

**HOUSATONIC RIVER NATURAL RESOURCES RESTORATION PROJECT**

REQUEST FOR INFORMAL PROPOSALS: AQUATIC NATURAL RESOURCES  
RESTORATION/ENHANCEMENT

May 15, 2008

***PROJECT NAME: Restoration and Research of American Eel (*Anguilla rostrata*) in  
the Housatonic River Watershed***

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**INVITED SPONSORS REPRESENTING FIRST NATIONS PEOPLE:**

Schaghticoke Indian Tribe of Kent, CT  
Gary Ritchie (Norkentuki), Secretary

Onandaga Nation  
Eel Clan Grandmother Audrey Shenandoah (Gonwaiannah)

**BACKGROUND:**

The American eel (*Anguilla rostrata*) brings us one of the world's most remarkable stories of endurance, perseverance and will to survive.

American eels begin their lives as eggs ("leptocephali") hatching in the warm waters of the Sargasso Sea near Bermuda. They can then take years to reach freshwater streams where they mature before returning to their birth waters to spawn and die. However, since the mid 1980s there has been a spectacular drop in the numbers of juvenile eels ("glass eels") migrating to the north Atlantic to their maturing grounds from the Sargasso Sea, and a corresponding decline in the numbers of adults ("yellow eels", transformed to "silver eels" upon migrating) exiting the rivers to spawn.

Each Autumn's darkest nights, American eels descend Atlantic rivers on a journey to their birthplace in the Sargasso Sea...a place that some females left as many as 20-50 years earlier. Their path is not known or understood how they navigate vast distances. The moon, stars, magnetism and an exceptional homing ability may guide them through the dark waters.

For First Nations' tribes, the American eel was interconnected with their lives and cosmology. The eel was a vitally important food source during the winter months as the fish would burrow in the mud. As well, it was also considered a food with medicinal purposes for when elders' lives were nearing their end, it was a food that encouraged an increase in appetite, and would most likely comprise the last meal that an elder might share. When fished, a portion of the catch may have been sold to subsidize income and the other portion was shared amongst the community.

The Housatonic River watershed was once widely populated with this top predator. Their paths have been severed in both directions between the ocean and river inland watersheds since the introduction of multiple dams along the mainstem of the river and along its tributaries. A 1998 USFWS report estimated that dams reduced potential eel habitat by 91 percent from Connecticut to Maine. As far as can be determined, American eel are now found only in areas below the Stevenson Dam, or very rarely above the Stevenson Station.

In their Coastal Hazardous Waste Site Review of the Housatonic River EPA site, NOAA lists the American Eel as a "*Common NOAA trust species of concern in the Housatonic River and estuary*". Samples of American eel (1996) from Lake Zoar were shown to have body burdens of polychlorinated biphenyls up to 28 mg/kg. Catadromous American eel is the only NOAA trust resource inhabiting the river upstream of the CT Derby Dam.

The severe decline and complete extirpation of American eels in various sections of the tri-state Housatonic River watershed is significant from an economic, cultural, and ecological perspective. The impact on other fish species by removing a top predator has yet to be fully recognized or studied, neither is the impact known on other larger predator species who once fed on eel, such as cormorant and great blue heron.

Due to precipitous declines, Canadian resource agencies have closed the harvest of eels in the Canadian portion of Lake Ontario and declared the American eel a "Species of Special Concern." Despite the decline of eel in recent years, the U.S. Fish & Wildlife Service (USFWS) was petitioned to list it as 'endangered' under the federal Endangered Species Act and decided against listing it at this time. However, USFWS acknowledged in its biological finding that the species is experiencing unexplained declines and more information is needed.

Although research continues and the data are not robust for American eel, there are clear indications that Housatonic River polychlorinated biphenyls have harmed the species. USFWS, Region 5 completed a review of approximately 170 peer reviewed journal articles, federal and state agency reports and academic research. Some of their conclusions indicate that:

1. Contaminants such as polychlorinated biphenyls interfere with biological processes;
2. Contaminant concentrations within the same range of concentrations found in American eel are associated with impacts to other species;
3. During migration, lipid reserves are utilized, thus remobilizing the contaminant(s) into the blood stream;
4. Contaminants potentially impact migration, reproductive development, spawning, hatchability, embryological and larval survival;
5. Preliminary European eel dosing study indicated PCBs stopped embryo development and caused embryonic malformations;
6. There is still no direct evidence that PCBs have contributed significantly to the decline of American eel.

The 1998 Wingspread Statement on the Precautionary Principle summarizes the principle this way: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." (The Wingspread Conference on the Precautionary Principle was convened by the Science and Environmental Health Network).

