

Resolution No. 6
Ohio River Natural Resource Damage Settlement

Re: Transfer of funds from the United States Department of the Interior's Natural Resource Damage Assessment and Restoration Fund to the U.S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, and the U.S. Geological Survey for restoration of mussels and snails to the Belleville Pool of the Ohio River in calendar year 2012.

Whereas the Ohio River Trustee Council was established pursuant to the February 2, 2007 Memorandum of Understanding entered into by the U.S. Department of the Interior, the West Virginia Division of Natural Resources, and the Ohio Environmental Protection Agency;

Whereas, an Ohio River Restoration Account (#0237) has been established in the U. S. Department of the Interior's Natural Resource Damage Assessment and Restoration Fund (NADAR Fund);

Whereas, the Ohio River Trustee Council, by unanimous consent, agrees that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) should be transferred from the Ohio River Restoration Account in the NADAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources and the U. S. Geological Survey for the purpose of providing funds to implement restoration activities in calendar year 2012. The funds so transferred shall be utilized as described in the attached "Proposed Work Plan – 2012". In summary the funds will be used to:

- 1). continue fish host studies on 12 species of mussels;
- 2). captive propagation of one endangered (pink mucket), one candidate (sheepnose) and up to 14 common mussel species;
- 3). translocation of adult mussels from approved donor sites;
- 4). qualitative and quantitative monitoring (year 5) within the active restoration area and at a reference site;
- (5) collection, captive care and propagation of two species of rare snails; and
- (6) coordination, securing permits for working with endangered species, evaluation of results, reporting and planning for subsequent years.

Funds will be distributed as follows:

WV Division of Natural Resources – WVDNR	\$55,272
Ohio Department of Natural Resources – ODNR and	\$71,218
Columbus Zoo Mussel Conservation and Research Center – CZ/OSU	
White Sulphur Springs National Fish Hatchery – WSSNFH	\$73,630
Ohio River Islands National Wildlife Refuge – ORINWR	\$ 9,100
Genoa National Fish Hatchery – Genoa NFH	\$13,000
Tennessee Tech Coop Unit/USGS	\$39,067
TOTAL for 2012	\$261,287

Steve C. Buckley
3/9/2012

Resolution No. 6
Ohio River Natural Resource Damage Settlement

Re: Transfer of funds from the United States Department of the Interior's Natural Resource Damage Assessment and Restoration Fund to the U.S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, and the U.S. Geological Survey for restoration of mussels and snails to the Belleville Pool of the Ohio River in calendar year 2012.

Whereas the Ohio River Trustee Council was established pursuant to the February 2, 2007 Memorandum of Understanding entered into by the U.S. Department of the Interior, the West Virginia Division of Natural Resources, and the Ohio Environmental Protection Agency;

Whereas, an Ohio River Restoration Account (#0237) has been established in the U. S. Department of the Interior's Natural Resource Damage Assessment and Restoration Fund (NADAR Fund);

Whereas, the Ohio River Trustee Council, by unanimous consent, agrees that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) should be transferred from the Ohio River Restoration Account in the NADAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources and the U. S. Geological Survey for the purpose of providing funds to implement restoration activities in calendar year 2012. The funds so transferred shall be utilized as described in the attached "Proposed Work Plan - 2012". In summary the funds will be used to:

- 1). continue fish host studies on 12 species of mussels;
- 2). captive propagation of one endangered (pink mucket), one candidate (sheepnose) and up to 14 common mussel species;
- 3). translocation of adult mussels from approved donor sites;
- 4). qualitative and quantitative monitoring (year 5) within the active restoration area and at a reference site;
- (5) collection, captive care and propagation of two species of rare snails; and
- (6) coordination, securing permits for working with endangered species, evaluation of results, reporting and planning for subsequent years.

