BIOLOGICAL OPINION

Effects of the Carter's Dam Removal Project on the Northern Riffleshell
Warren County, Pennsylvania

May 13, 2009

Flow coming over Carter's dam.
(Photo Credit: Western Pennsylvania Conservancy)

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CONSULTATION HISTORY

On June 4, 2003, the Fish and Wildlife Service received a fax from the Pennsylvania Fish and Boat Commission (PFBC) requesting information about species of special concern in the vicinity of the Carter's Dam removal project in Warren County, Pennsylvania.

July 8, 2003, the Service sent a letter to the Pennsylvania Department of Environmental Protection (PADEP) informing them that the project is in the range of the northern riffleshell and clubshell mussels. The Service requested a mussel survey be conducted prior to any further dam removal planning and implementation.

On December 11, 2003, the Service attended an interagency meeting to discuss the Carter's Dam removal project. At this meeting, it was determined that northern riffleshell were previously found in Conewango Creek, but surveys for the species had not been conducted in the project area.

On July 19, 2005, the Pennsylvania Natural Heritage Program (PHNP) completed a mussel survey for the proposed construction of a six-inch natural gas pipeline across Conewango Creek, approximately 0.7 mile upstream of Carter's Dam. Two northern riffleshell mussels were found at this location.

In July and August 2005, the Western Pennsylvania Conservancy (WPC) conducted a mussel survey above and below Carter's Dam to assess potential dam removal effects on freshwater mussels. Two northern riffleshell mussels were located below the dam.

On June 28, 2006, PFBC wrote a letter to the PADEP, reviewing data from the 2005 Carter's Dam mussel survey, and requesting that PADEP implement the dam removal in such a way that minimizes effects on rare and protected freshwater mussels and their host fish.

On October 31, 2006, the PFBC, PADEP and the Service met to discuss the WPC mussel survey report, mussel resource concerns, and dam removal procedures.

On November 7, 2006, the Service received technical specifications from the PADEP outlining the project scope and mobilization/demobilization procedures, including site plans.

On April 24, 2007, a meeting was held at Carter's Dam to discuss dam removal procedures and impacts.

On October 16, 2007, the PFBC submitted a draft Biological Assessment to the PADEP for their review.

On June 30, 2008, the Service received a request (dated June 25, 2008) from the U.S. Army Corps of Engineers (ACOE) to initiate formal consultation on the Carter's Dam Removal Project. The Service acknowledged initiation of formal consultation by letter of July 23, 2008, and indicated a biological opinion would be issued by November 6, 2008.

The final biological opinion was completed and delivered to the ACOE on May 13, 2009.

BIOLOGICAL OPINION

This biological opinion is based on information provided in the following documents: 1) *Report on the Freshwater Mussels in the Immediate Vicinity of Carter's Dam,* 2) *Contract No. D62-004-101.1 PA DEP Technical Specifications,* and 3) *Biological Assessment for the Carter Dam, Conewango Creek (River Miles 0.3-0.4),* as well as other information available in Fish and Wildlife Service files. The complete administrative record of this consultation is on file at the Service's Pennsylvania Field Office.

DESCRIPTION OF THE PROPOSED ACTION

As defined in 50 CFR 402.02, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States. The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present federal, State, or private activities within the action area, as well as cumulative effects of future State or private activities that are reasonably certain to occur within the action area.

This biological opinion evaluates a proposed dam removal project currently under consideration by the ACOE on Conewango Creek in the City of Warren, located in Warren County, Pennsylvania. This opinion addresses those actions for which the Service believes adverse effects may occur. In their biological assessment, PADEP and PFBC outlined activities that would adversely affect the federally listed, endangered northern riffleshell *(Epioblasma torulosa rangiana)*. The following opinion considers whether implementation of the project is likely or not likely to jeopardize the continued existence of this species.

For the purpose of this biological opinion, the action area associated with the Carter's Dam Removal Project includes Carter's Dam, and extends from 2,185 feet (666 m) upstream of the dam (to the 5th Avenue bridge) to 4,100 feet (1,250 m) downstream (to the Hickory Street bridge over the Allegheny River). The action area also includes those portions of the river and river bank that will be affected by dam removal and stream stabilization activities.

As depicted in the photo to the right, Conewango Creek enters the Allegheny River and hugs its northern bank. The mixing zone that Conewango Creek forms within the Allegheny River is included in the action area, since sediments associated with dam removal are likely to travel from Conewango Creek into the Allegheny River, at least up to the Hickory Street Bridge. The action area is the area within which project-associated

environmental effects (*e.g.*, earth disturbance, erosion, siltation, deposition, scouring, stabilization and fluvial-hydrological effects) are anticipated to occur.

The following project area and project descriptions are summarized in the October 16, 2007, *Biological Assessment for the Carter Dam, Conewango Creek (River Miles 0.3-0.4).*

Project Area

Conewango Creek flows through the City of Warren, Pennsylvania. Upstream of the dam, the creek is bordered by an elementary school on the left bank and a road and houses on the right bank. Downstream of the dam, the creek is bordered by industrial and commercial businesses on the right bank and roads and homes on the left bank. There is minimal riparian buffer associated with the creek upstream and downstream of the dam.

Conewango Creek is approximately 394 feet wide at the dam breast. The dam pool is very shallow – approximately 5.5 feet (1.68 m) at its deepest and approximately 3.9 feet (1.2 m) throughout the pool. Stream depths vary from 3 to 5 feet immediately below the dam to approximately 11 feet in the vicinity of the Pennsylvania Avenue Bridge. According to the Pennsylvania Code Chapter 93, Water Quality Standards, Conewango Creek is classified as a warm water fishery. Conewango Creek empties into the Allegheny River approximately 2,297 feet (700 m) downstream of Carter's Dam (Figure 1).

Project Description

Carter's Dam was originally constructed in the late 1800s to facilitate the movement of logs down Conewango Creek to sawmills in Warren. Later (circa 1911), the pool created by Carter's Dam served as a reservoir for industrial water supply intake. Carter's Dam can be described as a concrete overflow dam spanning the width of Conewango Creek. The dam is approximately 394 feet (120 m) wide and approximately 5 feet (1.52 m) high, and is located between river miles 0.3 and 0.4. The coordinates for the dam's centroid are N 41° 50' 40.20"; W 79° 8' 24.49" (NAD27).

