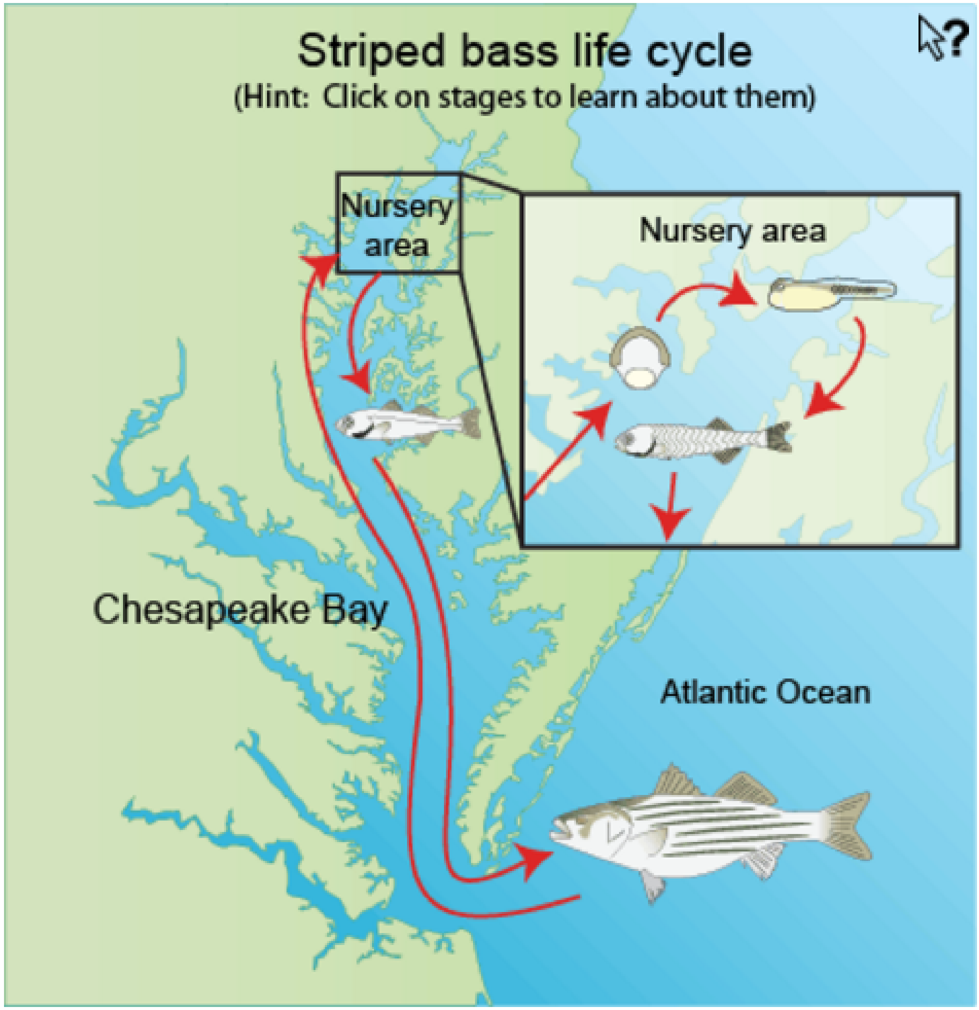
Measuring a juvenile striped bass.

Photo courtesy of Teodora Vlaicu

When striped bass first enter the juvenile stage, they are as long as a cherry

Striped bass larvae begin metamorphosis to the juvenile stage when they are about 20 mm in length. Juveniles look like tiny adults, with fully developed eyes, hard bones, spines in their fins, scales and stripes. As juveniles grow, they leave the nursery area and move progressively downriver towards saltier water, feeding on larger prey like mysids (shrimp-like creatures) and worms. Shallow, nearshore areas are the preferred habitat of juvenile striped bass. The growth of striped bass depends on how much food they can find as well as properties of the water like salinity (amount of salt), temperature, and dissolved oxygen.

http://teachoceanscience.net/teaching_resources/education_modules/fish_and_physics/learn_about/



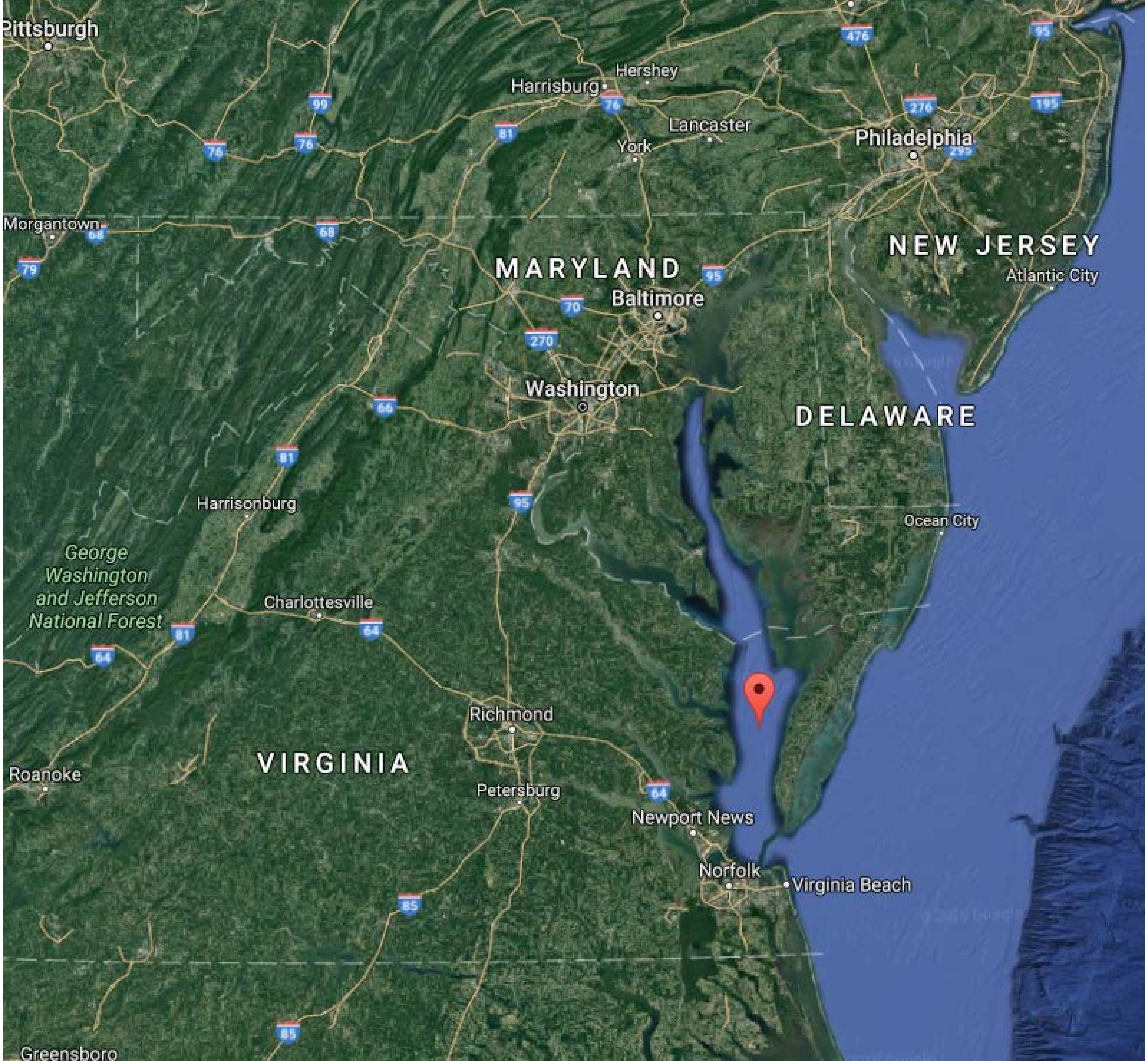
Adult

Measuring an adult striped bass.

