

What preserves biodiversity on a budget?

Community ecology protects RTEs against invasives and environmental degradation



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Patuxent Region of the Chesapeake

- Largest and longest river that is completely located in the state of Maryland
- Tributaries
 - Little Patuxent
 - Middle Patuxent
 - Western Branch
- Patuxent River Watershed Act (1980)
- Current focus
 - Replenish fish and shellfish resources
 - Drinking water
 - Recreation and public access



Issues Overview

- **Priorities:** Preserve biodiversity, maintain economic stability
- **Challenges:** environmental degradation, invasive species, budget restrictions
- **Manager Goals:**
 - Protect watch list species
 - Increase fishery yields
 - Decrease invasive species
- **How can managers consider abiotic & biotic interactions under restricted budgets?**
 - Holistic approach
 - Monitor at-risk species
 - Manage invasives
 - Restore degraded environments

Major Invasive Species of Concern



Blue and Flathead Catfish

(*Ictalurus furcatus* & *Pylodictis olivaris*)



Northern Snakehead

(*Channa argus*)



Virile Crayfish

(*Orconectes virilis*)



Green Sunfish

(*Lepomis cyanellus*)



Zebra Mussels

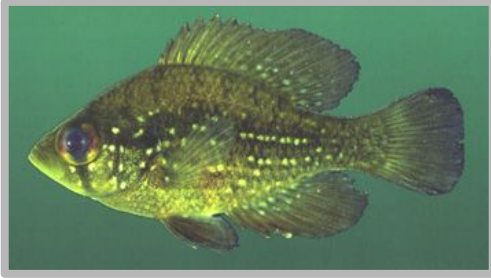
(*Dreissena polymorpha*)



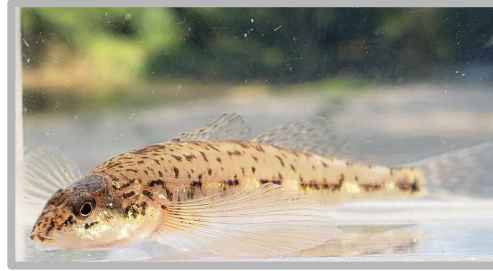
Common Reed

(*Phragmites australis*)

Major Native Species of Concern



Bluespotted Sunfish
(*Enneacanthus gloriosus*)



Glassy Darter
(*Etheostoma vitreum*)



Warmouth
(*Chaenobryttus gulosus*)



Stripeback Darter
(*Percina notogramma*)



Yellow Bullhead
(*Ameiurus natalis*)

Patuxent Fishery Species

White perch (*Morone americana*)

Striped bass (*Morone saxatilis*)

Croaker (*Micropogonias undulatus*)

Catfish (*Siluriformes*)

Herring (*Clupea*)

Carp (*Cyprinidae*)

Spot (*Leiostomus Xanthurus*)

Oyster (*Ostreidae*)

Sunfish (*Centrarchidae*)

Bluegill (*Lepomis macrochirus*)

Largemouth bass (*Micropterus salmoides*)

Snakehead (*Channa argus*)

*invasive and non-native species

Management Challenges

Environmental Degradation



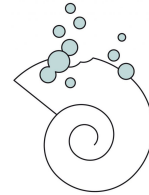
Habitat Loss



Runoff



Warming



Acidification



Pollution

Invasive Species



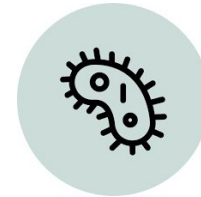
Competition



Predation



Hybridization



Disease

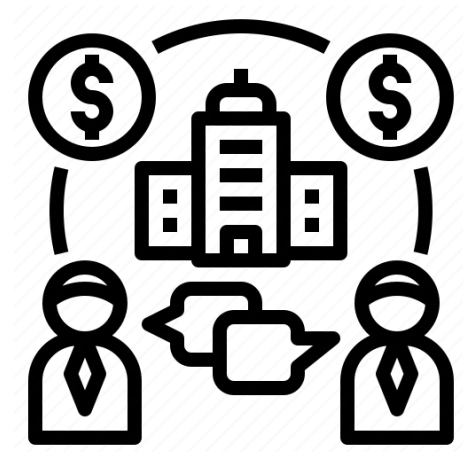


Parasites

Management Challenges



Budgetary Restrictions



Conflicting stakeholder wants

Management Solutions: Holistic Approach

Invasive Species	Directly Impacted Species	Effects
Snakehead	Bluespotted Sunfish, Glassy Darter, Stripeback Darter, Yellow Bullhead, Sunfish, Largemouth Bass, Striped Bass, White Perch, Bluegill	Predation, competition, parasite and disease vector
Mycobacteria	Striped bass, Perch, Oysters	Parasitic infection
Flathead & Blue Catfish	Bluespotted Sunfish, Glassy Darter, Stripeback Darter, Yellow Bullhead, Sunfish, Bluegill, Striped Bass, Largemouth Bass	Predation, competition, changing substrate type (vegetation -> bare)
Virile Crayfish	Warmouth, Yellow Bullhead	Outcompetes native crayfish, a vital foodsource
Green Sunfish	Warmouth	Hybridize, outcompete natives
Zebra Mussels	Perch, Striped Bass, Sunfish	Change in food availability and substrate, cyanobacteria hyperconcentration
Hydrilla	Bluespotted sunfish, Sunfish, Warmouth, Striped Bass, Largemouth Bass	Outcompete vegetation, create additional submerged aquatic vegetation patches
Phragmites	Perch, Spot	Alter near-shore habitat

Management Solutions

- **Monitoring**
 - Biodiversity surveys; NAS Patuxent River Marine Species Survey (2015-2017)
- **Protected Areas**
 - NAS and 11,000 acres in the Patuxent River region
- **Buffer Zones**
 - Wetland preservation
 - Pollutant-tolerant vegetation
- **Stocking**
 - Channel catfish
 - Trout
- **Recreational fisheries**
 - Blue catfish
 - Snakehead



Upcoming Innovations

eDNA

Underwater Imaging

Automated Species Recognition

Buffer Zone Composition

Breeding & Stock Advances

Biocontrol Research

Legislation

necessary