Carter's Dam during high flow.
(Photo credit Robert Anderson, USFWS)

Due to the dam's poor structural condition, the PADEP has proposed its removal to eliminate a threat to public safety, as well as to restore nearly 328 feet (100 m) of stream channel. Associated with this project is the stabilization of streambanks in the immediate vicinity of the dam, and construction of a temporary causeway for dam removal.

Currently, small breaches created by water erosion are present at the crest of the dam. Flow is extremely swift along the right descending bank of the stream, creating a flume that heavily scours the stream channel. This flume area is approximately 66 feet (20 m) in width and runs from the base of the dam to approximately 33 feet (10 m) above the Pennsylvania Avenue Bridge. Flows along the rest of the dam exhibit traditional flow regimes. The dam has altered the natural hydrology and

sediment transport of the river to the extent that there are shallow cobble shoals and quickly sloping depositional pools downstream.

The specific construction sequence will be as follows:

Using the eight-foot-wide (2.4 m) downstream apron of the existing concrete dam, a temporary access ramp will be constructed down the east bank, and a temporary, 150-foot long (46 m) by 12-foot-wide (3.7 m) causeway will be built to the proposed dam breach area. The dam will be breached at this location by removing a 50-foot (15.2 m) section of the dam down to the original stream channel. Operations will temporarily cease to allow the dam pool to draw down. Once water flow stabilizes at a constant depth through the breach, operations will restart.

Next, the temporary causeway will be extended to access the western section of the dam. The western end of the dam will be removed to the bed of the stream channel. The western portion of the streambank where the dam meets the bank will be stabilized with R-5 rip-rap.

Finally, the causeway, remaining portions of the dam, and diversion pipes will be removed, progressing in an easterly direction. Once completed, the access ramp will be removed and the eastern streambanks restored and stabilized with R-5 riprap. The temporary rock construction entrance will also be removed, as well as any erosion and sedimentation control measures. According to information provided by PADEP, the only areas to be protected with rip-rap are the areas where the dam meets the streambanks on either side of the creek.

All erosion and sediment controls will be installed and maintained in accordance with an approved Warren County Conservation District Erosion and Sediment Control Plan. Erosion and sediment control measures will be removed once the site has reached 70 percent uniform vegetative cover. Dam removal is expected to occur during the summer or fall of 2009, and take approximately three weeks to accomplish.

Conservation Measures

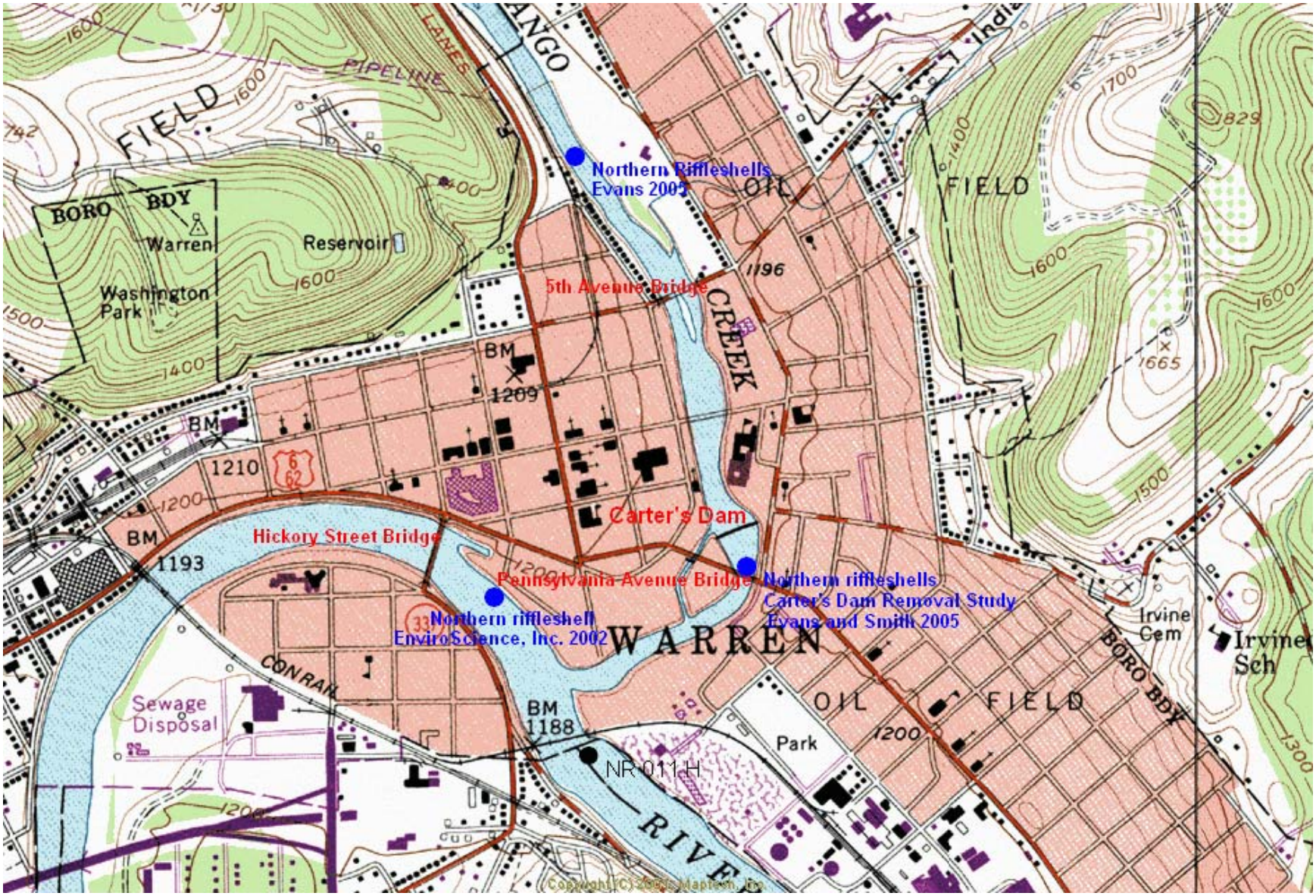
Measures are proposed to minimize and monitor the effects of dam removal on mussels. As summarized from the project biological assessment, these measures include:

- During dam demolition, PFBC biologists and a group of volunteers will salvage stranded mussels and mussels located in areas of direct impact. Mussels will be measured, marked, and relocated to appropriate habitat at the Backup Corners and Fifth Avenue Bridge sites.