Funds will be distributed as follows:

WV Division of Natural Resources - WVDNR	\$55,272
Ohio Department of Natural Resources - ODNR and	\$71,218
Columbus Zoo Mussel Conservation and Research Center - CZ/OSU	
White Sulphur Springs National Fish Hatchery - WSSNFH	\$73,630
Ohio River Islands National Wildlife Refuge - ORINWR	\$ 9,100
Genoa National Fish Hatchery - Genoa NFH	\$13,000
Tennessee Tech Coop Unit/USGS	\$39,067
TOTAL for 2012	\$261,287

Resolution No. 6
Ohio River Natural Resource Damage Settlement

NOW THEREFORE BE IT RESOLVED that the Trustee Council agrees, by unanimous consent, that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) be transferred from the United States Department of the Interior's NRDAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, the West Virginia Department of Environmental Protection and the U. S. Geological Survey for the purposes described above.

Dated this 2nd day of March, 2012.

U.S. Department of the Interior
U.S. Fish and Wildlife Service

By: Mary Knapp
Mary M. Knapp, Field Supervisor, Columbus Ohio Field Office

Ohio Environmental Protection Agency

By: Jeffery DeShon, Division of Surface Water

West Virginia Division of Natural Resources

By: Curtis Taylor, Wildlife Resources Section

West Virginia Department of Environmental Protection

By: Michael Zeto, Office of Environmental Enforcement

Resolution No. 6
Ohio River Natural Resource Damage Settlement

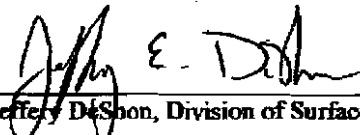
NOW THEREFORE BE IT RESOLVED that the Trustee Council agrees, by unanimous consent, that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) be transferred from the United States Department of the Interior's NRDAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, the West Virginia Department of Environmental Protection and the U. S. Geological Survey for the purposes described above.

Dated this 2nd day of March, 2012.

U.S. Department of the Interior
U.S. Fish and Wildlife Service

By: Mary M. Knapp, Field Supervisor, Columbus Ohio Field Office

Ohio Environmental Protection Agency



By: Jeffrey DeShon, Division of Surface Water

West Virginia Division of Natural Resources

By: Curtis Taylor, Wildlife Resources Section

West Virginia Department of Environmental Protection

By: Michael Zeto, Office of Environmental Enforcement

Resolution No. 6
Ohio River Natural Resource Damage Settlement

NOW THEREFORE BE IT RESOLVED that the Trustee Council agrees, by unanimous consent, that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) be transferred from the United States Department of the Interior's NRDAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, the West Virginia Department of Environmental Protection and the U. S. Geological Survey for the purposes described above.

Dated this 2nd day of March, 2012.

U.S. Department of the Interior
U.S. Fish and Wildlife Service

By: Mary M. Knapp, Field Supervisor, Columbus Ohio Field Office

Ohio Environmental Protection Agency

By: Jeffery DeShon, Division of Surface Water

West Virginia Division of Natural Resources



By: Curtis Taylor, Wildlife Resources Section

West Virginia Department of Environmental Protection

By: Michael Zeto, Office of Environmental Enforcement

Resolution No. 6
Ohio River Natural Resource Damage Settlement

NOW THEREFORE BE IT RESOLVED that the Trustee Council agrees, by unanimous consent, that Two Hundred Sixty One Thousand, Two Hundred Eighty Seven Dollars (\$261,287.00) be transferred from the United States Department of the Interior's NRDAR Fund to the U. S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the West Virginia Division of Natural Resources, the West Virginia Department of Environmental Protection and the U. S. Geological Survey for the purposes described above.

Dated this 2nd day of March, 2012.

