

**Proposed Work Plan – 2013**  
**Ohio River Aquatic Restoration Implementation Plan**  
**NRDAR Project 0237**

The proposed work for 2013 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 2013 are:

- (1) continuation of fish host studies on elephantear, Ohio pigtoe, round hickorynut, and the endangered sheepsnose;
- (2) captive propagation of two endangered mussels (pink mucket and sheepsnose); and up to 14 common mussel species (plain pocketbook, 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 within the passive restoration area;
- (5) collection, captive care and propagation of two species of rare snails; and
- (6) coordination, evaluation of results, reporting and planning for subsequent years.

The summary of cooperators and overall budgets for 2013 are below, and the detailed work plans of each of the cooperators are attached separately:

|                                                                                                                  |                  |
|------------------------------------------------------------------------------------------------------------------|------------------|
| WV Division of Natural Resources – WVDNR                                                                         | \$48,000         |
| Ohio Department of Natural Resources – ODNR and<br>Columbus Zoo Mussel Conservation and Research Center – CZ/OSU | \$75,000         |
| White Sulphur Springs National Fish Hatchery – WSSNFH                                                            | \$62,700         |
| Ohio River Islands National Wildlife Refuge – ORINWR                                                             | \$11,880         |
| Genoa National Fish Hatchery – Genoa NFH                                                                         | \$13,000         |
| Tennessee Tech Coop Unit/USGS                                                                                    | \$39,100         |
| <b>TOTAL for 2013</b>                                                                                            | <b>\$249,680</b> |

**Resolution No. 7**  
**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 2013.

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 Forty Nine Thousand, Six Hundred Eighty Dollars (\$249,680.00.00) 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 2013. The funds so transferred shall be utilized as described in the attached "Proposed Work Plan – 2013". In summary the funds will be used to:

- 1). continue fish host studies on 4 species of mussels, including the endangered 'sheepnose';
- 2). implement captive propagation of two endangered mussels (pink mucket and sheepnose) and up to 18 common mussel species;
- 3). continue translocation of adult mussels from approved donor sites;
- 4). conduct qualitative and quantitative monitoring within the passive restoration areas;
- (5) continue collection, captive care and propagation of two species of rare snails; and
- (6) continue coordination, evaluation of results, reporting and planning for subsequent years.

Funds will be distributed as follows:

|                                                               |                  |
|---------------------------------------------------------------|------------------|
| WV Division of Natural Resources – WVDNR                      | \$48,000         |
| Ohio Department of Natural Resources – ODNR and               | \$75,000         |
| Columbus Zoo Mussel Conservation and Research Center – CZ/OSU |                  |
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Dated this X day of April 2013.

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

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**Ohio River Natural Resource Damage Settlement**

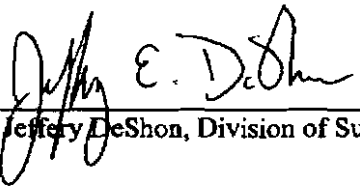
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Dated this 26<sup>th</sup> day of April 2013.

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U.S. Fish and Wildlife Service

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

Ohio Environmental Protection Agency

  
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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

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By: Michael Zeto, Office of Environmental Enforcement

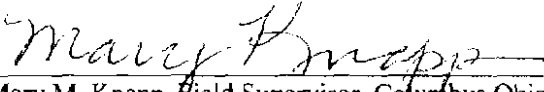
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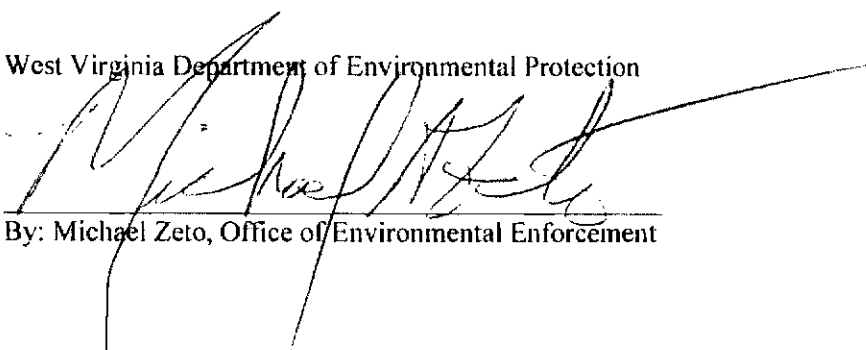
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West Virginia Division of Natural Resources