Adults can grow to be the length of five hoagies placed end-to-end.

Adult striped bass migrate out of the estuary and into the coastal ocean. When spring arrives, the fish will migrate back into estuaries to spawn. Each year until they are three years old, striped bass grow about 120 mm (the size of a hot dog). In their first few years, striped bass swim in schools while pursuing food: small fish such as spot and menhaden. As the fish age, they become more independent hunters. Female striped bass live longer and grow larger than males. Most fish age eleven and older are females. Large striped bass, which may weigh as much as 125 pounds and be up to 59 inches long, are almost exclusively females.

http://teachoceanscience.net/teaching_resources/education_modules/fish_and_physics/learn_about/


Pittsburgh
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Harrisburg
Lancaster
York
Philadelphia
Morgantown
NEW JERSEY
Atlantic City
MARYLAND
Baltimore
Washington
DELAWARE
Harrisonburg
Ocean City
George Washington and Jefferson National Forest
Charlottesville
Richmond
VIRGINIA
Roanoke
Petersburg
Newport News
Norfolk
Virginia Beach
Greensboro
476
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70
270
66
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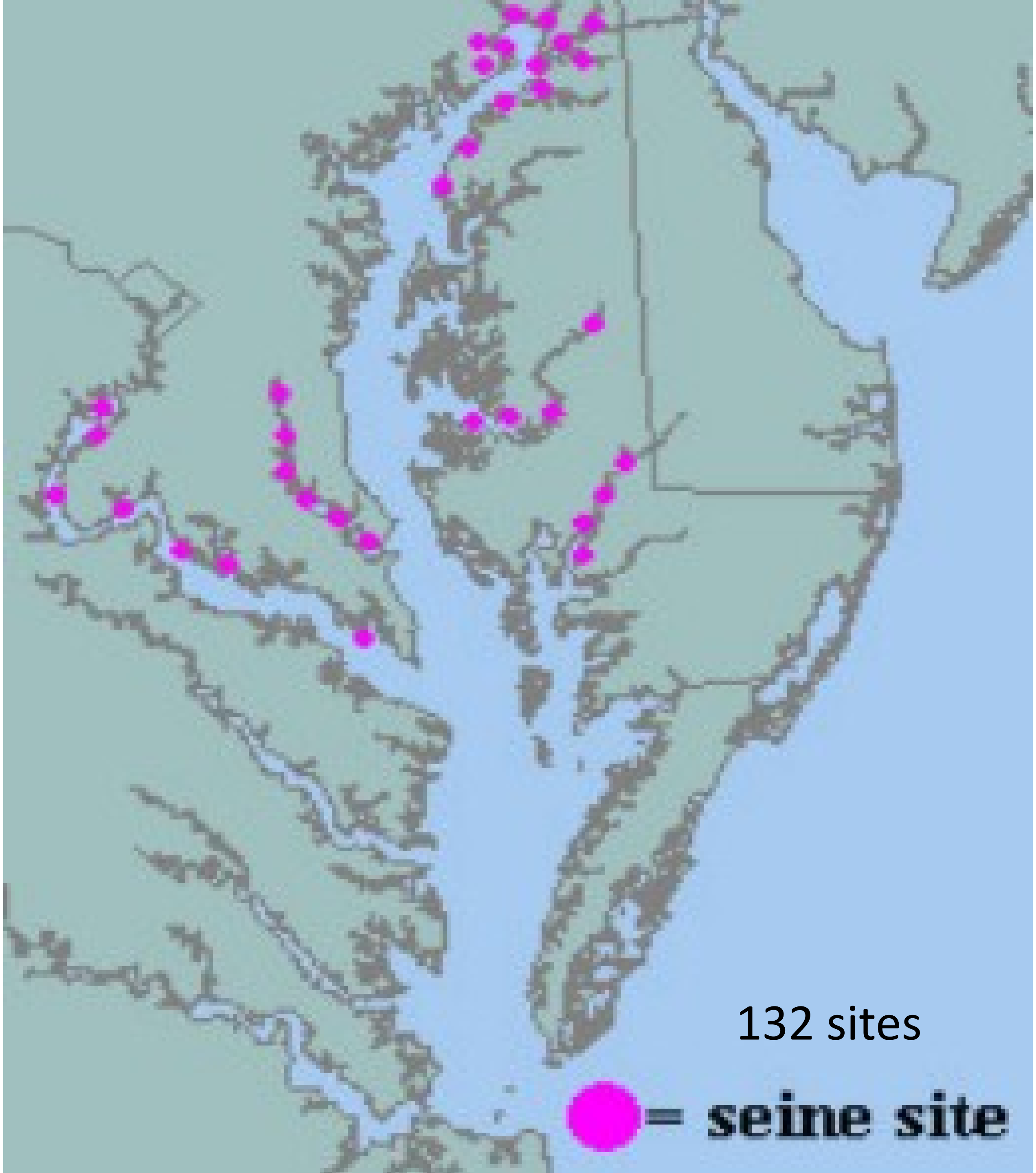
85


132 sites
= seine site


MARYLAND
DEPARTMENT OF
NATURAL RESOURCES
MARYLAND
Smart, Green & Growing
Governor Martin O'Malley
Lt. Governor Anthony Brown
Secretary John Griffin
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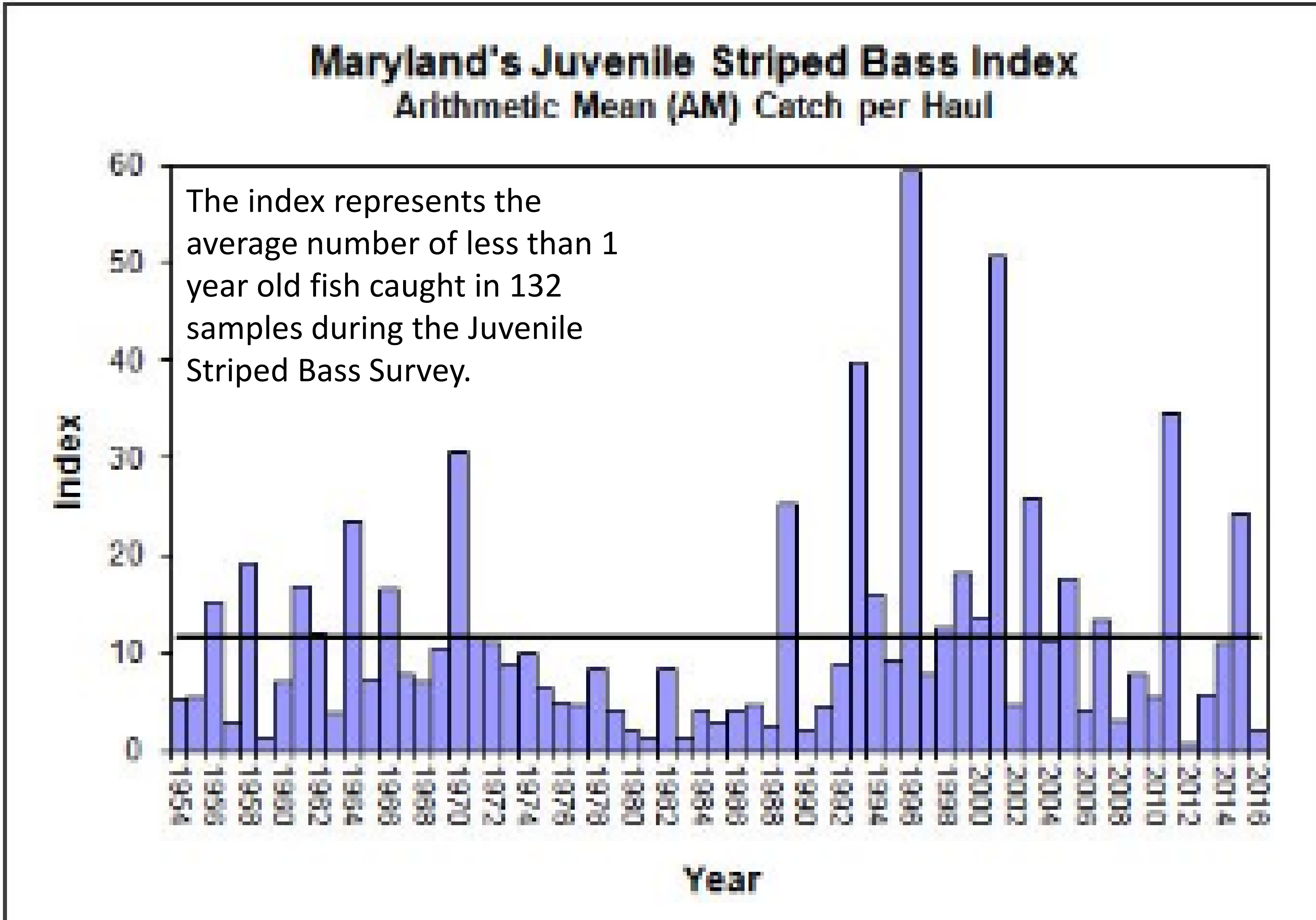