U.S. Department of the Interior
U.S. Fish and Wildlife Service

By: Mary M. Knapp, Field Supervisor, Columbus Ohio Field Office

Ohio Environmental Protection Agency

By: Jeffery DeShon, Division of Surface Water

West Virginia Division of Natural Resources

By: Curtis Taylor, Wildlife Resources Section

West Virginia Department of Environmental Protection

By: Michael Zeto, Office of Environmental Enforcement

Proposed Work Plan – 2012
Ohio River Aquatic Restoration Implementation Plan
NRDAR Project 0237

The proposed work for 2012 supports the contributions and expertise of two state wildlife agencies (WV and OH), two federal fish hatcheries (Genoa and White Sulphur Springs), one private mussel conservation facility (Columbus Zoo/OSU), one USGS coop unit (TN Tech), four ecological services field stations (OH, WV, KY, and PA), and one national wildlife refuge (Ohio River Islands NWR).

The major work components for 2012 are:

- (1) continuation of fish host studies on 12 species of mussels;
- (2) captive propagation of one endangered mussel (pink mucket); one candidate mussel (sheepnose); and up to 14 common mussel species (three-ridge, plain pocketbook, fatmucket, Ohio pigtoe, washboard, monkeyface, pimpleback, mapleleaf, pink heelsplitter, mucket, butterfly, elephantear, round hickorynut, and black sandshell) by five facilities. Tasks include collection and holding of broodstock mussels and host fish; transformation of juvenile mussels on fish (in labs and in cages) and *in vitro*; captive care and grow out of juveniles, and stocking tagged juvenile mussels into the restoration area.
- (3) translocation of adult mussels from approved donor sites;
- (4) qualitative and quantitative monitoring (year 5) within the active restoration area and at a reference site;
- (5) collection, captive care and propagation of two species of rare snails; and
- (6) coordination, securing permits for working with endangered species, evaluation of results, reporting and planning for subsequent years.

The summary of cooperators and overall budgets for 2012 are below, and the detailed work plans of each of the cooperators are attached:

WV Division of Natural Resources – WVDNR	\$55,272
Ohio Department of Natural Resources – ODNR and Columbus Zoo Mussel Conservation and Research Center – CZ/OSU	\$71,218
White Sulphur Springs National Fish Hatchery – WSSNFH	\$73,630
Ohio River Islands National Wildlife Refuge – ORINWR	\$ 9,100
Genoa National Fish Hatchery – Genoa NFH	\$13,000
Tennessee Tech Coop Unit/USGS	\$39,067
TOTAL for 2012	\$261,287

Ohio River Restoration 2012 Planned Activities West Virginia Division of Natural Resources (28 February 2012)

Palestine Fish Hatchery and Belleville Complex

The West Virginia Division of Natural Resources (WVDNR) is a trustee in the Ohio River Aquatic Restoration NRDAR Project 0237, and an active participant in the restoration effort. To facilitate this program, the WVDNR has dedicated two one-acre fish hatchery ponds for fish and mussel production during the entire life of the project. The ponds will be used for rearing of appropriate warmwater fish species for mussel infestation, and/or for holding mussels.

Fish species and number requests need to be presented to the WVDNR no later than March of the year preceding the need. In addition, interior-holding facilities are available for the program upon a two-week notice.

Three upweller holding tanks are currently being utilized to overwinter mussel broodstock at the WVDNR Belleville Complex (BC). These tanks receive Ohio River water after passing through an additional tank which allows sediment to settle. These tanks will continue to be used for holding overwintered broodstock. In 2011 these tanks were temporarily modified to hold short-term broodstock while awaiting glochidia releases. An additional small upweller was constructed by the USFWS Ohio River Islands National Wildlife Refuge (ORINWR) for growing out juveniles. Two additional tanks are used for holding host fish and an inoculation set-up was established such that following washboard inoculations in March 2011, all WVDNR inoculations occurred at the BC. This will continue for 2012 propagation activities.

Propagation Efforts

Juvenile *Quadrula quadrula* (Mapleleaf) propagated in cages held at the French Creek embayment in 2011 are currently being held at the BC in the small upweller described above. In addition, 29 cages are potentially holding juvenile mussels from host fish inoculations conducted in 2011. All cages are currently being held at Stonewall Jackson State Park (SJSP) Marina where racks were placed under the floating docks to hold the cages. All cages will be assessed in 2012 and all mussels of stockable size will be tagged and stocked while others will be consolidated into fewer cages or moved to the BC for continued grow-out. Juveniles produced by cooperating facilities will also be tagged and stocked within the restoration zone. A few additional cages need to be refurbished.