\_\_\_\_\_  
By: Curtis Taylor, Wildlife Resources Section

West Virginia Department of Environmental Protection

  
\_\_\_\_\_  
By: Michael Zeto, Office of Environmental Enforcement

*Steven C. Bailey*  
*Office of the Auditor*  
*April 16, 2013*

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# **DETAILED WORK PLANS**

## **Ohio River Restoration**

### **2013 Planned Activities**

#### **West Virginia Division of Natural Resources**

**April, 2013**

Janet L. Clayton  
WV Division of Natural Resources  
Wildlife Resources Section  
PO Box 67  
Elkins, WV 26241  
304-637-0245  
[Janet.L.Clayton@wv.gov](mailto:Janet.L.Clayton@wv.gov)

and

Scott F. Morrison  
WV Division of Natural Resources  
Wildlife Resources Section  
6321 Emerson Avenue  
Parkersburg, WV 26101  
304-420-4550  
[Scott.F.Morrison@wv.gov](mailto:Scott.F.Morrison@wv.gov)

## **Palestine Fish Hatchery and Belleville Complex (BC)**

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. In 2013 channel catfish, sunfish (bluegill and green sunfish) and fathead minnows will be provided.

Requests for fish numbers by species 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. These tanks receive Ohio River water after passing through an additional tank which allows sediment to settle out. These tanks are also used for holding mussel broodstock throughout the summer in order to monitor for glochidia development and conduct fish host inoculations. This facility was also used to test a juvenile grow-out system during the winter of 2011/2012.

### **Propagation Efforts**

Prior to 2012 most of the propagation cages were located at Stonewall Jackson State Park (SJSP). In 2011 two cages were placed into the French Creek Embayment of the Ohio River (FCE). Successful recruitment of mapleleaf mussels (*Quadrula quadrula*) occurred here which were overwintered in the BC. Seventy-three juveniles survived the winter and were placed into a cage which was then placed in the FCE for continued grow-out. With the success observed at the FCE in 2011, most of the 2012 propagation cages were placed at the FCE (12) and only a few were placed at SJSP (4). In 2012 Genoa National Fish Hatchery provided the WVDNR with newly transformed juveniles of the butterfly (*Ellipsaria lineolata*) and pink heelsplitter (*Potamilus alatus*). These were placed into two of the cages at the FCE, one of which also contained the over-wintered mapleleaf mussels. Fourteen cages are potentially holding juvenile mussels from fish inoculations conducted by the WVDNR/ORINWR in 2012. One additional cage at SJSP contains the 2011 juveniles that were consolidated for continued grow-out. All cages will be assessed in 2013 and mussels of stockable size will be tagged and stocked while others will be consolidated into fewer cages or moved to the Belleville Complex for continued grow-out. Juveniles produced by cooperating facilities will also be tagged and stocked within designated restoration areas within the Belleville Pool of the Ohio River.

In 2013 we propose to propagate eight species of unionids. These include the black sandshell (*Ligumia recta*), pocketbook (*Lampsilis cardium*), fat mucket (*Lampsilis siliquoidea*), monkeyface (*Quadrula metanevra*), mapleleaf (*Quadrula quadrula*), pimpleback (*Quadrula pustulosa*), Ohio pigtoe (*Pleurobema cordatum*) and sheepnose (*Plethobasus cyphus*). Efforts will consist of up to 40 cages being utilized for holding inoculated fish. Most of the cages are to be located at the FCE. In 2012 we propose to test propagation using floating baskets within area ponds and at the FCE. Juveniles harvested from these will be either tagged and stocked if of sufficient size or over-wintered at the BC or within cages. In addition to cage culturing juvenile mussels we plan to inoculate and release within the kill zone any additional host fish that may be

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available. Mussel species for this inoculation will be determined upon availability of gravid individuals.

In 2013 we propose to collect wild fish for propagation of black sandshell, monkeyface, Ohio pigtoe and sheepsnose mussels. These will include sauger, creek chubs and stonerollers. A summary of the 2013 planned propagation work is provided in Table 1.

