

An aerial photograph of a vast, flat landscape, likely a wetland or marsh. A winding river flows through the center, surrounded by dense green forest. The foreground is dominated by a thick forest of tall, thin trees. The background shows a wide expanse of flat land leading to distant mountains under a blue sky with scattered white clouds.

Aquatic Habitat for Endangered Species

By: Corinne Horner and Olivia Jobin

CIVE 717

Assignment Six

Species Specific Habitat

- Essential Fish Habitat (ESH) describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity
 - Note: habitat requirements can be different for larvae, juvenile fish, and adult fish
- Destruction of habitat is the cause of many cases of endangerment, extirpation, and extinction

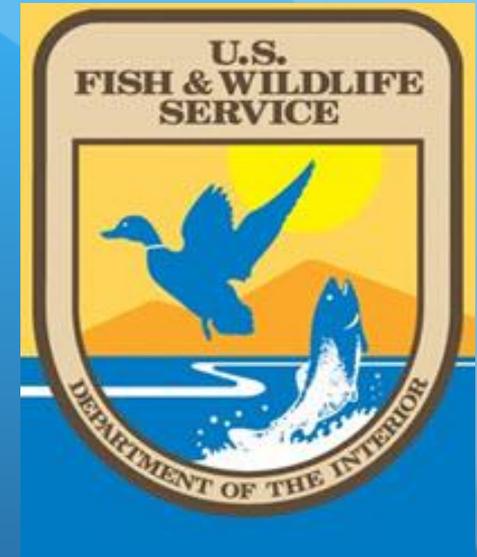


Species Specific Habitat

- Habitat requirements can include:
 - Temperature
 - Velocity (during high and low flows)
 - Depth/width ratio
 - Bed material
 - Floodplain connectivity
 - Morphology
 - Unobstructed range (migrating species)
 - Dissolved oxygen content
 - Nutrient concentration
 - Turbidity
 - Shelter provision
 - Non-native species

Case Studies

- Rio Grande Silvery Minnow
 - Status: Endangered (1994)
- Pacific Northwest Salmon (species?)
 - Status:
- Ozark Hellbender
 - Status: Endangered (2011)
- Colombia Spotted Frog
 - Status: candidate species



Rio Grande Silvery Minnow

Hybognathus amarus

- One of the most endangered fish species in North America (according to USFWS)
- Feed on river plants and benthic macroinvertebrates
 - Help keep river clean by eating algae
- Small in size
 - Roughly 3.5 inches in total length
- Important food source to other animals within the ecosystem



Silvery Minnow Spawning



- Usually spawn in late April or early May
- Produce up to 5000 eggs at a time
 - Eggs are semi-buoyant
 - Hatch within 24 hours
 - Can swim within 3-4 days
- Large drift distances of over 100 kilometers
 - Often drift through diversion structures

Silvery Minnow Habitat

Requirements

- Moderate depth and low water velocity
 - 15-40 cm and 4-9 cm/s respectively
- Water temperatures around 19 degrees Celsius
- Silt or sand bed material
- Can survive in deeper, cooler habitats for a short period of time

Constraints

- Dams do not have adequate fish passage structures
 - Prevents return to natal spawning sites
- Ideal fish passage:
 - Rock structures with less than a 1% slope and variable velocity

Rio Grande Silvery Minnow

- Reasons for endangered listing:
 - Decaying habitat conditions
 - River fragmentation
 - Stream channelization
 - Poor water quality
 - Invasive species
- Catch rates have declined rapidly in the last decade
 - Lowest ever recorded in September 2003
- Research on what can be done to ensure the species will survive in the future is being done