- PFBC will evaluate survivorship of relocated mussels at the Backup Corners and Fifth Avenue Bridge relocation sites. Surveys will be conducted at both sites, two and five years after dam removal.

- Surveys will be conducted to assess mussel recolonization upstream and downstream of the dam at two and five years after dam removal.

Figure 1. Northern riffleshell mussel locations and project action area



STATUS OF THE SPECIES

Northern Riffleshell

Species Description

The northern riffleshell is a small to medium-size mussel, up to three inches long. The shell exterior is brownish-yellow to yellowish-green with fine green rays. The shell interior is typically white. The species is sexually dimorphic; male shells are irregular ovate in outline, with a wide shallow sulcus just anterior to the posterior ridge. Female shells are obovate in outline, and greatly expanded post-ventrally.

According to Williams *et al.* (1993), the genus *Epioblasma* is among the most diverse of the Unionidae in North America, with 25 recognized taxa. This genus once ranged from the St. Lawrence River system to the Mobile River system, occurring principally in larger rivers. All but one species in this genus are either thought to be extinct or are listed as endangered species under the federal Endangered Species Act. The northern riffleshell's two sibling species, the tubercled blossom (*E. torulosa torulosa*) and green blossom (*E. torulosa gubernaculum*), have not been seen alive or freshly dead in recent decades, and may be extinct.

Life History

No detailed life history studies of the northern riffleshell have been completed, but its life history probably follows that of closely related species such as the tan riffleshell (*Epioblasma florentina walkeri*), which has been the subject of detailed study by Rogers *et al.* (2001).

The adult northern riffleshell is a sedentary filter-feeder, obtaining oxygen and food directly from the water column or from water flowing through the substrate (interstitial flow). The breeding season appears to be initiated by seasonal changes, such as changes in water temperature. Females hold unfertilized eggs in water tubes within a specialized marsupial region of the gill. In the related tan riffleshell, males release sperm into the water in August and September, and downstream females uptake the sperm with incoming water (Rodgers *et al.* 2001). The eggs are then fertilized in the water tubes within the marsupium, where they are held until the following summer. The expanded shell shape of the female riffleshell results from shell growth around the expanded marsupial gill region.

The fertilized eggs develop into minute bivalve larvae, or glochidia, which are unique to freshwater mussels (Parmalee and Bogan 1998). While in the marsupium, developing glochidia are exposed to the adult's circulatory fluid, but not directly to the water column (Gardiner *et al.* 1991, Richard *et al.* 1991). Northern riffleshell glochidia are obligate parasites on fish. From May to September, gravid females of this species expose a brilliant white mantel margin to attract host fishes. Glochidia are discharged primarily in May and June, and become encysted on a suitable host fish where they transform into juvenile mussels over a period of days to weeks. The transformed young then fall from the host fish and burrow into the substrate. Unlike the adults, which are filter-feeders, juveniles are relatively mobile and appear to be pedial feeders, sifting food items from sediments with hair-like structures (cilia) arranged on their foot.

The northern riffleshell is a long-term breeder (bradytictic), with fertilization in the late summer and glochidial release the following spring or summer (Ortmann 1919). Individuals within a population exhibit a range of behaviors, and may release glochidia from spring through late summer.

Host suitability studies have identified the host fish of the northern riffleshell as the banded darter *(Etheostoma zonale*), bluebreast darter (*E. camurum*), brown trout (*Salmo trutta*), and banded sculpin (*Cottus carolinae*). Some of these species (brown trout and banded sculpin) are not native within the extant range of this species. These studies did not test all of the fish species that are native to the range of the northern riffleshell; therefore, it is likely that additional host species can be used by northern riffleshell glochidia.

Habitat

The northern riffleshell occurs in clean, packed, coarse sand and gravel in riffles and runs of small and large streams (Stansbery *et al.* 1982, Watters 1990). The common name 'riffleshell' implies habitat often associated with the genus, although several species, including the northern riffleshell, frequently occur in relatively slow flowing and deep runs. It is not clear if specimens living in more typical riffle areas can adapt to slower water should conditions change. Use of low-flow areas may also be limited in more turbid waters were concomitant silt deposition may limit survival or successful reproduction. Northern riffleshells bury themselves to the posterior margin of the shell, although females may be more exposed, especially during the breeding season (U.S. Fish and Wildlife Service 1994). The tan riffleshell populations in Virginia are not visible on the substrate surface from November through January (Rogers *et al.* 2001), and northern riffleshells also appear to undergo a seasonal vertical migration (Anderson 2000).

Population Dynamics

Riffleshells appear to have a relatively short life-span for a freshwater mussel. Sexual maturity can be reached in as little as three years, and most individuals probably live for only eight to 15 years (Rodgers *et al.* 2001). Like other mussels, the northern riffleshell probably experiences very low annual juvenile survival. The combination of short life span and low fecundity indicates that populations depend on a large annual cohort resulting from a large population (Musick 1999). Species following this reproductive strategy are susceptible to loss of individuals from predation and stochastic events, and are slow to recover from such losses (Rodgers *et al.* 2001), but may be well suited to exploit dynamic micro-habitat shifts characteristic of free-flowing rivers.

The northern riffleshell is now sparsely distributed within a highly restricted range, although population numbers may be high in localized areas. As stated above, large populations appear to be necessary for the long-term conservation of this species; below this level, mortality exceeds reproductive potential and the population may crash.

Threats

The northern riffleshell is subjected to many of the same threats as are other aquatic species. Pollution from municipal, agricultural, and industrial sources has reduced or eliminated mussel populations directly, as well as indirectly through elimination of host fish, resulting in

reproductive failures (U.S. Fish and Wildlife Service 1994). Increases in turbidity and suspended sediments are detrimental in that they decrease the depth and amount of light penetration, affect primary productivity, decrease oxygen levels, increase water temperature, irritate or cause clogging of gills, and result in a blanket of silt on the substrate. Northern riffleshells may be directly affected by siltation through smothering. High turbidity may interfere with sight lures, such as conglutinates, which attract host fish. Siltation affects mussels by smothering eggs or larvae of the fish host populations and by reducing food availability. Siltation also fills interstitial spaces, thereby eliminating spawning habitat critical to the survival of young fish and juvenile mussels. Altered hydrologic regimes resulting from land-clearing, mining, agriculture, urbanization, and channelization were probably responsible for many of the population losses observed (U.S. Fish and Wildlife Service 1994). Point and non-point source pollution and acid mine drainage likely contributed to the species decline in various portions of its range.