Maryland's Juvenile Striped Bass Index
Arithmetic Mean (AM) Catch per Haul
The index represents the average number of less than 1 year old fish caught in 132 samples during the Juvenile Striped Bass Survey.
Index
0
10
20
30
40
50
60
Year
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016

Is it a problem?

- Recruit overfishing?
- Habitat?
- Environmental conditions?

"While this year's (2016) striped bass index is disappointing, it is not a concern unless we observe poor spawning in multiple, consecutive years," said Fishing and Boating Services Director David Blazer. "Very successful spawning years, as recently as 2011 and 2015, should more than compensate for this below-average year-class. Nonetheless, the department and our partners will continue to work to maintain a sustainable fishery for our commercial watermen and recreational anglers."

HABITAT MANAGEMENT

Why is habitat important?

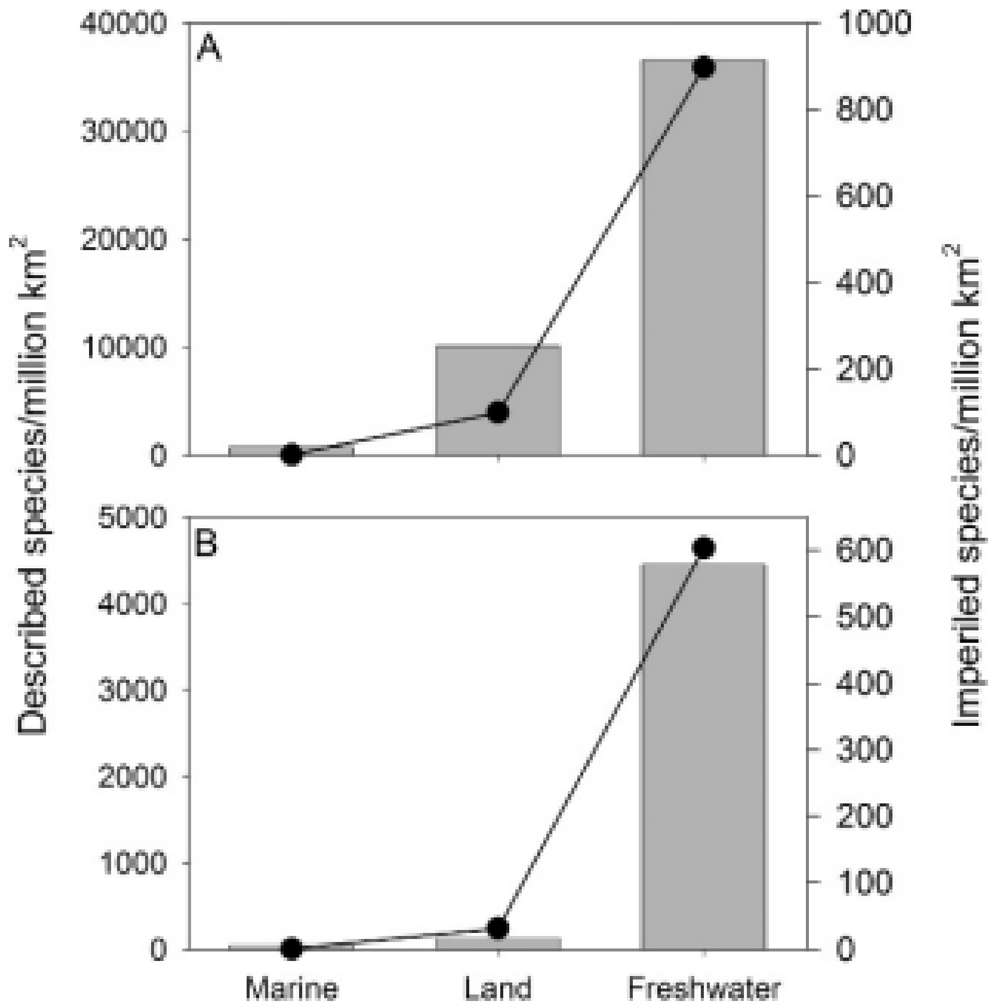


FIG. 3. The number of described (bars) and imperiled species (lines) of eukaryotes (A) and chordates (B) in fresh waters is much higher than would be expected from the area of the globe covered by freshwater habitats. This pattern holds true for chordates, which have been well inventoried, and for all eukaryotes, for which the data are very incomplete and probably biased. Numbers of described species are from Palmer et al. (1997), Groombridge and Jenkins (2002), and Balian et al. (2008). Imperiled species include species listed by IUCN (2007) in the following categories: extinct, extinct in the wild, critically endangered, endangered, and vulnerable.

Strayer, D. L., and D. Dudgeon. 2010. Freshwater biodiversity conservation: recent progress and future challenges.