Pacific Northwest Sockeye Salmon

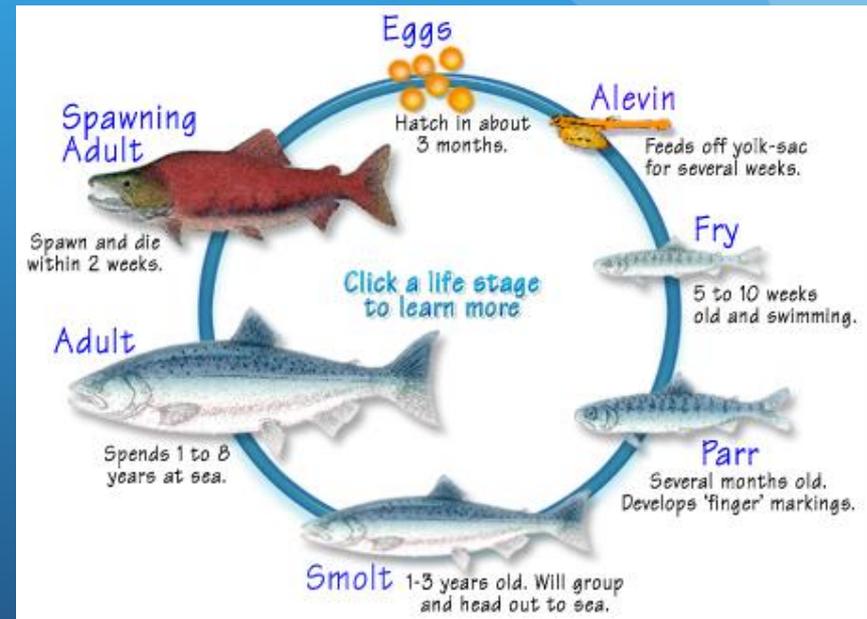
Oncorhynchus nerka

- Most important commercial species
 - 25% of the West Coast catch
- Generally live 2-6 years
- Can grow 18-31 inches in length
- Weigh between 4-15 pounds
- Primarily feed on plankton as well as small crustaceans and fish



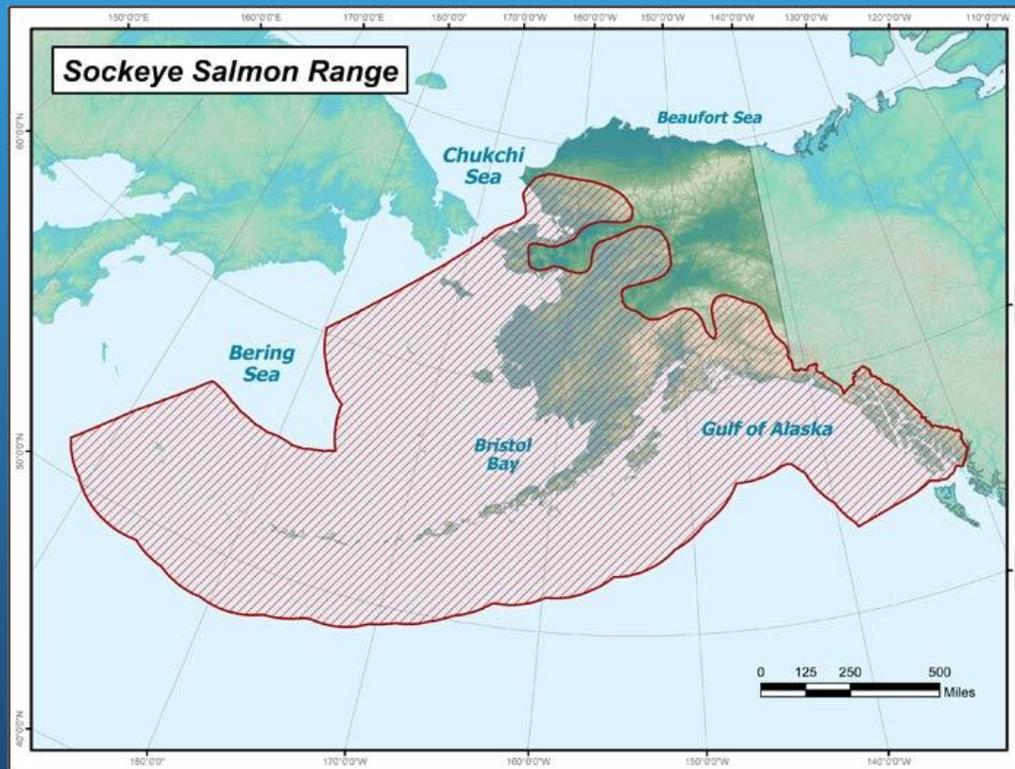
Salmon Spawning

- Spend anywhere from 3 months to 3 years in freshwater
- Anadromous: born and spawn in freshwater, live most of their life in saltwater
 - Will die after spawning
- When in the ocean
 - Greenish blue on the head/back
 - Silvery on the sides and belly
- When spawning
 - Head and caudal fin become green
 - Body turns scarlet