In 2012 we propose to propagate seven species of unionids. These include *Amblema plicata* (three-ridge), *Megaloniaia nervosa* (washboard), *Quadrula metanevra* (monkeyface), *Q. Quadrula*, *Q. pustulosa* (wartyback), *Pleurobema cordatum* (Ohio pigtoe) and *Plethobasus cyphus* (sheepnose). A total of 44 cages are available for holding inoculated fish and/or juvenile mussel grow-out. With the success observed in 2011 with the two cages of *Q. quadrula* in the French Creek embayment we plan to expand production in this area in 2012. This year we hope to find an area within the embayment suitable for leaving the cages in place overwinter. Other cages will still be located at SJSP.

Data gathered over the last few years indicates that *M. nervosa* tend to release their glochidia throughout the winter with few individuals holding larvae into March. Channel catfish are currently being inoculated with *M. nervosa* as glochidia are sporadically released. These catfish are being held at the BC and will be caged mid March at SJSP as soon as lake conditions allow.

We also hope to continue limited experimentation with cage culturing and juvenile grow-out at the Clayton farm pond. Other species of mussels may be attempted pending cage, broodstock

and host fish availability. A summary of the 2012 planned propagation work is provided in Table 1. In addition to cage culturing juvenile mussels any additional host fish that may be available will be inoculated and released within the kill zone. Mussel species for this inoculation will be determined upon availability of gravid individuals.

Table 1. Summary of the 2012 propagation work proposed by the WV Division of Natural Resources

	Estimated # Cages	Cage Location	Host Fish	Minimum # Host Fish	Gravid Period
<i>Megaloniaias nervosa</i>	6	Lake	Channel Catfish	600	Nov-Mar
<i>Pleurobema cordatum</i>	3	Lake/ Embayment	Fathead Minnow Creek Chub	300	Jun-Jul
<i>Quadrula pustulosa</i>	5	Lake/ Embayment	Channel Catfish	125	June
<i>Quadrula metanevra</i>	2	Lake/ Embayment	Fathead Minnow	200	June-July
<i>Amblema plicata</i>	12	Lake/ Embayment	Largemouth Bass	450	July-August
<i>Quadrula quadrula</i>	5	Lake/ Embayment	Channel Catfish	150	July-August
<i>Plethobasus cyphus</i>	2	Lake/ Embayment	Stoneroller	100	June
To be determined (TBD)	Free Release	River	TBD	As available	

Broodstock Collection

Much effort will be placed into the collection of gravid broodstock for our work in 2012 as well as that of White Sulphur Springs National Fish Hatchery, Genoa National Fish Hatchery, Ohio State University, The Wilds, Tennessee Technological University, and KY State University. Targeted species include *A. plicata*, *Q. quadrula*, *Q. metanevra*, *Q. pustulosa*, *P. cordatum*, *M. nervosa*, *Ligumia recta*, *Lampsilis cardium*, *L. siliquioidea*, *Ellipsaria lineolata*, *Potamilus alatus*, *P. cyphus*, *Obovaria subrotunda*, and *Elliptio crassidens*. *Elliptio crassidens* will be targeted from the Greenup Pool of the Ohio River for both translocation of adults to the restoration area as well as providing broodstock for host fish studies. Gravid individuals of other species targeted for restoration will also be collected and provided to cooperating facilities for host work. All host work should emphasize the use of commercially or easily available host fish. Work will continue on the collection of potential broodstock of other target species that are difficult to collect in a timely fashion for assessing gravid condition and or supplying them as broodstock. These individuals will be placed into the mussel corral and their position recorded.