Conservation status

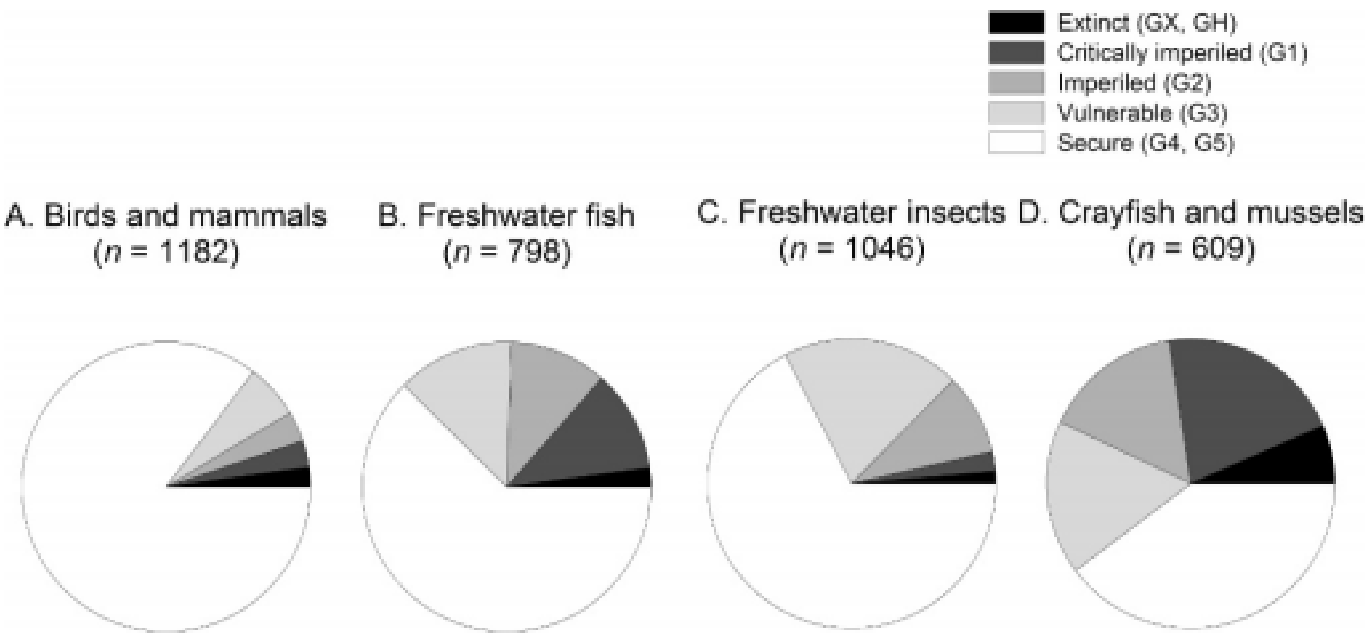


FIG. 4. Conservation status of birds and mammals (A), freshwater fishes (B), freshwater insects (C), and crayfish and mussels (D) in the US in the late 1990s (from Master et al. 2000), showing that freshwater animals, especially those that disperse poorly, are more highly endangered than their terrestrial counterparts. The number of species in each group (*n*) is given in parentheses. Freshwater insects includes only Odonata and Plecoptera. The conservation status of other freshwater insects was not assessed. Assessment codes are NatureServe designations.

Strayer, D. L., and D. Dudgeon. 2010. Freshwater biodiversity conservation: recent progress and future challenges.

Challenges to biodiversity

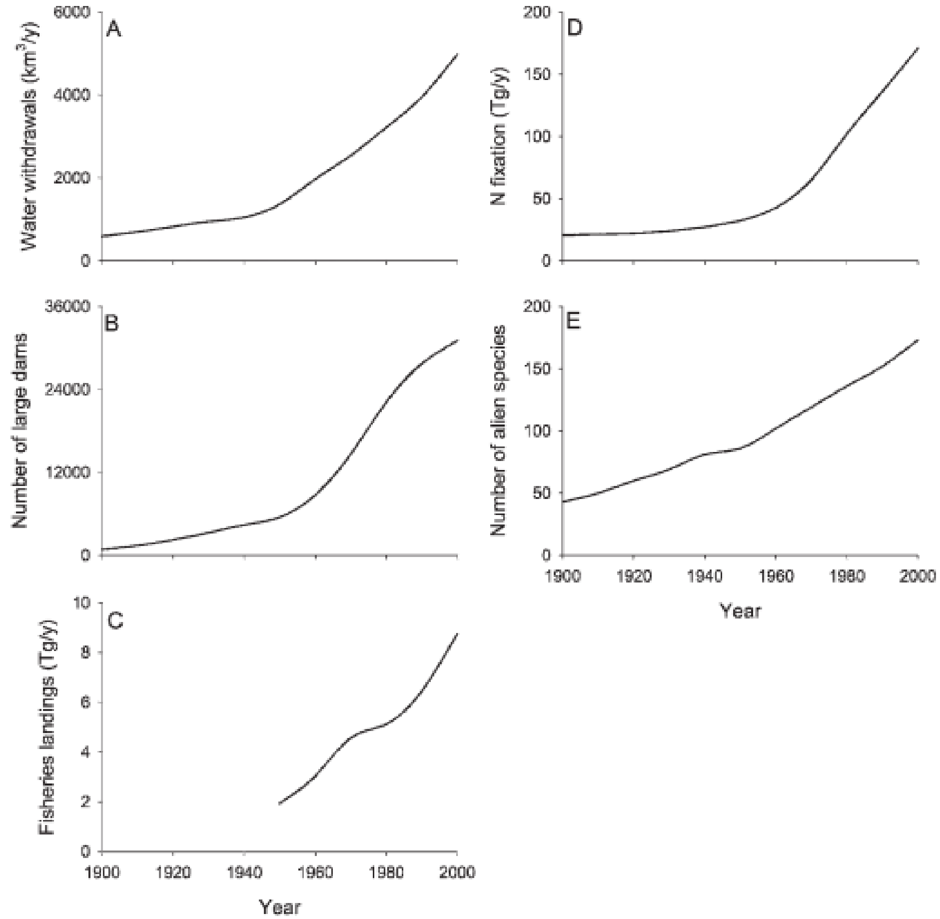
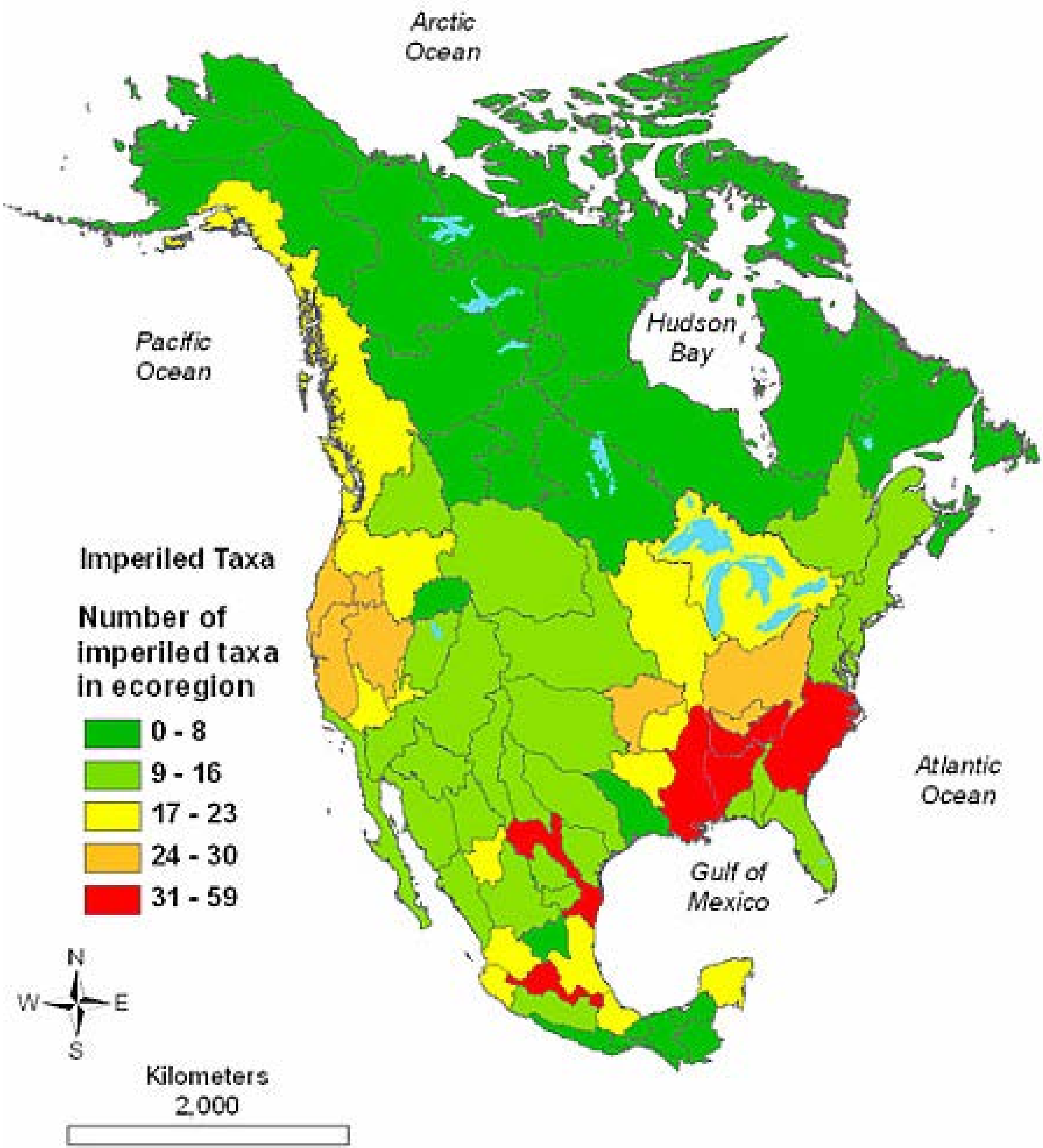