Salmon Habitat Range

- Range from Klamath River in Oregon to Point Hope in northwestern Alaska in the United States



Source: Alaska.gov

Habitat Requirements

- Optimal freshwater habitat includes clean, cool, well oxygenated water flowing at a normal rate
- Need unimpeded passages to get to spawning grounds
- Deep pools, vegetative cover, and root wads are needed for resting and shelter from predators
- Eggs need stable gravel with very little amounts of fine-grained sediment

Threats to Sockeye Salmon

- Dramatic declines have been seen over the past few decades due to:
 - Water diversion for agriculture and flood control
 - Loss of habitat and direct mortality due to hydropower projects
 - Resource extraction and development
- Future threats:
 - Habitat loss and degradation
 - Climate change
 - Over fishing

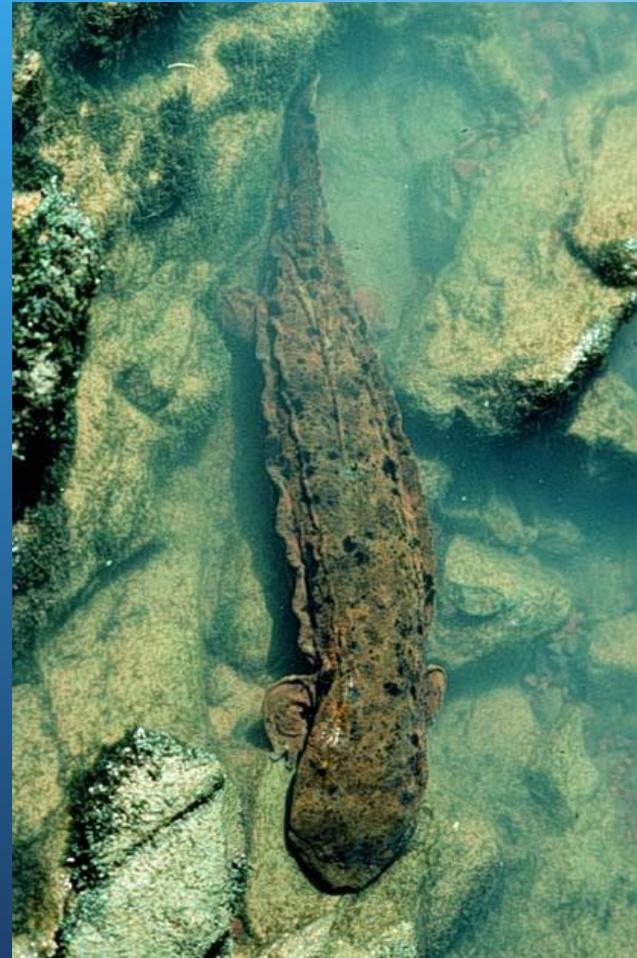
Restoration Efforts

- **Salmon Recovery Act** developed in Washington
 - **Priorities include**
 - Restoring federally listed populations through six salmon recovery plans
 - Create/maintain sustainable fisheries
 - Protect and restore habitat
 - Track and report performance
- Other states have enacted laws to restrict the amount of salmon caught and when people can fish
- Efforts have also been put into habitat/stream restoration, hatcheries, implementation of salmon recovery boards and councils
- Dams and hydropower plants need to be designed to allow fish passage

Ozark Hellbender

Cryptobranchus alleganiensis

- Large (up to 2-ft) aquatic salamander found in southern MO and northern AR
- Sexually mature at 5 to 8 years
 - Produces up to 500 eggs at a time
- Nocturnal
- Feeds on crawfish and other invertebrates, small fish, and other hellbenders



Habitat Requirements

- Habitat specialist: evolved to fill a specific niche
- Cool, clear water with constant levels of dissolved oxygen to enable respiration through the skin
- Streams with large, intermittent rocks (cobble-boulder sized) and fast-moving water