Monitoring

Qualitative collections for species richness curve development and relative abundance will be conducted at Neal Island, Site 11 and Muskingum Island in 2012. Quantitative monitoring will also be conducted at Site 11 and Muskingum Island. This will be the first quantitative monitoring since active restoration began.

Adult translocations

Coordination will be conducted with any construction projects being conducted within the Belleville Pool. Any project requiring mussel relocations will be requested to relocate mussels to the head of Neal Island. Coordination with the PA Fish and Boat Commission will continue to

collect adult mussels from the Allegheny River for relocation to the head of Neal Island. These mussels would be salvaged from an area on the Allegheny River that is targeted for sand and gravel dredging or other construction projects requiring mussel salvage.

Summary of Expenses

Cost estimates are provided in Table 2.

Table 2. Estimated expenses for 2012 proposed Ohio River mussel restoration activities by WV Division of Natural Resources.

Broodstock Collection Costs	\$14,368.29
Inoculation & Caging	\$19,116.32
Fish Transportation	\$6,845.94
Belleville Complex Expenses	\$4,620.00
Wild Fish Collection	\$959.00
Monitoring	\$6,862.23
Administration	\$2,500.00
Grand Total	\$55,271.78

Proposal to the Ohio River Restoration Work Group

Submitted by:

G. Thomas Watters
The Ohio State University
1315 Kinnear Rd.
Columbus, OH 43212

John Navarro
ODNR, Division of Wildlife
2045 Morse Rd
Columbus, OH 43229

27 February 2012

Host Identifications for Freshwater Mussels

The Facility has a history of determining potential hosts for mussels using state-of-the-art equipment. We have identified numerous hosts, including hosts for three federally endangered species. The Facility currently has two full-time staff dedicated to mussel propagation and host identification and all necessary equipment is in place. The Facility now has an agreement with the Newport (KY) Aquarium in which their personnel will supply Ohio River fish, including some rarely used species, to the Facility for host work. This is in addition to our fish supplies from ODNR and our own collections.

We have independently contracted a dive team to collect mussels in May of this year for host identification work and brood stock. Of the 26 species listed as impacted by the spill, we anticipate receiving half of these species in this effort. We have begun to take delivery on host fishes from the Newport Aquarium and from commercial hatcheries in preparation for the study. Additional host fishes are being supplied by the Thomas Moore College Field Station. Host identifications take place throughout most of the year, with the remainder of the time devoted to caring for the fish, mussels, and maintenance of the facility.

Our 2012 plan calls for continued host identifications for the following species: *Elliptio crassidens*, *Megalonais nervosa*, and *Pleurobema cordatum*. The following species may be included as well as specimens become available: *Ellipsaria lineolata*, *Ligumia recta*, *Potamilus alatus*, and *Plethobasus cyphus*.

Mussel Propagation

The Advisory Committee has identified over 14 mussel species for captive propagation. We advocate propagating mussels by several methods:

1. Releasing newly transformed juveniles to the river. This method delivers the largest number of juveniles but probably has the greatest mortality rate. It is also more difficult to gauge success as the juveniles are too small to tag. We anticipate genetically fingerprinting the juveniles for comparison with recaptured individuals found in monitoring studies.
2. Growing juveniles in the laboratory using a variety of grow-out chambers, such as those in use by Missouri State University and the Frankfort, KY, facility.

3. Growing juveniles in cages within Ohio from captive hosts. The Facility already has a program with The Wilds to use their existing ponds for this purpose. No fish will be released or placed into the Ohio River.

Our 2012 plan calls for propagation of the following species: *Lampsilis cardium*, *Lampsilis radiata luteola*, *Megaloniais nervosa*, *Pleurobema cordatum*, *Ligumia recta*, and *Amblema plicata*.

