

# LEETOWN SCIENCE CENTER

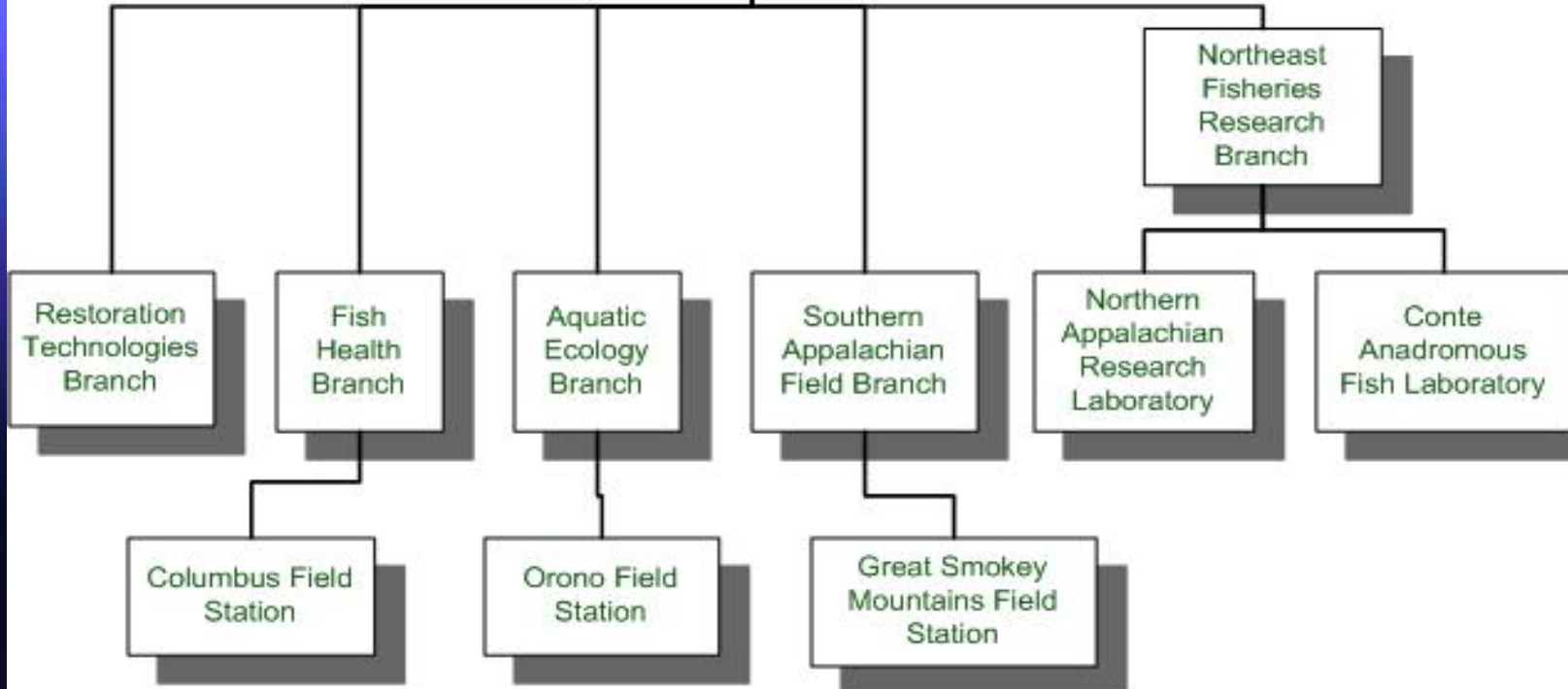
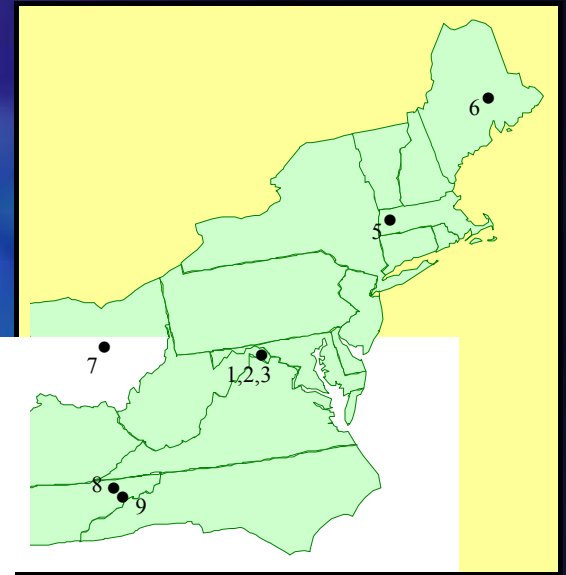
## **Mission:**