FIG. 1. Five examples of rising human pressures on the world's freshwater ecosystems. A.—Global water withdrawals (after Gleick 1993). B.—Number of large (>15 m high) dams (International Commission on Large Dams 2008). C.—Fisheries landings from inland waters (Allan et al. 2005a). D.—Global inputs of anthropogenically fixed N. Input from all natural sources is ~110 Tg/y (Vitousek 1994, Galloway et al. 2008). E.—Number of known alien species in the Laurentian Great Lakes (Ricciardi 2006).

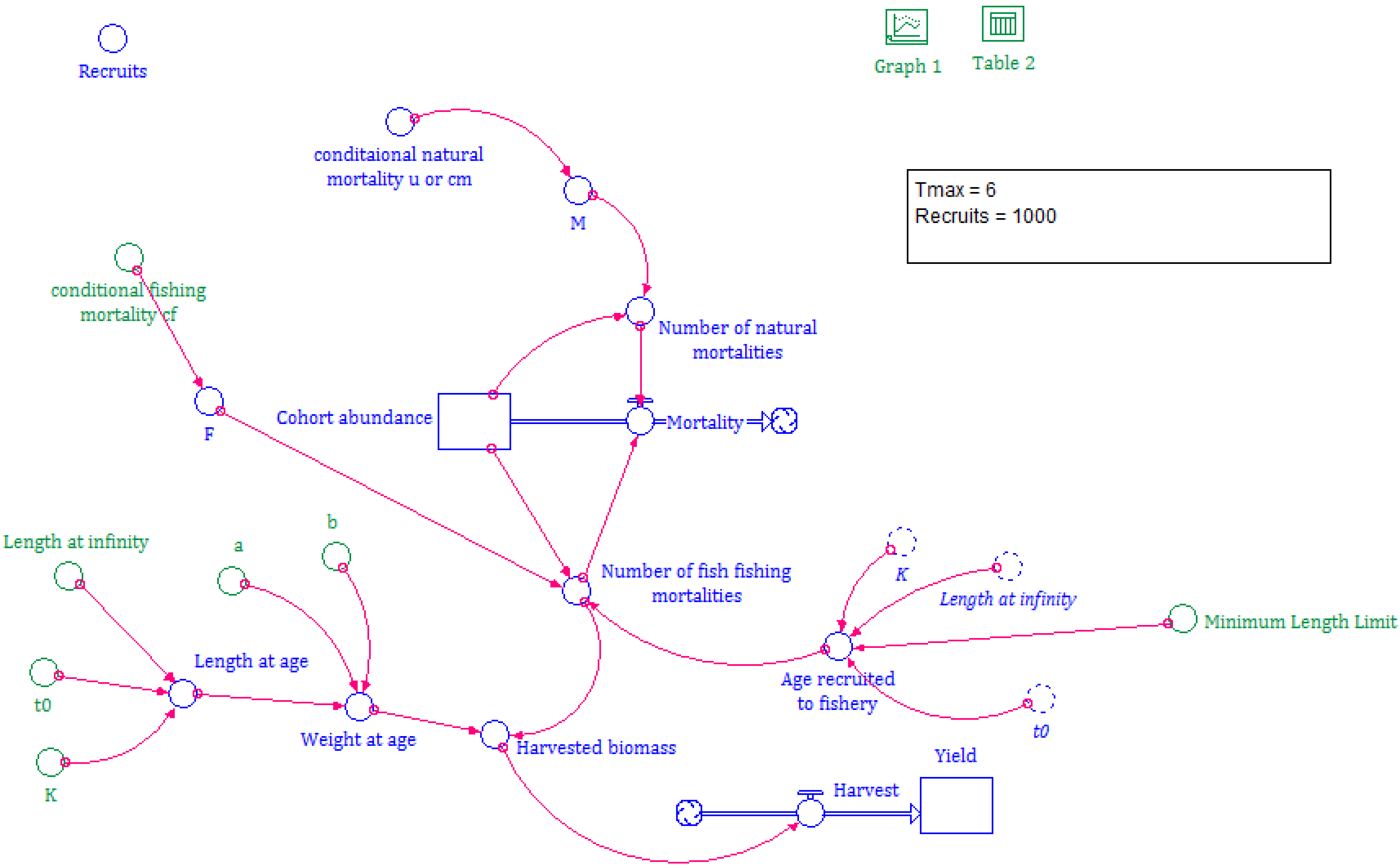
Strayer, D. L., and D. Dudgeon. 2010. Freshwater biodiversity conservation: recent progress and future challenges.


Arctic Ocean
Pacific Ocean
Hudson Bay
Atlantic Ocean
Gulf of Mexico
Imperiled Taxa
Number of imperiled taxa in ecoregion
0 - 8
9 - 16
17 - 23
24 - 30
31 - 59
N
W
E
S
Kilometers
2,000

HABITAT AND HABITAT MANAGEMENT

habitat loss has been identified as the primary threat factor, more significant than invasive species or overexploitation (Dextrase and Mandrak 2006; Venter et al. 2006).

Where is the habitat?



Fish Habitat

What is habitat

NSW Fisheries Management Act 1994 fish habitat means: any area occupied, or periodically or occasionally occupied, by fish or marine vegetation (or both), and includes any biotic (living) or abiotic (non-living) component.