***In Vitro* studies**

Transformation of mussels on hosts remains a time-consuming and expensive method of propagation. An alternative method is to transform mussels without their host *in vitro* in blood sera media. This technique has met with limited and unpredictable success. In 2012 we will attempt *in vitro* transformation on *Ellipsaria lineolata*. A PhD level graduate student will be placed on this project, which is overseen by Dr. Barbara Wolfe, lead veterinarian at The Wilds. The majority of equipment needed for the project has already been purchased under other projects. We ask for funding for supplies and supplementary equipment.

Total requested: \$71,217.

Matching

The major expenses for this mitigation project have already been paid by other parties. The main Facility has been on line for several years. We do not request any addition funds for the existing Facility beyond defraying maintenance costs and a single dedicated personnel position. Currently over \$450,000 has been spent in personnel and equipment to bring the Facility to its present state. This represents a significant commitment of the Ohio Department of Natural Resources Division of Wildlife, the US Fish and Wildlife Service, the Ohio State University, the Columbus Zoo and Aquarium, and many other parties to this propagation effort.

Budget. Columbus Zoo and Aquarium Freshwater Mussel Facility
Ohio River Restoration 2012
Submitted 27 Feb. 2012

Host work

	hr/week	cost/week	weeks	totals	
Elliptio crassidens	15	\$558.37	8	\$4,466.98	
Pleurobema cordatum	15	\$558.37	8	\$4,466.98	
Megaloniaias nervosa	15	\$558.37	8	\$4,466.98	total
totals				\$13,400.93	\$13,400.93

Propagate

	hr/week	cost/week	weeks	totals	
Infest	Amblema plicata	15	\$558.37	8	\$4,466.98
	Lampsilis cardium	15	\$558.37	8	\$4,466.98
	Lampsilis r. luteola	15	\$558.37	8	\$4,466.98
	Megaloniaias nervosa	15	\$558.37	8	\$4,466.98
	Pleurobema cordatum	15	\$558.37	8	\$4,466.98
	Ligumia recta	15	\$558.37	8	\$4,466.98
	totals			\$26,801.85	
	hr/week	cost/week	weeks	totals	
Monitor	Amblema plicata	7	\$260.57	16	\$4,169.18
	Lampsilis cardium	7	\$260.57	16	\$4,169.18
	Lampsilis r. luteola	7	\$260.57	16	\$4,169.18
	Megaloniaias nervosa	7	\$260.57	16	\$4,169.18
	Pleurobema cordatum	7	\$260.57	16	\$4,169.18
	Ligumia recta	7	\$260.57	16	\$4,169.18
	totals			\$25,015.06	propagate total
					\$51,816.92

In Vitro Ellipsaria lineolata \$3,000.00

Facility overhead \$2,000.00

Snail Pilot Project \$1,000.00

TOTAL \$71,217.84

Budget for 2012 Ohio River Restoration: Juvenile Propagation and Culture at White Sulphur Springs National Fish Hatchery

The below table represents an estimate of costs based on the propagation and culture of four species and host fish identification tests for at least three species of freshwater mussels. Effort and personnel hours for juvenile culture are based on producing enough mussels to release 500 tagged juveniles at 15-30+ mm in length. Please note that total person-hours equal less than 1 ½ full time employees.

Our efforts for 2012 will focus on propagation and culture of at least five species and host fish identification tests for at least three of the Target High Priority mussel species found in Table 1. As well, WSSNFH will continue to focus on advances in propagation and culture of some of the more difficult mussel species, the short-term brooders. Given the added complexity of working with these species, realignment of hours from production may be directed to additional host fish work and/or long-term grow out.