Table 1. Mussel propagation planned for 2013 by the WVDNR/ORINWR.

| Species                      | Method | Location  | Host Fish                     |
|------------------------------|--------|-----------|-------------------------------|
| <i>Lampsilis cardium</i>     | Cage   | FCE       | Sunfish                       |
| <i>Lampsilis cardium</i>     | Basket | Pond, FCE |                               |
| <i>Lampsilis siliquoidea</i> | Cage   | FCE       | Sunfish                       |
| <i>Lampsilis siliquoidea</i> | Basket | Pond, FCE |                               |
| <i>Ligumia recta</i>         | Cage   | FCE       | Sauger                        |
| <i>Pleurobema cordatum</i>   | Cage   | FCE       | Fathead Minnow<br>Creek Chubs |
| <i>Pleurobema cordatum</i>   | Basket | FCE       |                               |
| <i>Quadrula pustulosa</i>    | Cage   | FCE       | Channel Catfish               |
| <i>Quadrula pustulosa</i>    | Basket | FCE       |                               |
| <i>Quadrula metanevra</i>    | Cage   | FCE       | Fathead Minnow<br>Creek Chubs |
| <i>Quadrula metanevra</i>    | Basket | FCE       |                               |
| <i>Quadrula quadrula</i>     | Cage   | FCE       | Channel Catfish               |
| <i>Plethobasus cyphus</i>    | Cage   | FCE       | Stonerollers                  |
| <i>Plethobasus cyphus</i>    | Basket | FCE       |                               |

**Broodstock Collection**

Much effort will be directed toward the collection of gravid broodstock for our work in 2013 as well as that of White Sulphur Springs National Fish Hatchery, Genoa National Fish Hatchery, and Ohio State University. Targeted species include *Elliptio crassidens*, *Quadrula quadrula*, *Q. metanevra*, *Q. pustulosa*, *Pleurobema cordatum*, *Ligumia recta*, *Lampsilis cardium*, *L. siliquoidea*, *Ellipsaria lineolata*, *Obovaria subrotunda*, and *Plethobasus cyphus*. Gravid individuals of other species targeted for

restoration will also be collected if located and provided to cooperating facilities for host work. Host work should include 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.

In 2012 elephant ear mussels (*Elliptio crassidens*) were collected from the Greenup Pool for broodstock and translocation to the Belleville Pool. None were found to be gravid. This species will be targeted again in 2013 for collection of broodstock for host fish studies by other cooperators and for additional translocation effort.

**Monitoring**

In 2010, 200 endangered fanshells (*Cyprogenia stegaria*) were stocked at Muskingum Island and their three year survival will be assessed in 2013. The head of Blennerhassett Island and the Degussa monitoring sites were established in 2008. This year marks the five year point and these sites are scheduled to be resurveyed. Neither site is being actively restored so they will be good indicators of natural recovery in the river. We will also attempt to re-survey the site at Buckley Island that was surveyed in 2000. Two presentations were provided on the five year results of our restoration efforts at the Freshwater Mollusk Conservation Society Symposium. Part 1 was a presentation by the ORINWR and Part 2 was presented by the WVDNR.

**Adult translocations**

Coordination will be conducted on all 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. This was a new area targeted for active restoration in 2012. Coordination efforts continue with the PA Fish and Boat Commission to collect adult mussels from PA for relocation to WV restoration areas. These mussels would be salvaged from an area on the Ohio River that is targeted for sand and gravel dredging. The WV Division of Highways is also planning relocation of mussels at a bridge construction site on the New River. We plan to relocate approximately 1000 mucklets (*Actinonaias ligamentina*) to the Belleville Pool restoration areas. If this effort is successful, this would meet the restoration goal for this species.

**Summary of Expenses**

Cost estimates are provided in Table 2.

Table 2. Estimated expenses for 2013 proposed Ohio River mussel restoration activities by WV Division of Natural Resources.

|                                              |                    |
|----------------------------------------------|--------------------|
| Broodstock Collection Costs                  | \$10,419.30        |
| Inoculation & Caging                         | \$21,205.47        |
| Fish Collection, Delivery and Mussel Holding | \$9,775.76         |
| Monitoring                                   | \$6,500.00         |
| <b>Grand Total</b>                           | <b>\$48,000.00</b> |

## **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**

**29 March 2013**

### **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 2013 plan calls for continued host identifications for the following species: *Elliptio crassidens*, and *Pleurobema cordatum*. The following species may be included as well as specimens become available: *Ellipsaria lineolata*, *Ligumia recta*, *Potamilus alatus*, *Obovaria subrotunda*, 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
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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 2013 plan calls for propagation and/or grow out of the following species: *Lampsilis cardium*, *Lampsilis radiata luteola*, *Pleurobema cordatum*, *Ligumia recta*, *Obovaria subrotunda*, *Potamilus alatus*, *Ellipsaria lineolata*, and *Lampsilis abrupta*.

**Total requested: \$75,000.**

### **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 additional funds for the existing Facility beyond defraying maintenance costs and a single dedicated personnel position. Currently over \$500,000 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.

