

Conservation and Management of Amphibian Populations



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Goal of the Lecture

To familiarize students with some conservation and management strategies for amphibians.

Reading Assignments:

1. Recommendations for Riparian Buffers: Salamanders (Crawford and Semlitsch 2007)
2. Recommendations for Wetland Buffers: Amphibians and Reptiles (Semlitsch and Bodie 2003)
3. Principles for Management of Aquatic Breeding Amphibians (Semlitsch 2000; Journal of Wildlife Management 64:615-631)

Handouts Also

Lecture Structure

- I. Aquatic and Terrestrial Habitat Needs
- II. Aquatic Environment Strategies
- III. Terrestrial Environment Strategies
- IV. Wetland Buffers, Small Wetlands, and Roads

Aquatic and Terrestrial Needs



Aquatic Environment

Life Cycle:

- Breeding Habitat: Anurans & Salamanders
- Eggs, Embryos & Tadpoles
- Overwintering Sites

Concerns:

- Shoreline Vegetation
- Hydroperiod (2-3 mo)
- Water Quality & Temp
- Fish
- Introduced Species



What can we do to ensure habitat needs are met?



Terrestrial Environment

Life Cycle:

- Breeding Habitat: Salamanders
- Juvenile & Adult Foraging Sites
- Overwintering & Estivation Sites
- Dispersal, Migration, Home Range

Concerns:

- Intact Vegetation
- Decomposing Logs
- Abundant Insects
- Dispersal Corridors: Connectivity

Temperature, Humidity, Predators

Conservation and Management

Aquatic Environment: Shoreline Vegetation

- Minimize Access by Cattle**
 - Electric Fence
 - > Feb-August
 - Grazing Rotation
 - > <1 month
 - Needs to be Tested
 - > <30 head/ha wetland
 - Provide Water Troughs

- Constructed Wetlands**
 - Gradual slope
- Control Exotic Plants**
 - Herbicides
 - 2,4-D: Broad-leaved (AquaKleen)
 - Glyphosate: Non-selective (Rodeo)
 - Imazapyr: Invasive Exotics (Habitat)
 - Biological Control


Conservation and Management

Aquatic Environment: Hydroperiod

- Plug Ditch or Drain Tile**

- Managed Wetlands:**
 - February-August
 - Multiple Species: Amphibians, Waterbirds

- Provide Diverse Hydroperiods/Wetlands**

Copeia 1999:101-113, Conservation Biology 14:414-419

 - Wetland complex: > Ephemeral & Permanent

- Gradual Drawdowns** (>2 weeks)
 


Conservation and Management

Aquatic Environment: **Water Quality**

34-42 C
93-104 F

- 1) Minimize Agricultural Chemicals**
 - Pesticides, Herbicides, Fertilizers
 - Apply following Manufacture Recommendations
- 2) Maximize Dissolved Oxygen**
 - Minimize Eutrophication
 - > Minimize Cattle Access
 - > Minimize Fertilizers (0.5, 2, 30 mg/L)
 - Managed: Flush with oxygenated water
- 3) Prevent High Temperatures**
 - Maintain Adjacent Tree Cover
 - Maintain Shoreline Vegetation
- 4) Maintain Natural Flow (lotic)**
 - 20 C and >5 mg/L

Chemical Mixtures

- Establish >15 m Buffer (Needs to be Tested)









Conservation and Management

Aquatic Environment: **Predators**

- 1) Minimize Predatory Fish Population**
 - All Fish Eat Eggs
 - Tadpoles: Green Sunfish, Catfish, Bass, Trout
 - Adults: Catfish, Bass, Trout
- 2) Eliminate all Introduced Species**
 - Amphibians and Fish

Options

- Electroshock or Seine Fish, Capture or Gig Frogs
- Fish Kill with Rotenone (early fall – winter)
 - ✓ Breaks down Rapidly (<1 month) ✓ Closed System
 - ✓ Potassium Permanganate (KMnO₄; 1:1)