The zebra mussel (*Dreissena polymorpha*) is a highly invasive bivalve native to Europe and western Asia, but accidentally introduced to Lake Erie around 1985 via release of trans-Atlantic ship ballast water. The species has since spread through much of the eastern United States. Zebra mussels can quickly reach enormous population densities that compete for food, oxygen, and space with native mussels, including the northern riffleshell. Zebra mussels produce byssal threads able to firmly attach to many substrates. When zebra mussels attach to native mussels, they can cause mortality of native mussels by preventing them from closing, preventing them from borrowing, and increasing drag to the point that they are scoured from the substrate. Unlike native mussels, zebra mussels do not require a host fish to reproduce. Their planktonic young appear to be relatively intolerant of turbulent free-flowing streams, and may require greater dissolved calcium concentrations than native mussels. Zebra mussels have not become established in all habitats to which they have been introduced, including some currently occupied by northern riffleshell. Zebra mussels appear to have eliminated northern riffleshells in Lake Erie and the Detroit River. They were documented in French Creek in 2002, but are not known to occur in the free-flowing portion of the Allegheny River at this time. However, zebra mussels are known from the Allegheny River basin at Edinboro Lake, and from within the lower navigation channel of the river.

Other introduced exotic species now present in the historic range of the northern riffleshell may present a threat should they expand in range or increase in abundance in waters supporting the northern riffleshell. These include two exotic bivalves, the quagga mussel (*Dreissena bugensis),* and Asiatic clam *(Corbicula fluminea*); and two invasive exotic fish, the round goby *(Neogobius melanostomus)* and black carp *(Mylopharyngodon piceus),* both of which are molluscivores.

Status and Distribution

Historically, the northern riffleshell was relatively common and appears to have been a highly successful species occupying a range of riverine habitats throughout the Ohio River basin and into Michigan and Ontario tributaries of Lake Erie, Lake St. Clair, and the Detroit and St. Clair Rivers (U.S. Fish and Wildlife Service 1994). The northern riffleshell has suffered a range reduction of over 95 percent. As a result, it was listed as endangered, without critical habitat, in 1993.

Although it once occupied at least 54 streams, the northern riffleshell now appears to be restricted to four, successfully recruiting populations in the Ohio and St. Lawrence River Basins, specifically the East Branch Sydenham River, Allegheny River, French Creek, and Ausable River populations. The Elk River population is probably extant, but recruitment has not been documented recently. Since the species was listed as endangered, populations in Fish Creek, Detroit River, Green River, Big Darby Creek, and Tippecanoe River have undergone severe declines, and recent surveys failed to locate living specimens. Although additional surveys are ongoing, northern riffleshells may have been extirpated from these systems. Table 1 lists the known locations and status of remaining northern riffleshell populations.

In the Allegheny River, northern riffleshells are distributed over 66 miles of river (C. Bier, WPC, *in litt*., 6 January 1994; in U.S. Fish and Wildlife Service 1994). The species has been documented to occur in good numbers at several locations in the Allegheny River, but its distribution is discontinuous (*i.e.*, localized to areas of suitable habitat) and the condition of these populations ranges from those exhibiting successful reproduction, to those with apparently depressed vigor and a predominance of older adults (USGS 2004). Aside from the survey conducted for the subject consultation (Evans and Smith 2005), the most upstream location at which northern riffleshells have been found alive in recent years is near the City of Warren, Pennsylvania (EnviroScience 2002).

Northern riffleshells appear to become a frequent member of the mussel community of the Allegheny River about nine miles below Warren, with peak densities documented near the Forest/Venango County line. There, northern riffleshells are the dominant mussel species, with a mean density of 7.57 individuals/m^2, and an estimated population of 169,622 individuals in a 100-meter wide cross-section of the Allegheny River (USGS 2002). Compared to the West Hickory bridge site, where the mean density in 1999 was estimated to be 0.5/m^2 (USGS 2004), northern riffleshells have been found to be more abundant both upstream and downstream, with a mean density of 1.8/m^2 at five sites quantitatively sampled between Tidioute and Tionesta. During the 2000 mussel survey conducted for the West Hickory Bridge project, approximately 42,758 and 42,650 northern riffleshell were estimated to occur in two, 100-meter-wide river sections located 200 and 300 meters downstream of the existing bridge (USGS 2000). Northern riffleshell populations are known from scattered locations in the middle Allegheny River (*e.g.*, near the towns of Kennerdell, Foxburg, Oil City, Parker, East Brady, and downstream to river mile 58) where northern riffleshell population densities are generally less than 0.1/m^2.

The northern riffleshell population is discontinuously distributed in the lower reaches of French Creek, from its confluence with the Allegheny River at Franklin, upstream to the vicinity of the State Route 6 Bridge at Mill Village. Within this reach, northern riffleshells range from relatively common, to rare or absent at sites that have otherwise diverse mussel communities. For example, of 31 sites investigated along the length of French Creek in 2003, northern riffleshells were documented to occur in nine of the lower 21 sites surveyed. These nine sites had mussel diversity of between six and 19 species, although they were often separated by apparently equally diverse sites, with up to 15 species, but excluding northern riffleshells (Tamara Smith, WPC, personal communication).

Table 1. Extant and possibly extant northern riffleshell populations.