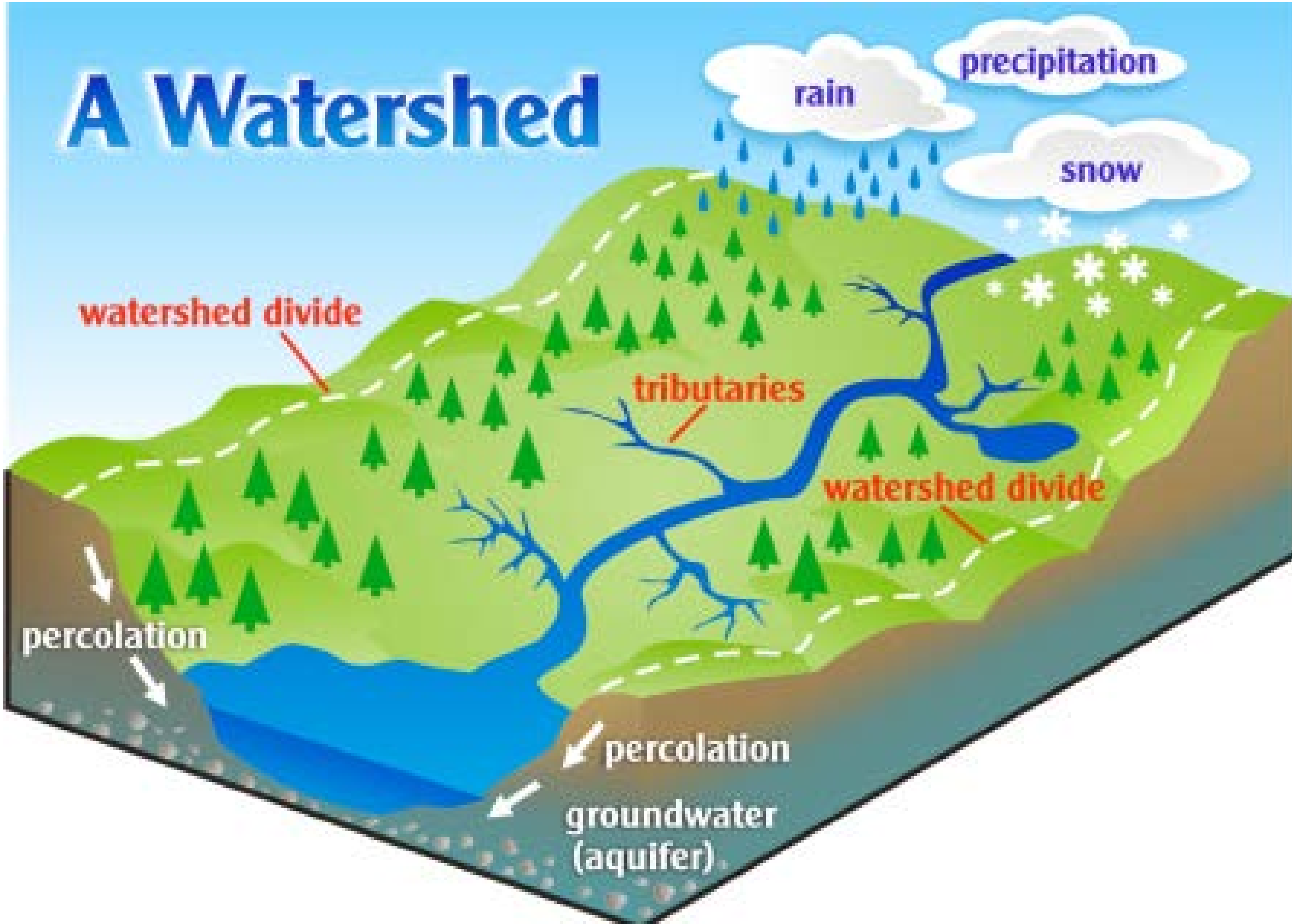
Water & Land

Inland habitat types

1. Streams
2. Lakes & Reservoirs

Habitat

- 119 public lakes
- 123,000 stream miles
- 225,000 freshwater acres


A Watershed
rain
precipitation
snow
watershed divide
tributaries
watershed divide
percolation
percolation
groundwater
(aquifer)

Hierarchical organizations

A Hierarchical Framework for Stream Habitat Classification: Viewing Streams in a Watershed Context

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ABSTRACT / Classification of streams and stream habitats is useful for research involving establishment of monitoring stations, determination of local impacts of land-use practices, generalization from site-specific data, and assessment of basin-wide, cumulative impacts of human activities on streams and their biota. This article presents a framework for a hierarchical classification system, entailing an organized view of spatial and temporal variation among and within stream systems. Stream habitat systems, defined and classified on several spatiotemporal scales, are associated with watershed geomorphic features and events. Variables selected for classification define relative long-term capacities of systems, not simply short-term states. Streams and their watershed environments are classified within the context of a regional biogeoclimatic landscape classification. The framework is a perspective that should allow more systematic interpretation and description of watershed–stream relationships.

Managers of streams and their associated resources face problems of understanding and managing nonpoint source pollution, evaluating the complex, cumulative impacts of changing land use on stream habitats and biological communities, and assessing the effectiveness of fish habitat improvement projects and other mitigation procedures. Scientists have developed few generally applicable perspectives

system is designed to intermesh with a biogeoclimatic land classification system (Warren 1979, Lotspeich and Platts 1982, Warren and Liss 1983), and emphasizes a stream's relationship to its watershed across a wide range of scales in space and time, from the entire channel network to pools, riffles, and microhabitats.

Class roadmap

1. Elements of aquatic habitat
2. Elements of aquatic habitat management
3. Stream habitat Examples
    1. Lower Missouri River
    2. Pahsimeroi River

Elements of aquatic habitat

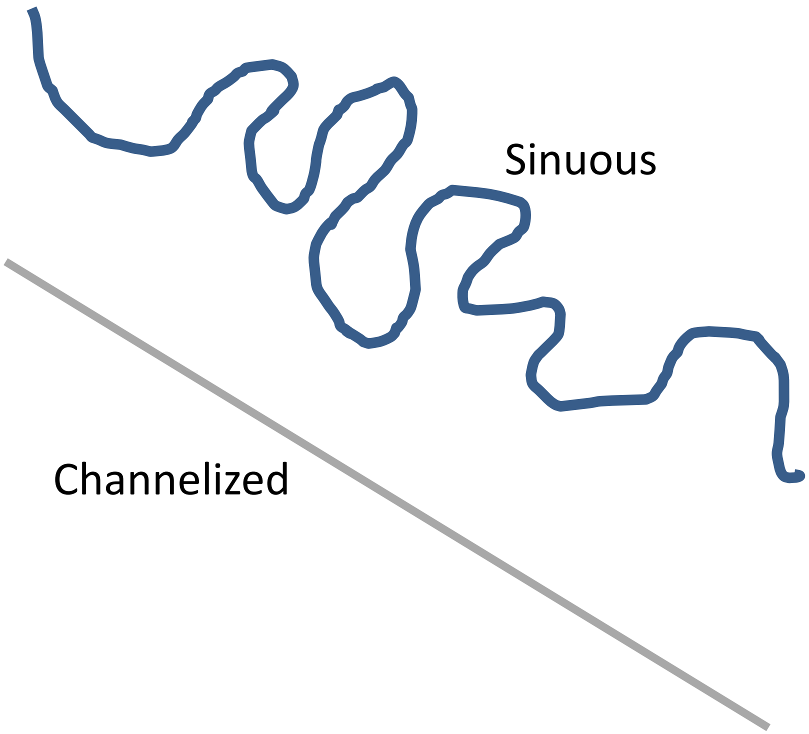
1. Amount
2. Chemical
   – Dissolved oxygen, pH,salinity
3. Physical
   – Sediment, turbidity, substrate
4. Biological
   – Macrophytes, Woody debris