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**Budget. Columbus Zoo and Aquarium Freshwater Mussel Facility  
Ohio River Restoration 2013  
Submitted 29 March 2013**

**Host work**

|                      | hr/week | cost/week | weeks | totals    |           |
|----------------------|---------|-----------|-------|-----------|-----------|
| Elliptio crassidens  | 15      | \$558.37  | 8     | \$4,467   |           |
| Pleurobema cordatum  | 15      | \$558.37  | 8     | \$4,467   |           |
| Obovaria subrotunda  | 15      | \$558.37  | 8     | \$4,467   |           |
| Ellipsaria lineolata | 15      | \$558.37  | 8     | \$4,467   |           |
| totals               |         |           |       | \$ 17,868 | \$ 17,868 |

**Propagate**

|                 | hr/week              | cost/week | weeks    | totals    |           |
|-----------------|----------------------|-----------|----------|-----------|-----------|
| Infest/Grow out | Lampsilis abrupta    | 15        | \$558.37 | 8         | \$4,467   |
|                 | Lampsilis cardium    | 15        | \$558.37 | 8         | \$4,467   |
|                 | Lampsilis r. luteola | 15        | \$558.37 | 8         | \$4,467   |
|                 | Potamilus alatus     | 15        | \$558.37 | 8         | \$4,467   |
|                 | Pleurobema cordatum  | 15        | \$558.37 | 8         | \$4,467   |
|                 | Ligumia recta        | 15        | \$558.37 | 8         | \$4,467   |
|                 | Ellipsaria lineolata | 15        | \$558.37 | 8         | \$4,467   |
| totals          |                      |           |          | \$ 31,269 | \$ 31,269 |

|         | hr/week              | cost/week | weeks    | totals    |           |
|---------|----------------------|-----------|----------|-----------|-----------|
| Monitor | Lampsilis abrupta    | 7         | \$260.57 | 16        | \$4,170   |
|         | Lampsilis cardium    | 7         | \$260.57 | 16        | \$4,170   |
|         | Lampsilis r. luteola | 7         | \$260.57 | 16        | \$4,170   |
|         | Potamilus alatus     | 7         | \$260.57 | 16        | \$4,170   |
|         | Pleurobema cordatum  | 7         | \$260.57 | 16        | \$4,170   |
|         | Ligumia recta        | 7         | \$260.57 | 16        | \$4,170   |
| totals  |                      |           |          | \$ 25,020 | \$ 25,020 |

|                          |  |  |  |              |                  |
|--------------------------|--|--|--|--------------|------------------|
| <b>Facility overhead</b> |  |  |  |              | \$850            |
|                          |  |  |  | <b>TOTAL</b> | <b>\$ 75,000</b> |

**Budget for 2013 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 of four mussel species and the culture of three species that have been shipped to us by Genoa National Fish Hatchery or Tennessee Tech. Propagation species include washboard, mucket, round hickorynut, pimpleback, and may also include mapleleaf. Culture work includes pink mucket, pink heelsplitter, butterfly, and fawnsfoot. Additional work including host fish identification tests for sheepsnose is also included in the budget below. Effort and personnel hours for juvenile culture are based on producing enough mussels to release and average of 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 2013 will focus on propagation and culture of the above species which are also Target High Priority mussel species found in Table 1. As well, WSSNFH will continue to grow-out the remaining 14,825 juveniles from 2011-2012. We will grow mussels out in floating cages and in the laboratory Upwelling systems. 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.

| <b>Task</b>                                                   | <b>Effort (hours)</b> | <b>Rate/hour</b> | <b>Number of personnel required</b> | <b>Total (\$)</b> |
|---------------------------------------------------------------|-----------------------|------------------|-------------------------------------|-------------------|
| Mussel broodstock collection                                  | 40                    | 20               | 1                                   | 800               |
| Fish collection                                               | 30                    | 25               | 3                                   | 2250              |
| Fish purchase                                                 |                       |                  |                                     | 600               |
| Operational costs (Utilities and supplies)                    |                       |                  |                                     | 12000             |
| Juvenile mussel collection and tagging                        | 275                   | 25               | 2                                   | 13750             |
| Juvenile culture assuming 1-2 year grow-out                   | 600                   | 30               | 1.5                                 | 27000             |
| Juvenile cage culture                                         | 60                    | 30               | 3                                   | 5400              |
| Host fish identification                                      | 25                    | 30               | 2                                   | 1500              |
| Development of work plans, data entry, writing annual reports | 40                    | 30               | 1                                   | 1200              |
|                                                               |                       |                  |                                     | <b>\$62,700</b>   |