Basin	Population	Stream	Approximate Range	Status[1]
St. Lawrence River system	Lake St. Clair	East Branch Sydenham River	Lower and middle reaches, 17 sites	Recruitment documented; declining
	Lake Huron	Ausable River	Upper and middle reaches	Recruitment documented; declining
	Maumee River	Fish Creek	Last reported in early 1990's, 2-mile reach	Status unknown; possibly extirpated
	Detroit River	Detroit River	A freshly dead shells found in 2005	Status unknown; possibly extirpated
Ohio River	Green River	Green River	One to two freshly dead shells found in 1987 and 1989 at two sites	Status unknown; possibly extirpated
	Scioto River	Big Darby Creek	Last reported in early 1990's;	Status unknown; possibly extirpated; Augmentation project
	Allegheny River	Allegheny River	scattered over 66 miles – Warren, Forest, Venango, Clarion, Armstrong Counties	Successful recruitment at multiple sites; stable
		Conewango Creek	Near the confluence with the Allegheny River	A few live individuals found in 2005; no recruitment documented; status unknown
	French Creek	French Creek	Scattered over 60 miles -- Venango & Crawford Co.	Successful recruitment at multiple sites; stable
		LeBoeuf Creek	3-mile reach	Recruitment documented; stable
		Muddy Creek	1 site near the confluence with the French Creek	Peripheral to French Creek; status unknown
	Kanawha River	Elk River	Two freshly dead shells found in 2003 at one site	Status unknown; possibly extirpated
TOTALS	9 populations	12 streams	4 populations in 5 streams recruiting	

Several federal actions have taken place in Pennsylvania that have adversely affected the northern riffleshell, and for which incidental take has been estimated (Table 2).

Table 2. Previous biological opinions authorizing incidental take of the northern riffleshell in Pennsylvania.

Project Name	Estimated Incidental Take	Year	Monitoring Report Received	Monitoring Report Citation	Project Status
Kennerdell Bridge	875	1998	YES	U.S. Geological Survey (2002)	Complete
Utica Bridge	389	1998	YES	U.S. Geological Survey (2002)	Complete
Foxburg Bridge	65	2001	NO	-	Pending
Forest Plan - Allegheny National Forest	unquantified	2001	NO	-	Ongoing
Sugar Creek Pipeline	20	2002	NO	-	Pending
East Brady Bridge	76	2002	NO	-	Ongoing
Warren St. Bridge	57	2003	NO	-	Complete
Mill Village Bridge	9	2004	NO	-	Ongoing
West Hickory Bridge	905	2004	NO	-	Ongoing

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

Status of Species within the Action Area

The Western Pennsylvania Conservancy conducted a freshwater mussel survey in Conewango Creek at Carter's Dam between July 28 and August 30, 2005. The study area encompassed

approximately 280,528 square feet (26,062 m^2), and extended from approximately 100 m above to 150 m below the dam to the Pennsylvania Avenue Bridge. A total of 1,191 mussels representing 16 species were located during qualitative sampling.

Mussel species diversity in sampling cells ranged from zero to eight species within 100 m upstream and downstream of the dam. However, species diversity in sampling cells farther downstream increased to 12 to 13 species. It was in these higher-diversity cells that two individuals (one male and one female) of the northern riffleshell were located, approximately 410 feet (125 m) and 443 feet (135 m) below the dam, near the Pennsylvania Avenue Bridge (Evans and Smith 2005).

Because quantitative sampling methods were not used during this survey, population density information is not available for this site. In the absence of density information in the project area, we are assuming the density of northern riffleshell in Conewango Creek below the dam (*i.e.*, from Carter's Dam to the Allegheny River) is similar to the density found in the Allegheny River at the Hickory Street Bridge (0.01/m^2), which is approximately 0.75 mile below the project area (EnviroScience 2002). Due to the relatively short distance between these sites and the extension of the Conewango Creek flow plume into the Allegheny River, mussels at both locations are considered to be part of the same mussel community. At both locations, there is similar mussel species diversity, similar aquatic habitats, and similar host fish species. Furthermore, this mussel community is probably susceptible to similar water quality impacts.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of an action on listed species or critical habitat, together with the effects of other activities interrelated and interdependent with that action, which will be added to the environmental baseline. Indirect effects are caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action, and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

Direct Effects

"Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated" (USFWS and NMFS 1998).

Direct effects would be expected to occur at, and immediately upstream and downstream of the dam during the period when in-stream activities (*e.g.*, causeway construction and removal, dam removal, bank stabilization) take place. However, because no northern riffleshell were found in the direct impact area (Evans and Smith 2005), and because the low mussel diversity in the direct impact area indicates this species is not likely to occur there, no direct effects on the northern riffleshell are anticipated.

Indirect Effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02]. Dam removal is expected to result in indirect effects on northern riffleshell both upstream and downstream of the dam, as sediments behind the dam are mobilized and transported, and as stream hydrology and morphology upstream and downstream of the dam adjust to the dam's removal. These indirect effects are expected to occur intermittently over a period of several years following dam removal.

Upstream Effects

Effects are expected to extend approximately 0.4 mile upstream to the 5th Avenue Bridge, and result from pool draw-down and changes in stream hydrology and morphology. Because Carter's Dam is a low-head dam, stream depth behind the dam does not differ significantly from that upstream or downstream. Therefore, while pool draw-down may result in the dewatering of shallow areas upstream of the dam, we would only expect a small amount of the current stream channel to be exposed. However, any mussels in these de-watered areas would likely be stranded and killed. The loss of mussels due to stranding will be minimized by having biologists on-site during demolition to salvage mussels from de-watered and direct impact areas (see *Conservation Measures*). Because the exposed portions of the channel are likely to coincide with those areas that have historically been dewatered during low-flow conditions and droughts, the risk of northern riffleshell mortality in these areas is relatively low.

Northern riffleshell upstream of the dam may be killed or injured as stream morphology and flow adjust to dam removal over a period of years in a series of scouring, sediment transport, and sediment deposition events. Northern riffleshell that occur in areas that are scoured or subjected to head-cutting will be displaced from the stream substrate and transported downstream. They may be injured or exposed to predation in the process. If they are not able to right themselves and re-burrow in suitable habitat, they will not persist. Those northern riffleshell that occur in areas where sediments deposit may be smothered and killed. The changes in flow patterns are also expected to alter host fish habitat and distribution, adversely affecting mussel reproduction.

Downstream Effects

Effects are expected to extend approximately 0.75 mile downstream to the Hickory Street Bridge on the Allegheny River. Downstream indirect effects are expected from sedimentation, as well as alterations in stream hydrology and morphology resulting from dam removal. The substrate in the dam pool consists of sand/silt cover over cobble. This pool was not as deep as other small dam pools observed by surveyors in similar-sized streams. The lack of depth may be due to sediment overflows at small breaches along the dam (Evans and Smith 2005). Due to the periodic flushing of sediments over the dam during high flows, we expect less sediment to be carried downstream once the dam is breached and removed. As sediments behind the dam are mobilized, they will be subjected to several cycles of mobilization and re-deposition as high flows flush them downstream.