Elements of aquatic habitat management

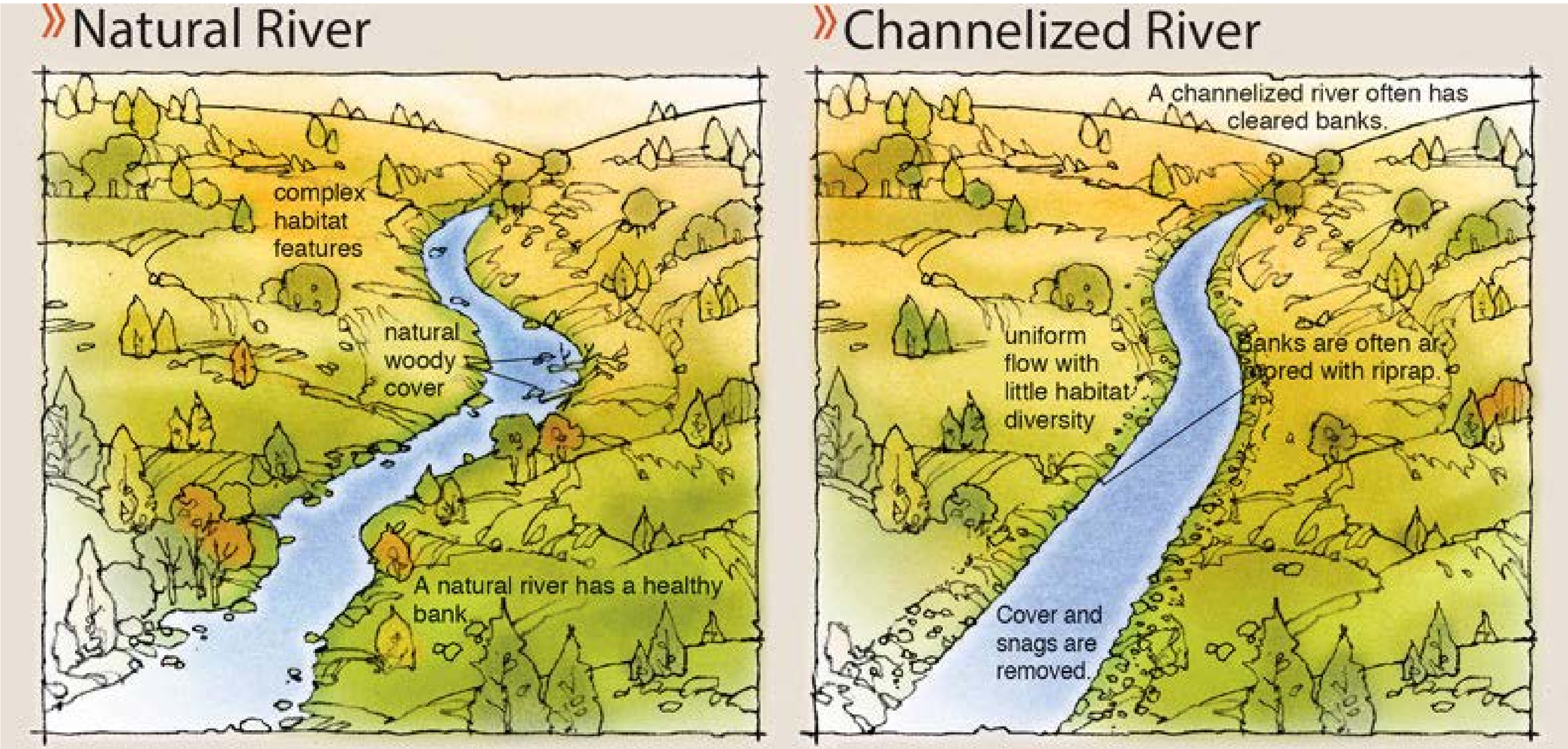
1. Restoration
2. Conservation
3. Mitigation