In the absence of irrefutable evidence, and as the vital work of scientists and governments proceed, we believe that the (largely unrecognized) dilemma of the American eel should be afforded protection under the Precautionary Principle, and that NRD funds be awarded to this important, and harmed, species of the Housatonic River.

### **PRELIMINARY PROJECT PROPOSALS:**

We appreciate this opportunity presented by the Housatonic River NRD trustees to submit additional informal proposals for aquatic projects. Due to the limited time from notice to deadline, please be advised that there was insufficient opportunity for the sponsors to thoroughly discuss and reach any well-defined parameters for projects.

Our American eel project will likely be multi-pronged with several components:

#### **Research**

Drs. Hodson, Casselman, Oliveira, Hable and deFur are all eel experts in their respective specialties (e.g. toxicologists, fishery biologists, risk assessment, fish ecology, environmental physiology, etc.). We would like propose a research project to this proposal. Dr. Casselman suggested looking at the biology of eel samples that have been archived or could be collected to determine recruitment, growth, and production. He works closely with a commercial contractor who in the past had a commercial electrofishing operation. Drs. Hodson and Casselman use this contractor extensively to index and collect samples, since the commercial fishery for eels in the upper St. Lawrence River and Lake Ontario was closed in 2004. Electrofishing is an excellent sampling device; Dr. Casselman suggests that arrangements be made to have the contractor come to sample Housatonic River eel if the design of the project and the funding were appropriate. Dr. Casselman is also interested in looking at eel abundance and recruitment, the latter through accurate age assessment. Of course, we would coordinate any activities with all local agencies to avoid interfering with existing research-assessment programs.

He is currently working on a fairly detailed study looking at long-term changes in recruitment from accurate otolith age interpretations, correlating them with the variable climate signal and oceanic effects, North Atlantic Oscillation Index. Dr. Casselman is particularly interested in sampling other eel sub-populations along the range to see if the specific recruitment signal corresponds to what they see in the St. Lawrence River system. This would be an ancillary study, but will provide fundamental information on abundance, year class, age, growth and production to further support our other proposals.

Dr. Hodson provided an overview of his and Dr. Casselman's current project on contaminants in eels. Their current work is to evaluate whether chemicals in female eels (such as PCBs) are sufficiently concentrated to cause toxicity to their offspring. It is not possible to actually study their offspring because eels are difficult to breed in captivity, so they are extracting the chemicals from migrating silver eels, measuring their concentration and testing the toxicity of the extracts to a model fish species (Japanese medaka - equivalent to an aquatic 'white rat'). Thus far, their focus has been on sampling eels from different locations in the Lake Ontario - St Lawrence River ecosystem, and from rivers in Canada's Atlantic provinces. Dr. Oliveira from UMassD is a member of their team and they are working in collaboration to acquire eels (10/site) from rivers in the US known to be contaminated. Eels from the Housatonic could be an important sample for their study.

Drs. Oliveira and Hable from UMassD interest and experience with eels are far ranging. They recently developed a groundbreaking protocol to fertilize eels in the laboratory. This new method gives us the ability to examine the development of eels from fertilized egg into the larval stage. They can now examine toxicological effects on eel reproduction without having to go to the Sargasso Sea. They are enthusiastic to participate and contribute to a Housatonic River research project.

### **American Eel Studies**

This is a suggested study written by Steve Gephard and found on the CT DEP Long Island Sound License Plate Program website which funds various riverine, estuary and ocean projects. Perhaps we might collaborate with CT DEP in the design of such a research project.

**Background:** The American eel (*Anguilla rostrata*) is a catadromous fish species well-distributed throughout Connecticut and the East Coast. However, numbers have declined in recent years and the U.S. Fish & Wildlife Service (USFWS) was petitioned to list it as 'endangered' under the federal Endangered Species Act. The USFWS decided against listing it at this time but acknowledged in its biological finding that the species is experiencing unexplained declines and more information is needed. Larval eels colonize the Connecticut shoreline during February – May annually and then slowly move upstream into diverse habitats. Eels may live in freshwater habitats for as much as 20 years before moving downstream in the fall to re-enter the ocean and migrate to spawning habitat in the Sargasso Sea. These migratory adult eels are known as silver eels. Not much is known about them and both the USFWS and the Atlantic States Marine Fisheries Commission has recommended research that will add to our knowledge of silver eel biology and behavior.