Mortality, injury, and stress to mussels are expected from sedimentation and siltation caused by

dam removal and associated activities. Sediment is likely to remain concentrated near the source before becoming mixed in Conewango Creek and will, therefore, have more of an effect on mussels closer to the source. Female northern riffleshells may be gravid with eggs or glochidia for most of the year, and are at risk from significant sediment exposure, which has been documented to cause mussels to abort eggs or young that would likely die. As filter-feeders on microscopic food items, northern riffleshells are very susceptible to smothering by silt and other sediments in the water (Ellis 1936, in U.S. Fish and Wildlife Service 1994). Siltation may also result in reduced dissolved oxygen and increased organic material at the substrate level (Ellis 1936, Harman 1974; both in U.S. Fish and Wildlife Service 1994). At sub-lethal levels, silt interferes with feeding and metabolism in general (Aldridge *et al*. 1987, in U.S. Fish and Wildlife Service 1994). Because northern riffleshells typically bury themselves to the posterior margin of the shell (U.S. Fish and Wildlife Service 1994), this habitat also renders them susceptible to siltation, which clogs the substrate interstices and suffocates the animals, as well as limits their ability to feed. Proper implementation of erosion and sedimentation control practices should help to minimize some sources of sediment (*e.g*., on the exposed streambanks), but it will not prevent the release and transport of sediment currently trapped behind the dam.

Sediment toxicity is also a potential concern. No sediment sampling has been conducted in the dam pool, so contaminant levels in these sediments have not been quantified. Currently, the Conewango Creek watershed contains a significant amount of agricultural land use, in addition to historical uses as a source for industrial intake. Additionally, outfall pipes from waste water treatment plants and other sources could have added to pollutants in sediments that have accumulated behind the dam. Heavy metals, polychlorinated biphenols (PCBs), industrial solvents, agricultural pesticides and herbicides, and fertilizers are some of the pollutants that can be found in such sediments (Quinn 1999). If northern riffleshell are exposed to contaminated sediments, it may adversely affect their reproduction and survival.

Since its construction in the late 1800s, Carter's Dam has been a factor influencing the local hydrologic flow conditions in Conewango Creek. The dam currently has small breaches along its crest due to water erosion. Because of these breaches, flow is extremely swift along the right descending bank of the stream, creating a flume that heavily scours the stream channel. This flume area is approximately 20 m in width, and runs from the base of the dam to approximately 10 m above the Pennsylvania Avenue Bridge (Evans and Smith 2005). It is expected that this flume will eventually fill in, and that sediment from upstream will disperse across the entire stream channel width below the dam.

Because we have no hydrology or stream morphology data for Conewango Creek in the vicinity of Carter's Dam, it is difficult to predict exactly how, or how far, stream hydrology and morphology will be altered by dam removal. However, we do expect that over a period of several years, the channel will reconfigure as flow patterns change in response to dam removal. The most significant changes are expected to occur in Conewango Creek, and to a lesser extent in the Allegheny River below the confluence. As these changes occur, some areas will be scoured and some will be subjected to sediment deposition. According to Bushaw-Newton *et al.* (2002), monitoring the first spring after a dam removal indicated a significant decline in aquatic organism abundance downstream of the dam, coincident with sediment transport, scouring and deposition in these habitats from the former impoundment. These cycles of scouring, sediment transport, and sediment deposition are expected to occur primarily during high-flow events over

a period of years. In the process, pool, riffle, and run sequences will be altered, potentially burying habitat or existing mussel beds. As a result, northern riffleshell will be indirectly affected, as described above (see *Upstream Effects*).

The northern riffleshell will also be at risk during construction if chemical spills occur. Construction materials and equipment may affect mussels if the equipment is washed into the river and either physically transported downstream by currents, or if toxic materials such as fuel spills into the river. Nearshore placement of earthmoving equipment and trucks will place them at risk of flooding during high-flow events unless precautions are taken to avoid this. Toxic chemical spills could directly or indirectly affect this species, and result in take.

Finally, it was recommended by Evans and Smith (2005) that *Myriophyllum*, an invasive plant species established behind the dam, be removed prior to dam removal. However, dam removal will eliminate lentic conditions favorable to this plant, which will probably decline over time or be washed downstream. Consequently, the chemical or mechanical treatments necessary to eradicate the plant would be more harmful to mussels than allowing the plant population to decline naturally due to dam removal.

Although take of northern riffleshell will occur upstream and downstream of Carter's Dam due to project implementation, this project is likely to have a beneficial effect on the northern riffleshell population in Conewango Creek over the long-term. Dam removal will improve population connectivity and facilitate fish host dispersal, thereby benefitting the population. In addition, the currently unsuitable habitat behind the dam may become more suitable for the northern riffleshell as the accumulated sediments are flushed downstream.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation under section 7 of the Endangered Species Act. No cumulative effects are foreseen; therefore, none have been evaluated for the Carter's Dam Removal Project.

CONCLUSIONS

After reviewing the status of the northern riffleshell, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the proposed Carter's Dam Removal Project is not likely to jeopardize the continued existence of the northern riffleshell. No critical habitat has been designated for this species; therefore, none will be affected.

While this project will result in the take of some northern riffleshells, removal of the dam is expected to improve population connectivity and host fish dispersal, and therefore benefit the northern riffleshell population in Conewango Creek over the long term. Ultimately, removal of the dam will improve the existing stream system for mussel species. Despite some initial take,

we expect the population to eventually recolonize the upstream portions of Conewango Creek, and repopulate the downstream sections after shifting gravel and sediment have stabilized.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of Endangered Species Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Because incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity, this Incidental Take Statement is valid only upon receipt by the applicant of all appropriate authorizations and permits from Federal, State and local permitting authorities. These permits/authorizations may include, but are not limited to, a permit under section 404 of the Clean Water Act from the Corps of Engineers; a section 401 Water Quality Certification and Chapter 105 Dam Safety and Encroachment Permit from the Pennsylvania Department of Environmental Protection; a section 75.4 Special Permit from the Pennsylvania Fish and Boat Commission; and an approved Erosion and Sedimentation Control Plan from the Warren County Conservation District. Again, this incidental take statement, along with its exemption from the section 9 prohibitions of the Endangered Species Act, is valid only upon receipt of all required permits and authorizations.