Conduct research to provide information needed to restore, enhance, maintain and protect fish and other important aquatic and terrestrial organisms and their supporting ecosystems.



# Organization

Center Director  
Assistant Center Director  
Secretary  
Administration



# BIOLOGY PROGRAMS

---

## ISSUES

- Drought
- Dam Removal/Fish Passage
- Conservation of Freshwater Mussels
- Changing Land Use
- Invasive Species
- Cave Systems
- Water Resources

# Drought Studies — Integrated Science

- Projecting drought severity and response of stream biota during extreme low-flows in northern Appalachia (Susquehanna)



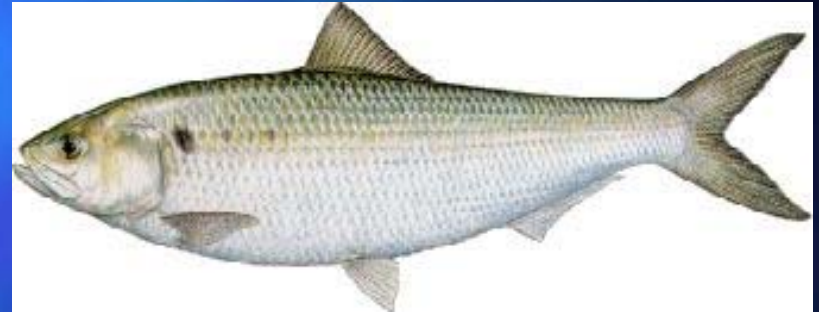
# Drought Research

- Calculate future low-flows for 20 streams
- Use predicted low-flow data as input for Instream Flow Models
- Use Model output to predict trout habitat loss
- Communicate results to resource managers and local interest groups

# Dam Removal

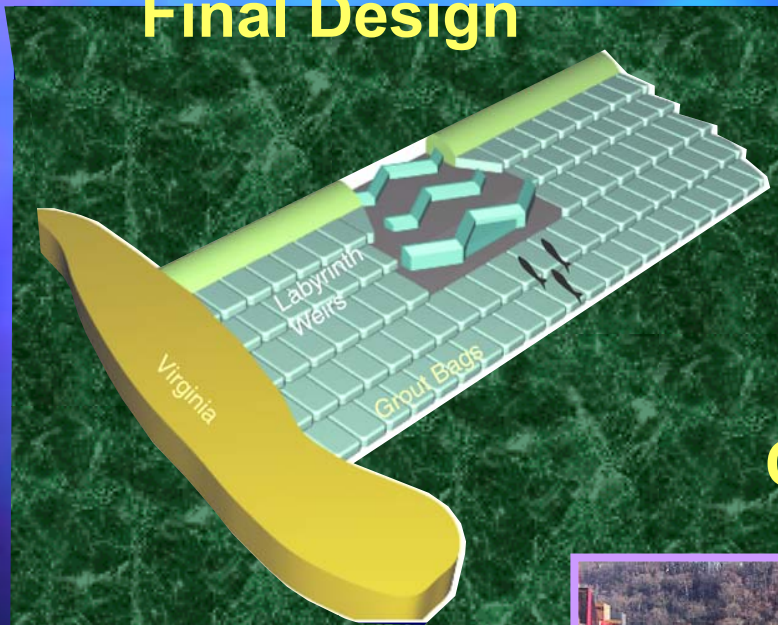
Compare and prioritize  
Susquehanna River  
tributaries for  
restoration of shad,  
herring, alewife.