Amount

Sinuosity

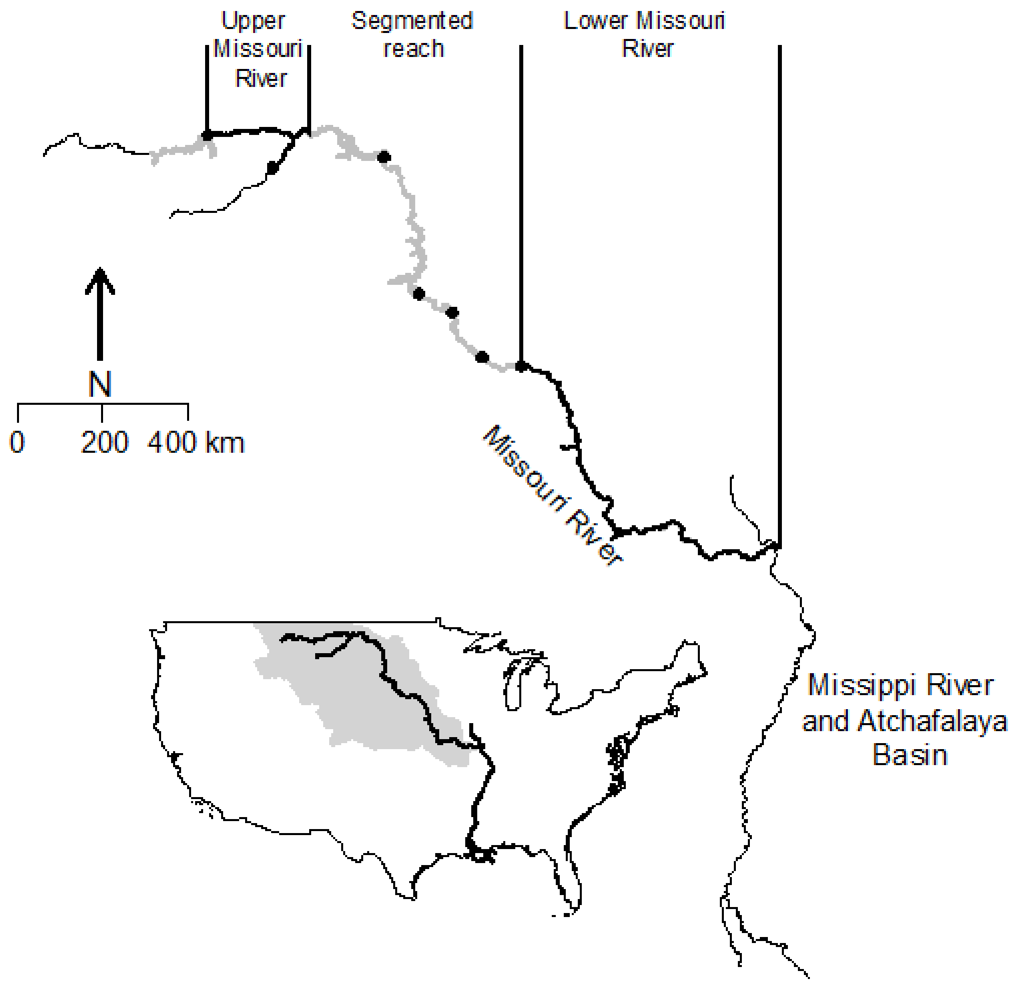


Stream channelization



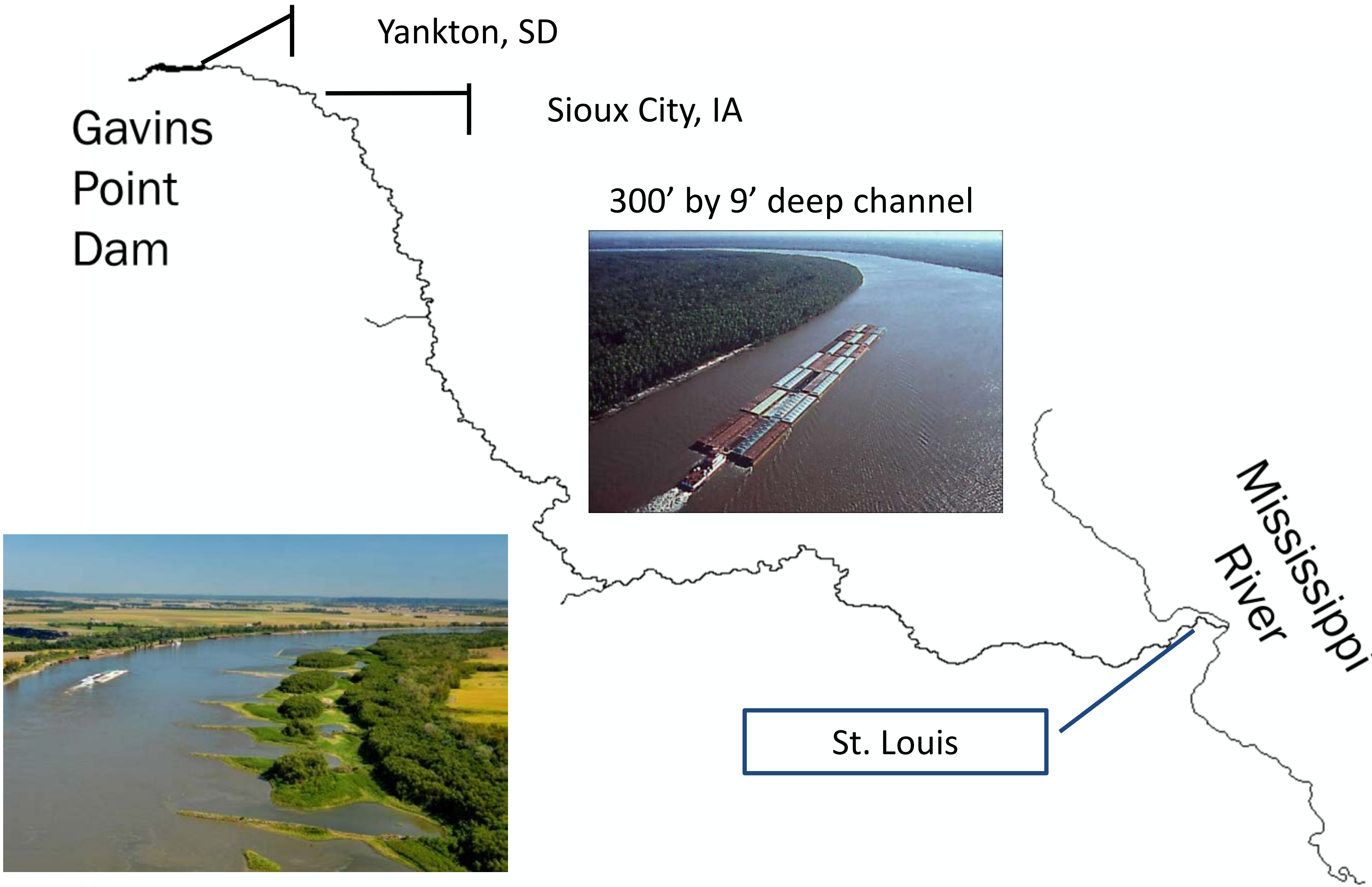
http://www.in-fisherman.com/files/2014/06/Natural-Channelized-Rivers-In-Fisherman.jpg

Restoration Example



Sources: National Research Council, National Academies of Science   THE TIMES-PICAYUNE

Lower Missouri River



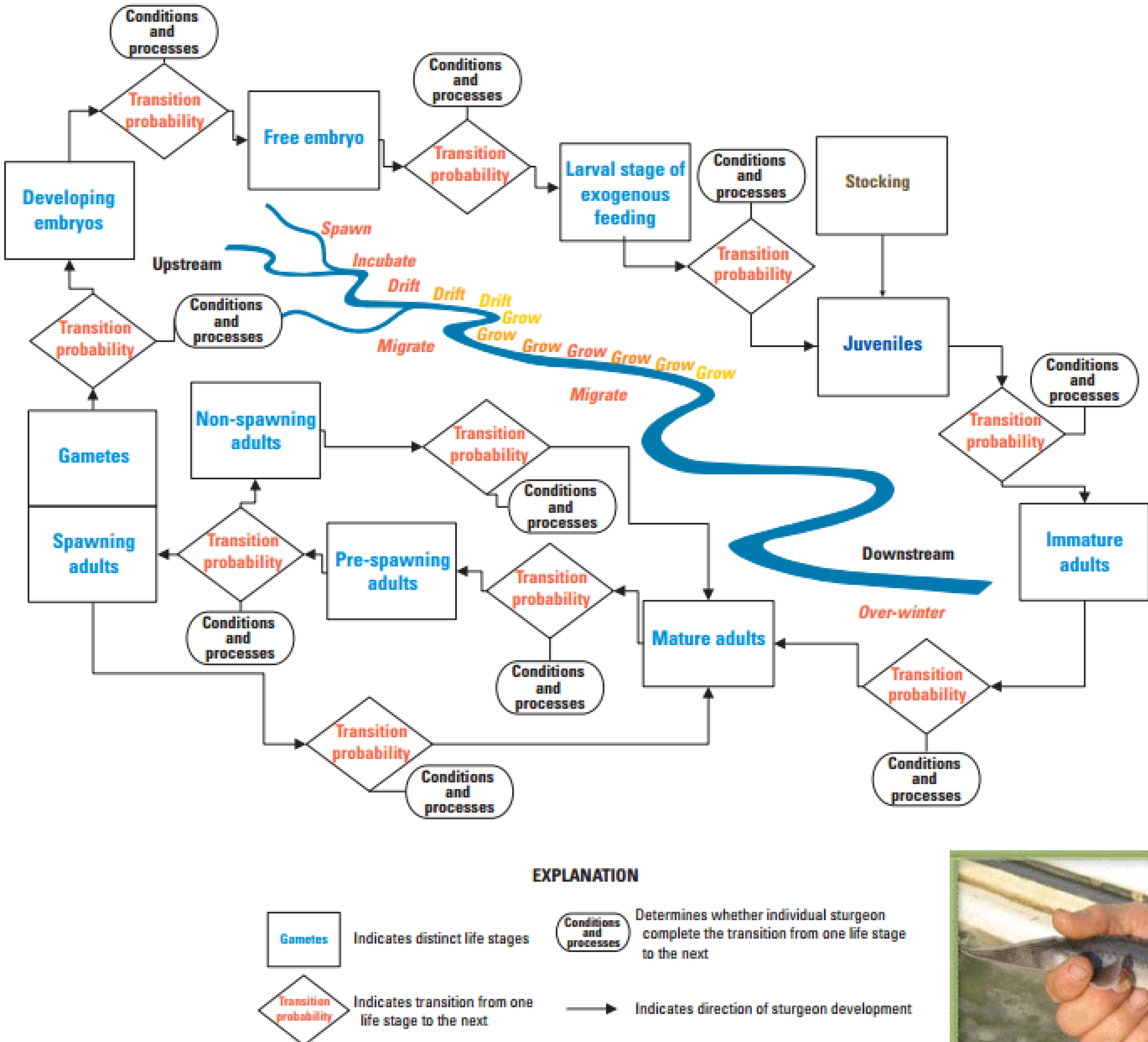


Figure 2. Conceptual model of *Scaphirhynchus* sturgeon life history.