The measures described below are non-discretionary, and must be undertaken by the ACOE so that they become binding conditions of any funding, permits, and/or approvals, as appropriate, issued to PADEP for the exemption in section 7(o)(2) to apply. The ACOE has a continuing duty to regulate the activity covered by this incidental take statement. If the ACOE 1) fails to require PADEP to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, authorization, or funding document; and/or 2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the ACOE or PADEP must report the progress of the action and its impact on the species to the Service, as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that take in the form of killing, harm, and harassment (as defined in 50 CFR §17.3) will occur as a result of the proposed action. We anticipate that northern riffleshell

will be taken during implementation of the Carter's Dam Removal Project through direct mortality, injury, and stress. Mortality and injury may occur in the action area during and after dam removal due to sedimentation, scouring, and changes in river hydrology and morphology. Stress, short-term reproductive impairment, and limited mortality due to changes in hydrology, scouring, and sedimentation, are predicted to occur in the action area. Stressors include low oxygen, decreased food, and decreased sperm availability in the water column, and increased silt and other sediment loading. The project will also result in the temporary loss or decreased suitability of mussel habitat due to sedimentation and scouring as the stream channel achieves a new equilibrium without the dam structure. These events will result in harm to adult northern riffleshell, the glochidial life stage of this species, and populations of host fishes.

We estimate the actual number of northern riffleshell in Conewango Creek between Carter's Dam and the Allegheny River confluence to be 537[1] individuals. We expect mussels in this part of the action area to face the highest risk of death, injury, or stress due to their proximity to the dam. Take upstream of the dam, and below the confluence of the two rivers, is also expected to occur, but is considered unquantifiable because we cannot predict the timing, frequency, duration or extent of scouring and subsequent sediment deposition. However, effects related to sediment deposition and scouring are expected to diminish with increasing distance from Carter's Dam.

Table 3 provides a qualitative description of the take that is expected to occur due to indirect effects of the Carter's Dam Removal Project. We are able to describe the type and relative risk of take upstream and downstream of the dam, but we cannot quantify take due to numerous uncertainties. For example, the actual density and distribution of northern riffleshell upstream and downstream of the dam are not known. Nor do we know which sections of Conewango Creek and the Allegheny River will be subject to scouring and sediment deposition following dam removal. The extent of indirect effects will be influenced by several factors, including stream velocity, shifts in stream hydrology related to dam removal, depth of sediment behind the dam, how far the pool extends upstream, and the effectiveness of erosion and sedimentation controls. Due to all of these uncertainties, it is not possible to predict how many individuals or what percentage of the population will be taken. However, we do expect some portion of the population will be harmed and/or harassed, and expect that more mussels will be temporarily affected (*e.g.,* by sedimentation, scouring, change in channel width, disruption of breeding) than will be killed. The actual level of incidental take will be difficult to detect or quantify because individual mussels (juveniles and adults) are small, and often buried in the substrate, making it unlikely that dead or injured specimens will be located.

Over the long term, we anticipate the northern riffleshell population within the action area will recover to near or above present levels, as mussels eventually recolonize suitable habitat. Once the project is completed, habitat above the dam will be more accessible to host fish, facilitating mussel population expansion. This project is expected to improve connectivity between the northern riffleshell population upstream and downstream of the Carter's Dam site.

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[1] Conewango Creek from Carter's Dam to the confluence is approximately 710 m long by 75.6 m wide (average stream width) = 53,676 sq m x .01/m^2 = 536.76 mussels. The density of .01/m^2 is based on the northern riffleshell density documented in the 2001 Hickory Street Bridge Replacement survey report (EnviroScience 2002).

If either 1) a spill or release of petroleum products or other hazardous substances into Conewango Creek occurs during dam removal; or 2) a failure of erosion and sediment control measures occurs, the ACOE will immediately take remedial action(s), contact the Service for recommendations, and determine whether reinitiation of consultation will be necessary. Also, if significant substrate deposition is documented downstream of the Hickory Street Bridge, the ACOE should, in consultation with the Service, initiate an evaluation to determine the cause. If evidence suggests that the cause was related to this project, reinitiation of consultation may be required.

Table 3. Incidental take estimates of northern riffleshell for the Carter's Dam Removal Project.

Individuals	**Type of Take**	**Area Where Take Will Occur**
≤ 537	Harassment or harm during and after dam removal, resulting in mortality, injury, stress, or temporary impairment of feeding or reproduction.	Conewango Creek from Carter's Dam downstream to the Allegheny River confluence (approx. 2,330 feet or 710 m)
unquantifiable	Harassment or harm during and after dam removal, resulting in mortality, injury, stress, or temporary impairment of feeding or reproduction. The risk of take is expected to decrease with increasing distance from Carter's Dam.	Conewango Creek from Carter's Dam upstream to the 5th Avenue Bridge (approx. 2,215 feet or 675 m)
unquantifiable	Harassment or harm after dam removal, resulting in limited mortality, injury, and stress, and temporary impairment of feeding and reproduction. The risk of take is expected to decrease substantially with increasing distance from the confluence.	Allegheny River from its confluence with Conewango Creek downstream to the Hickory Street Bridge (approx. 1,675 feet or 510 m)

EFFECT OF THE TAKE

In the proceeding biological opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the northern riffleshell.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the northern riffleshell at the Carter's Dam Removal Project site:

1. Minimize the impact of dam removal on endangered mussels and their habitat through careful project design and implementation.

2. Minimize take by salvaging endangered mussels and relocating them to suitable habitat, as described in the project *Conservation Measures*.