**Research:** A graduate student at the University of New Haven recently conducted the only known study of silver eels in Connecticut. It focused on silver eels moving through a water company's reservoirs and was very site specific. Research is needed on a smaller system where numbers emigrating silver eels can be monitored year after year and data can be collected on the up or down trend in numbers of migrants, timing of the migration, environmental cues, and the amount of habitat required to support the production of one silver eel. Such a study would be best if undertaken by

a college or university or other institution with a long-term commitment to the sampling site and monitoring. Funds could be used for set up costs. It is likely that the annual monitoring would cost very little money. If the monitoring is designed appropriately, it may be possible to document the number of incoming elvers and the number of resident yellow eels and compare these to the number of emigrating silver eels to help determine how many younger eels it takes to produce one silver eel. This kind of a 'recruitment model' has never been done for American eel. Silver eels migrate at night in the fall during rains (and often leaf drop), so it is difficult to operate a trap that will stand up these challenging environmental conditions. It will be essential that a small stream be chosen as a study stream in order for the mechanics of the sampling to be manageable, a site where the applicant has long-term access, and the ability to seasonally install a trap that will sample the entire streamflow. Results will assist in the protection, regulation, and restoration of American eel and support the forage base of many marine species in Long Island Sound. For additional technical information please contact Stephen Gephard, Diadromous Fish Program, 860-447-4316  
[http://www.ct.gov/dep/lib/dep/long\\_island\\_sound/license\\_plate/2008\\_lisf\\_rfp.pdf](http://www.ct.gov/dep/lib/dep/long_island_sound/license_plate/2008_lisf_rfp.pdf)

### **Tributary Passage and Eel Reintroduction Feasibility**

In a recent phone consultation with Steve Gephard, Senior Fisheries Biologist, Diadromous Fish Program, CT Department of Environmental Protection, he suggested that we focus on eel passage in the tributaries. "Eel is a prominent component of all East Coast ecosystems," Steve has said. "Any portion of a watershed that is devoid of eel is flawed."

Since the relicensing of the hydroelectric facilities along the Housatonic River in Connecticut, the hydro dam owners, thanks in large part to Steve and CT DEP, were required by FERC to install eel passage devices at each dam. Our research has shown that eel ladders can cost anywhere between \$2,000 for simple solutions up to \$5,000,000 for fish lifts. A recent "Eel-Evator" was installed at a CT dam for approximately \$100,000. On its first day of operation, 41,000 eel were lifted to safely navigate the dam.

We are proposing to conduct a feasibility study to determine which Housatonic tributaries (and their inland watercourses), from Long Island Sound to the Massachusetts border, possess the most advantageous conditions (e.g. habitat, water quality, ability to exit) for eel reintroduction. If a tributary presents to be ideal and is obstructed to eel passage, we would like to further investigate the possibility of eel passage devices and/or dam breaching.

Our coalition will recruit and provide some of the labor required.

Included in any eel restoration project will be a 5-10 year (or greater) monitoring program.

### **Education**

Eel are a misunderstood, traditionally maligned and most times ignored fish species. We propose an educational component to our final project that will target all ages. We might create a Riverkeeper presentation that includes American eel and adapt it to varying grade levels.

Along with the other NGO Co-Sponsors, we will identify appropriate sites to install interpretive eel displays that we design and produce.

In consultation with eel experts, angling organizations and CT DEP, we will propose a tri-fold informational brochure on eel that will be distributed at fishing license outlets and be displayed on the

the DEP's and other websites.

**Potential Matching Fund Sources**

Connecticut Department of Environmental Protection  
Long Island Sound License Plate Program  
Fish America Foundation  
NOAA Restoration Center  
Restore America's Estuaries  
Save The Sound, A Program Of Connecticut Fund For The Environment  
USDA, Natural Resources Conservation Service  
Project WET, Native Waters  
Patagonia  
Ben and Jerry's Ice Cream  
Newman's Own Foundation  
Fletcher Foundation  
Mashantucket Pequot Museum and Research Center  
Institute for American Indian Studies  
National Fish and Wildlife Foundation  
Long Island Futures Fund  
Restore America's Estuaries  
Ducks Unlimited  
The Torrington Area Foundation for Public Giving

Please be advised that the Housatonic River Initiative was EPA's chosen NGO to be the recipient of the single Technical Assistance Grant for the EPA-GE Housatonic River Superfund Site. Since 1996, HRI has been awarded over 20 grants. They have been successful in receiving over 95% of the grants they have written.

**Housatonic River NRD Fund Estimate**

\$1,000.000, which will most likely be lowered by a portion from matching funds.

**Conclusion**

Unquestionably, this is a preliminary proposal in its purest form. It is our hope that, if funded, our coalition of NGO's, scientists, agencies and tribal representatives will then have greater opportunity to further develop our goals.

*'Eels play a significant part in the environment,' Alex Haro, USGS said. 'They're generalists, they feed on a great variety of invertebrates. And they're food for just about anything that can eat them — bass, trout, pickerel. Herons love them. Cormorants love them. Let's say they go down easily.'*

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