Task	Effort (hours)	Rate/hour	Number of personnel required	Total (\$)
Mussel broodstock collection	50	20	1.5	1500
Fish collection	79	30	4	9480
Fish purchase				1000
Fish and mussel broodstock captive care	240	30	1.5	10800
Juvenile mussel collection	240	30	2	14400
Juvenile culture assuming 1-2 year grow-out	350	30	1.5	15750
Juvenile cage culture	150	20	3	9000
Host fish identification	150	30	2	9000
Development of work plans, data entry, writing annual reports	60	30	1.5	2700
				73630

Total personnel-hours 2766.87

Note: 1 Full Time Employee is 2080 person-hours, 1.5 is 3120

Table 1. WSSNFH 2012 Target Species for Ohio River Restoration

Target High Priority Mussel Species ¹	Laboratory Grow-out	Cage Infestation/Grow-out	Host Fish Work	Target Release Numbers ^{2,3}
Mucket <i>Actininaia ligamentina</i>	Yes	Yes	No	100
Three ridge <i>Amblema plicata</i>	Yes	No	Yes	200
Elephant ear <i>Elliptio crassidens</i>	Yes	No	Yes	5
Butterfly <i>Ellipsaria lineolata</i>	Yes	No	Yes	50
Plain pocketbook <i>Lampsilis cardium</i>	Yes	Yes	No	1000
Fat mucket <i>Lampsilis siliquoidea</i>	Yes	Yes	No	500
Black sandshell <i>Ligumia recta</i>	No	No	No	NA
Round hickorynut <i>Obovaria subrotunda</i>	Yes	No	Yes	10
Pink heelsplitter <i>Potamilus alatus</i>	Yes	No	No	NA
Ohio pigtoe <i>Pleurobema cordatum</i>	Yes	No	Yes	10
Sheepnose <i>Plethobasus cyphus</i>	Yes	No	Yes	10
Washboard <i>Megalonaias nervosa</i>	Yes	No	Yes	100
Monkeyface <i>Quadrula metanevra</i>	Yes	No	Yes	50
Pimpleback <i>Quadrula pustulosa</i>	Yes	No	Yes	50
Mapleleaf <i>Quadrula quadrula</i>	Yes	No	Yes	50

1. Target mussel species will depend on availability of gravid females, not all of the species listed above will be propagated in 2012.
2. Target grow-out sizes may not be reached until 2013-2014.
3. Target release numbers will largely depend on survival of mussel species that are very difficult to culture (*Quadrula quadrula*, *Quadrula pustulosa*, *Quadrula metanevra*, *Megalonaias nervosa*, *Pleurobema cordatum*, *Obovaria subrotunda*, *Amblema plicata*, and *Plethobasus cyphus*). As well, the ability to obtain gravid broodstock, may reduce the number of species that are produced in any given year. Species for which host fish work is completed will likely be low in juvenile release number.

Proposed Ohio River Aquatic Restoration Work FY 2012
USFWS-Ohio River Islands NWR
NRDAR Project 0237

Collect broodstock mussels as needed for propagation facilities (*M. nervosa*, *L. recta*, *L. cardium*, *L. siliquioda*, *Q. pustulosa*, *P. cordatum*, *Q. metanevra*, *Q. quadrula*, *A. plicata*, *O. subrotunda*, *E. crassidens*, *E. lineolata*, and *P. cyphus*). 5 dive team days = \$3000

Collect and transport 100-150 *Lithasia verrucosa* snails from Neal Island to CZ/OSU and Belleville facilities. 1 dive team day = \$600

Conduct quantitative and qualitative monitoring at Site 11 and Muskingum Island reference site. 6 dive team days = \$2400 (carried over 2 days from 2011)

Transport, hold and observe gravid mussels in refuge lab and Belleville to check for larval maturity 5 days = \$1300

Coordination with Technical Committee, Trustees, write up annual work plans and accomplishment reports. 5 days = \$1800

TOTAL 2012

\$ 9,100

**Production of Juvenile butterfly and pink heelsplitter mussels using Freshwater Drum for
Ohio River Restoration Project 0237**