Determine habitat  
potential using  
habitat suitability  
index (HSI) models



# FISH PASSAGE – Little Falls Dam

**Final Design**



**Field Construction**



# Conservation and Restoration of Native Mussels



Freshwater mussels are impacted by water quality and quantity. Studies are assessing and restoring populations.





# Mussel Research

---

- Life history and ecology
- Population genetics
- Development of standard survey methods for biological assessments of rare and endangered freshwater mussels
- Identifying potential diseases
- Evaluating the effects of exotic species and relocation as a management tool

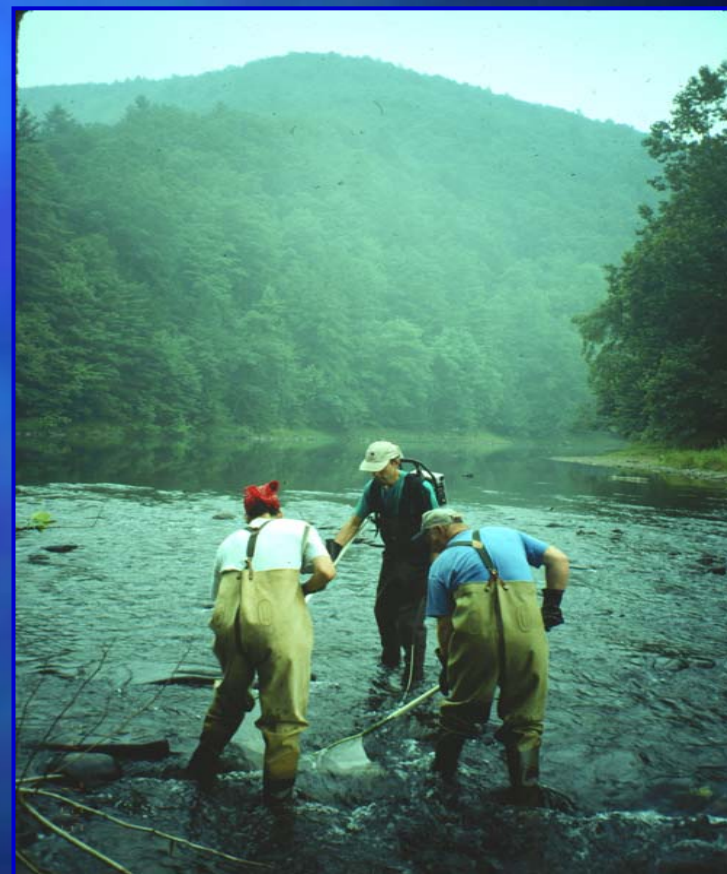
# New Mussel Research

- Focus on the effects of urban sprawl and effects of site specific disturbance, such as bridge construction, on the population of rare mussels within the river.



# Land Use – Opequon Watershed

Field study examined the relations between watershed (land use), riparian and instream habitat, and their influence on fish assemblages in Opequon River drainage.



# Results from Opequon Study

- Whole-catchment patterns were more predictive of overall biological integrity, hydrologic stability and water quality.
- Proportion of urban land in the catchment had a strong negative effect on hydrologic stability, with consequent reductions in overall invertebrate biological indices and total fish abundance, as well as increases in proportion of tolerant and non-native species.