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

Table 1. WSSNFH 2013 Target Species for Ohio River Restoration

| Target High Priority<br>Mussel Species <sup>1</sup> | Laboratory<br>Grow-out | Cage<br>Infestation/Grow-<br>out | Host Fish<br>Work | Target<br>Release<br>Numbers <sup>2,3</sup> |
|-----------------------------------------------------|------------------------|----------------------------------|-------------------|---------------------------------------------|
| Mucket<br><i>Actininaias ligamentina</i>            | Yes                    | Yes                              | No                | 500                                         |
| Butterfly<br><i>Ellipsaria lineolata</i>            | Yes                    | No                               | No                | 100                                         |
| Plain pocketbook<br><i>Lampsilis cardium</i>        | Yes                    | Yes                              | No                | 5000                                        |
| Fat mucket<br><i>Lampsilis siliquoidea</i>          | Yes                    | Yes                              | No                | 5000                                        |
| Round hickorynut<br><i>Obovaria subrotunda</i>      | Yes                    | Yes                              | No                | 50                                          |
| Pink heelsplitter<br><i>Potamilus alatus</i>        | Yes                    | Yes                              | No                | 2000                                        |
| Sheepnose<br><i>Plethobasus cyphus</i>              | Yes                    | No                               | Yes               | 10                                          |
| Washboard<br><i>Meglonaia nervosa</i>               | Yes                    | No                               | No                | 50                                          |
| Pimpleback<br><i>Quadrula pustulosa</i>             | Yes                    | Yes                              | No                | 200                                         |
| Mapleleaf<br><i>Quadrula quadrula</i>               | Yes                    | No                               | No                | 50                                          |

1. Target mussel species will depend on availability of gravid females, not all of the species listed above will be propagated in 2013.
2. Target grow-out sizes may not be reached until 2014-2015.
3. Target release numbers will largely depend on survival of mussel species that are very difficult to culture (*Quadrula quadrula*, *Quadrula pustulosa*, *Quadrula metanevra*, *Megalonaia 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 2013**  
**USFWS-Ohio River Islands NWR**  
**NRDAR Project 0237**

Collect broodstock mussels as needed for propagation facilities (*L. recta*, *L. cardium*, *L. siliquiodes*, *Q. pustulosa*, *P. cordatum*, *Q. metanevra*, *Q. quadrula*, *O. subrotunda*, *E. crassidens*, *E. lineolata*, and *P. cyphus*). 5 (2-person) dive team days = \$3000

Conduct quantitative and qualitative monitoring at passive restoration sites (DeGussa and/or Blennerhassett Island), possibly Buckley Island reference site, and fanshell re-introduction site, 6 (3-person) dive team days = \$5280

Transport, hold and observe gravid mussels in refuge lab and Belleville to check for larval maturity 5 days = \$1000

Possible trip to Ohio River or Allegheny River in PA to salvage common mussels from proposed dredge site, to be placed at Neal Island restoration site. 2 (2-person) dive team days = \$ 1200

Coordination with Technical Committee, Trustees, write up annual work plans and accomplishment reports. 4 days = \$1400

TOTAL 2013 **\$ 11,880**

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**Genoa National Fish Hatchery**

**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 four 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 2013 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**

For 2013 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. This long-term culture should provide juveniles of a size sufficient for tagging, 20-30 mm long. Culturing activities will occur at Tennessee Wildlife Resources Agency's Normandy Fish Hatchery, Cumberland River Aquatic Center, and also at the new TWRA Old Hickory WMA facility. This new facility provides access to fish ponds and restricted areas of the Cumberland River that will allow for cage culturing methods. 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. Juvenile pink mucklets (~125) produced in previous years will be transferred to WVDNR for stocking in the summer of 2013.

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

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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 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.

Table 1. Proposed species and culture methods of propagation activities at TCFRU and number of juveniles to be produced for OSU and WSSNFH culture facilities for 2013.

| Species                    | Laboratory culture | Cage culture | Number to be shipped |
|----------------------------|--------------------|--------------|----------------------|
| <i>Lampsilis abrupta</i>   | Yes                | Yes          | 10,000               |
| <i>Ligumia recta</i>       | Yes                | Yes          | 5,000                |
| <i>Obavaria subrotunda</i> | Yes                | No           | 1,000                |

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

| 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         |
| <b>Total Cost</b>                          | <b>\$39,100</b> |