Hellbender Decline

- Decline of this highly sensitive species due mainly to habitat degradation
 - Ore and gravel mining
 - Nutrient and toxin concentrations (via runoff)
 - Impoundments
- Recreation and “fishing” for the hellbender contribute to endangered status
- Chytrid fungus, fatal to an increasing number of amphibians world wide, found in all remaining Ozark hellbenders

Hellbender Recovery



- Research focused on pinpointing primary threats to hellbender survival and determining how best to lessen these threats
- Listing under the ESA: prevents killing or harming Ozark hellbenders
- Preventing trade via the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Education of anglers and recreationists to prevent catchment

Colombia Spotted Frog

Rana luteiventris

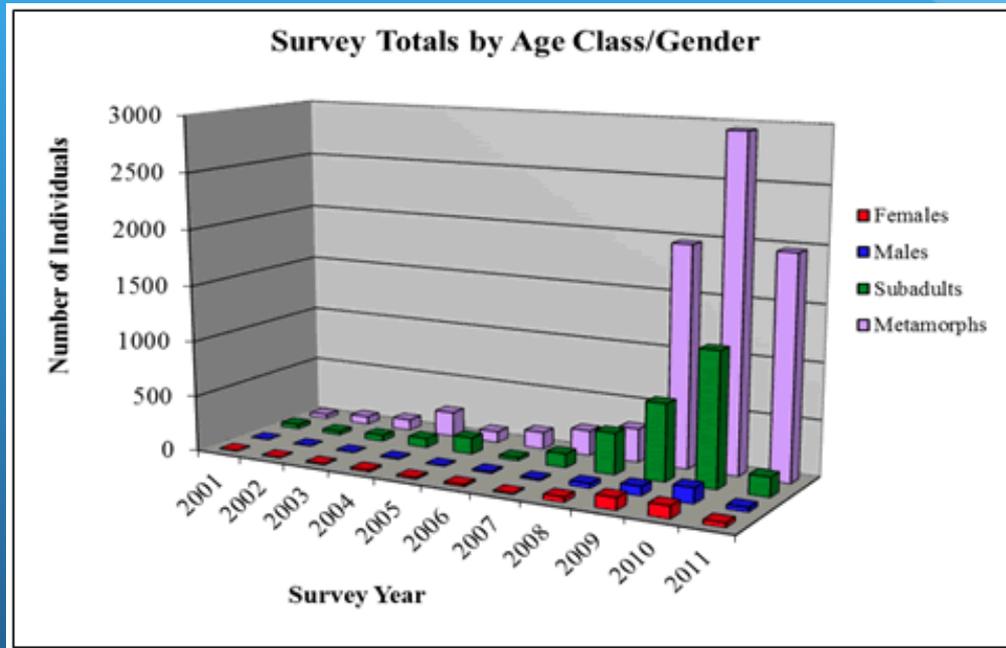
- Adults grow to be 2-3.5 inches long
- Found from Alaska, through British Columbia, down through Nevada and Utah
- Live in habitats with abundant low-growing vegetation (eg. wetlands, marshes, ponds, slow streams, etc.)
- Migrate between habitats for breeding, foraging, and hibernating



Threats to Colombia Spotted Frog

- Main cause of decline is alteration/fragmentation and loss of habitat
 - Development and degradation of wetlands
 - Especially important for breeding
 - Road and dam construction
 - Water diversions
 - Decline of native beaver populations
- Predation by non-native species
- Recent drought conditions

Colombia Spotted Frog Recovery Efforts



Columbia spotted frog age class & gender totals for 2001-2011 surveys along Dry Creek, OR

- Continuously monitoring populations in Idaho to better understand patterns of decline and population distribution
- Efforts to improve and generate habitat to prevent endangered status

Conclusions

- Habitat requirements differ greatly between and even among species
- It is important to connect the biology/physiology of the species and its life history to habitat requirements and incorporate these into engineering projects in order to maintain or restore EFH
- Protection of native habitat is easier and far more effective than repopulation
 - Preservation of habitat must become a priority of river engineering projects

Sources

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