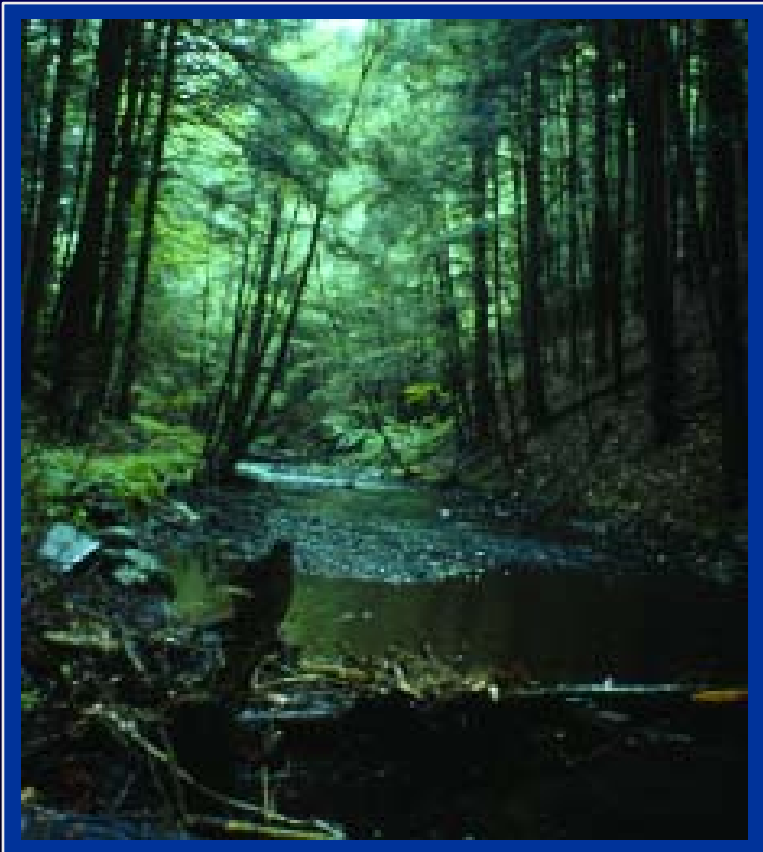
# Opequon Watershed Study

- Proportion of agriculture in the entire catchment was positively correlated with nitrates, turbidity, and suspended solids though it was not possible to directly link any biological responses to water quality.
- Most physical habitat metrics, including habitat diversity and several correlates of erosion and sedimentation, exhibited stronger correlations with riparian vegetation than whole catchment land use patterns.

# Invasive Species

**Hemlock Woolly Adelgid** – this exotic insect has caused defoliation of hemlock trees in the Delaware Water Gap, leading to increases in water temperature and a less favorable trout environment, and loss of terrestrial habitat for migratory neotropical birds. The insect is spreading south into Shenandoah Park.

# Hemlock ravine



# HWA infestation



# Invasive Species

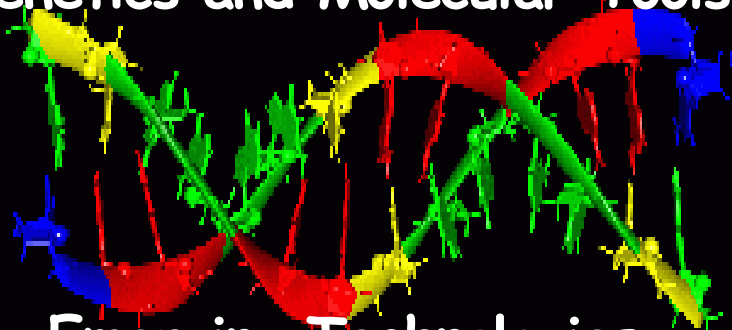
**Zebra mussels and Asian clams** – These exotic shellfish are invading freshwater streams and rivers, replacing native mussels and creating biofouling of intake structures.





# Genetics Research

## Genetics and Molecular Tools:



## Emerging Technologies

- Conservation of species
- Bacteria Source Tracking

## Genetics and Molecular Tools

- Population Delineation
- Gene Marking
- Molecular Systematics
- Biomarkers
- Disease
- Informational

# Cave Systems

---

- Cave- and karst-related long-term ecological monitoring is being developed for Mammoth Cave National Park.
- Identification of “stressors” and selection of “indicators” for monitoring to assist management of the cave ecosystem.

# New Directions

---

- NBII node for karst systems/Mid-Appalachia – compile and increase accessibility of USGS data (biology, hydrology, geology, geography)
- Ground Water Study – extensive study of the ground-water availability and quality at LSC

# LSC Ground Water Assessment

## Objectives:

- Increase understanding of ground water flow in a fractured karst aquifer
- Develop a monitoring well program
- Determine the hydraulic properties of aquifer
- Develop an inventory of current and past water and land use at LSC & the surrounding area
- Develop a ground water flow model



# For More Information:

---



- Center Website:

[www.lsc.usgs.gov](http://www.lsc.usgs.gov)