Genoa National Fish Hatchery (NFH) has been actively involved in mussel propagation since 2000. Currently, Genoa NFH is producing two federally endangered species, one federal candidate and several more of interest on local state levels. Genoa NFH proposes to propagate target species which use freshwater drum (*Aplodinotus grunniens*) as a primary host for the Ohio River Restoration Project 0237. Four mussel species targeted for restoration under the project use the freshwater drum as primary host; the butterfly (*Ellipsaria lineolata*), pink heelsplitter (*Potamilus alatus*), deertoe (*Truncilla truncata*) and fawnsfoot (*Truncilla donaciformes*). For this year the pink heelsplitter and butterfly will be the focus of restoration efforts. Biologists from West Virginia/Ohio will collect gravid mussels of the target species during their brooding period and ship them to Genoa NFH. Genoa NFH biologists will extract glochidia, infest host fish, and monitor infested fish for juvenile mussel transformation. All propagation will be done at Genoa NFH in disease free conditions; no mussels will be either produced or cultured off-station or in wild stream water. At the end of each infestation broodstock females and all newly metamorphosed juvenile mussels will be shipped back to West Virginia/Ohio for release at target restoration sites or further culture.

Budget

Host Fish Collection	\$2,000
Host Fish Maintenance	\$2,000
Salary	\$8,000
Utilities/Shipping	\$1,000
Total	\$13,000

Proposal for 2012 Ohio River Restoration: Propagation and Culture of Juvenile Mussels at Tennessee Technological University

Submitted by:
Kendall Moles
Tennessee Cooperative Fishery Research Unit
Tennessee Technological University
1100 North Dixie
Cookeville, TN 38505

We propose to propagate and culture three species of freshwater mussels (*Lampsilis abrupta*, *Ligumia recta*, and *Obovaria subrotunda*) for restoration efforts in the Ohio River. The goal of the Tennessee Cooperative Fishery Research Unit will be to produce a total of 5,000 juvenile *Lampsilis abrupta* of 3 year classes. Each year class will be cultured for 16 to 18 months at Tennessee Wildlife Resources Agency's Normandy Fish Hatchery and also at the Cumberland River Aquatic Center. This long-term culture should provide juveniles of a size sufficient for tagging, 20-30 mm long. Broodstock will be a combination of a captive population, currently held at the Normandy Fish Hatchery, and additional individuals collected from the Tennessee River. In addition to providing juveniles of a taggable size, the Tennessee Cooperative Fishery Research Unit will also transfer 1-7 day old juveniles to other cooperators for grow-out in their respective mussel culture facilities. Depending on availability, up to 10,000 newly metamorphosed juvenile *L. abrupta* will be distributed each year among the other cooperators. These juveniles will be delivered to cooperators using overnight shipping with next day delivery service provided by shipping companies.

Additionally, the Tennessee Cooperative Fishery Research Unit will attempt to produce a total of 5,000 juvenile *Ligumia recta* and 2,000 juvenile *Obovaria subrotunda* of 3 year classes. Each year class will be cultured for 16 to 18 months to allow juveniles to grow to a size sufficient for tagging. Depending on availability the Unit will also transfer 1-7 day old juvenile *L. recta* and *O. subrotunda* each year to other cooperators. Depending on availability, up to 5,000 newly metamorphosed juvenile *L. recta* and 1,000 newly metamorphosed juvenile *O. subrotunda* will be distributed each year among cooperators' facilities. Gravid female *L. recta* and *O. subrotunda* used for broodstock would be provided to the Tennessee Cooperatives Fishery Research Unit by other cooperators. Individuals from source populations in or near the Ohio River would be collected by other cooperators and transferred to the Tennessee Cooperative Fishery Research Unit. These individuals would be held at the Normandy Fish Hatchery until the completion of propagation activities at which time they would be returned to the original providers.

Budget for proposed propagation and culture of mussels at Tennessee Technological University for Ohio River Restoration.

Task	Estimated Cost
Propagate, collect and grow out juveniles	\$25,833
Collect adult mussels for propagation	\$1,222
Captive care of fish and mussel broodstock	\$4,700
Acquire host fish (for mussel propagation)	\$4,875
Annual report, work plan etc.	\$2,437
Total Cost	\$39,067