Overwintering Larvae will Die

Mow shoreline vegetation

Purpose	Number acre-feet treated with 1 gallon (5%)	Concentration (ppm)	
		Active rotenone	5% Formulation
Normal pond renovation; no bullheads, carp, bowfin, etc.	6.0 - 3.0	0.025 - 0.050	0.50 - 1.0
Ponds with carp or bullheads	3.0 - 1.5	0.050 - 0.10	1.0 - 2.0
Ponds with bowfin, gar, largemouth bass	1.5 - 1.0 (possibly 2 applications)	0.10 - 0.150	2.0 - 3.0 (1 ha)

Conservation and Management

Terrestrial Environment

- 1) Limit Agriculture Near Wetlands**
 - Establish at least 100 m buffer
 - If haying, leave >30 cm standing stubble
 - No herbicide or insecticide in buffer
- 2) Perform Partial Cuts**
 - Under extensive investigation
- 3) Leave Slash and Decomposing Logs**
- 4) Minimize Soil Disturbance**
 - Drier, LP, Tire, Skid Trails
- 5) Promote Abundant Insects**
 - Restore Natural Fire Frequency
 - > Spring Burns Best for Amphibians
 - Establish NWSGs in Grasslands
- 6) Maintain Dispersal Corridors**
 - Areas of Limited Disturbance
 - Aquatic and Terrestrial Sites
 - Spatially Disjunct Wetlands:

LEAP Project

Semlitsch, Gibbons, Hunter, Gibbs, Rothermel




•Shelterwood Cut

- > Cut Mature Trees: BA 50 ft²/ac
- > Leave Large Shade (and seed) Producing Trees

Return 5-10 yrs

→ Riparian Corridors


Buffers for Amphibians

Semlitsch and Bodie (2003)

1) Wetland Buffers

Terrestrial Habitat Use

159-290 m

I. Aquatic: Water

II. Core: Terrestrial Habitat

III. Buffer

Ideal: 340 m

3) Best Management Practices

- 15 m Buffer (10 m trees)
- Increase 0.75 m for every 1%

Inadequate to Cover Core Habitat

2) Riparian Buffers

Light Activity (<25% BA)

Core Stream

Amurans, Newt >200m

Ambystomatids 125 m

Plethodontids <30 m

Importance of Small Wetlands

Gibbs (1993) and Semlitsch and Bodie (1998)

Gibbs (1993): Maine

- Loss of wetlands: < 4 ha
- Wetland area decreased by **19%**
- Interwetland distance increased by **67%**

➡ (400 m; 0.6 to 1 km)

Semlitsch and Bodie (1998): SC

- Loss of wetlands: < 4 ha and 1.2 ha
- Interwetland Distance:
 - 4 ha: increased **43%** (195 m)
 - 1.2 ha: increased **136%** (641 m)
- Decreases Probability of Dispersal
- ➡ Detrimental to Rescue Effect: Sinks
- Small wetlands can be **sources**
- Small wetlands can be **specious**

Rainbow Bay (0.5 ha): 16 yr study

- >13,500 metamorphs / yr
- >27 amphibian species

Current Wetland Regulations:

- Tulloch Rule Overturned: Dredging Wetlands is Legal
- SWANCC Decision: Isolated Wetlands Not Protected

Effects of Roads

Conservation Biology 19:2004-2008 and 21:159-167, Biological Conservation 73:177-182, Herpetologica 60:45-53, Amphibia-Reptilia 28:25-31

1) Direct Mortality

- 2-18% Mortality Rates
- Mortality rate of some species increases with traffic intensity (toads)
- Distance to Wetland is the Best Predictor of Mortality Rate
- Low Intensity Impacts: 5-26 cars / hr

2) Habitat Destruction

- Loss of Wetlands
- Loss of Suitable Terrestrial Habitat

Reduced Habitat 1/3

- > Road-effect Zone: 35 m
- > Maintained & Abandoned

3) Habitat Fragmentation

- Forest Roads: Deflected Movement **51%** of time
- Type was **Unimportant**

4) Petroleum Runoff

5) Acoustic Interference

- Calling rate decreases at wetlands near roads

A Possible "Benefit"

Ecological Trap

Maintain Only Necessary Forest Roads; Replant Others

Mitigating Road Effects

ACO Polymer Products, Inc.



1) Drift Fence Diversion



2) Culverts



Forest Road Construction: BMP
•Follow Contours: <12% slope
•Locate at Upper Contours
•Minimize Stream Crossings
•Maximize Light Exposure: Replant



3) Signs