3. Monitor and report the take of mussels resulting from project implementation.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Endangered Species Act, the ACOE must comply with the following terms and conditions, which carry out the reasonable and prudent measures described above, and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. Design and implement the project in a manner that minimizes impacts on the northern riffleshell and its habitat, as described below.

    a. Submit the final dam removal plans to the Service for review and concurrence at least 30 days prior to the start of any proposed removal activities to ensure the resulting effects are consistent with those disclosed in the biological assessment and evaluated in this opinion.

    b. Remove the dam between May 1 and September 30. During this period, water levels are relatively low (compared to winter and early spring), and mussel salvage and relocation will be more successful.

    c. All rock must be 'clean' and free of any debris or fines prior to using it for causeway construction or bank stabilization. This includes any rock or concrete that is reused from the dam.

    d. Develop and implement an erosion and sedimentation control plan to address all sources of project-related erosion and sedimentation, including, but not limited to, construction access roads, roadway approaches, staging areas, dam removal, causeway placement and removal, etc**.**

        i. Monitor the project site daily to ensure the erosion and sedimentation control practices are implemented and properly maintained, and to identify any project-related impacts due to scouring or sedimentation.

        ii. Erosion and sediment control best management practices (BMPs) will be in place before, during, and after any work is conducted. All BMPs will be properly installed and maintained.

    e. Develop and implement a spill avoidance/remediation plan based on the most effective prevention and remediation practices to prevent hazardous materials (*e.g.,* petroleum products, solvents, etc.) from entering Conewango Creek, or from contaminating soils or waters within this watershed. Such measures will include, but are not limited to, stationing of emergency response equipment at the project site, and designation of contained fueling and fuel storage areas at least 300 feet (91m) away from the river.

        i. ACOE and/or PADEP, and contractors will monitor the project site daily to ensure spill avoidance practices are implemented.

ii. If a spill does occur, implement emergency remediation procedures to contain the spill, and prevent the spill from entering Conewango Creek.

iii. If flooding is anticipated, weather and river stages will be monitored and hazardous materials will be removed from the floodplain.

iv. The Service will be notified immediately of any spills of hazardous materials.

f. Following dam removal, no project-related or project-generated materials, waste, or fill will be deposited in streams inhabited by threatened or endangered mussels.

g. During the bidding process, prospective project contractors will be notified regarding the presence of endangered species in the project area, and the special provisions necessary to protect them. The successful contractor(s) will be instructed on the importance of the natural resources in the project area, and the need to ensure proper implementation of the required erosion and sedimentation controls, and spill avoidance/remediation practices. The following conditions (language) will be included in all construction and demolition contracts awarded for project implementation:

i. Endangered species are present in the project area and there is a risk of take (Endangered Species Act section 9 violation) if the Terms and Conditions of the Service's biological opinion are not closely followed.

ii. Best Management Practices for erosion and sedimentation control will be in place before, during, and after any work is conducted. All best management practices will be properly installed and maintained.

iii. Contractors will monitor the project site daily to ensure the erosion and sedimentation control, and spill avoidance practices are implemented.

iv. Develop and implement a spill avoidance/remediation plan based on the most effective prevention and remediation practices to prevent hazardous materials (*e.g.,* petroleum products, solvents, paints, etc.) from entering Conewango Creek, or from contaminating soils or waters within this watershed. Such measures will include, but are not limited to, stationing of emergency response equipment at the project site, and designation of contained fueling and fuel storage areas at least 300 feet (91m) away from the river.

v. Contractors will monitor weather and river stages, and remove any hazardous materials from the river and floodplain in the event that flooding is likely.

vi. The Service will be notified immediately of any failures of erosion and sedimentation control measures, or spills of hazardous materials.

vii. Following dam removal, no project-related or project-generated materials, waste, or fill will be deposited in streams inhabited by endangered mussels.

h. All equipment must be free of zebra mussels prior to commencement of construction.

i. If this project is not completed by 2013, the ACOE will reinitiate consultation with the Service to re-evaluate project impacts on the northern riffleshell, and to determine the appropriateness of the reasonable and prudent measures, and terms and conditions contained in this biological opinion.

2. To minimize take of endangered mussels, conduct mussel salvage in areas that are de-watered during dam demolition, and relocate the salvaged mussels to suitable habitat outside the direct impact area (see *Conservation Measures*). This salvage will be conducted by a PFBC malacologist or Service-approved qualified mussel surveyor. Mussels will be handled, processed, transported and relocated in a manner that minimizes the risk of mussel injury or mortality. A report documenting the salvage and relocation effort shall be prepared and submitted to the Service's Pennsylvania Field Office within three months of completion of the salvage.

3. Assess impacts to the mussel community (including the northern riffleshell) within the direct and indirect effects areas associated with the removal of Carter's Dam. The purpose of this survey is to document take, and to determine whether the effects of the project on mussels and mussel habitat are consistent with those anticipated in this opinion.

a. Repeat the survey that was conducted by Evans and Smith (2005). Using the same sampling methods, survey the areas that were sampled in 2005, but also include the former dam footprint and the area that had been identified as the "safety zone" in the 2005 report.

b. Conduct the survey between May 1 and October 15, during the fifth and tenth summer/fall season following dam removal. According to Bushaw-Newton *et al.* (2002), some ecosystems require more than a decade to adjust completely to the removal of a dam.

c. Surveys for mussels will be performed by Service-approved, qualified personnel. All mussels located will be identified to species, recorded, and replaced in the substrate. Mussel diversity, abundance, and distribution will be compared to that observed in 2005 to document the effects of the project on mussels and their habitat. A report documenting the survey effort will be prepared and submitted to

the Service's Pennsylvania Field Office within six months of each monitoring event. The report will be formatted similar to the one prepared by Evans and Smith (2005).

4. The Service's Pennsylvania Field Office and Region 5 Division of Law Enforcement are to be notified within 24 hours should any endangered or threatened species be found dead or injured as a direct or indirect result of the implementation of this project. Notification must include the date, time, and location of the carcass, and any other pertinent information. Northern riffleshells that are accidentally killed, or that are moribund or freshly-dead and contain soft tissues, are to be preserved according to standard museum practices, properly identified or indexed (date of collection, complete scientific and common name, latitude and longitude of collection site, description of collection site), and submitted to a recognized museum or research facility (*e.g.,* USGS facility in Leetown, WV). The appropriate person at the selected repository institution should be contacted regarding proper specimen preservation and shipping procedures.

5. Notification must be made to the following Fish and Wildlife Service offices at least two weeks prior to beginning in-stream salvage activities.

   a. Region 5 Division of Law Enforcement; 300 Westgate Center Drive, Hadley, MA 01035-9589 (telephone: 413-253-8343).

   b. State College, Pennsylvania Field Office (Attn: Endangered Species Biologist); 315 South Allen Street, Suite 322, State College, PA 16801 (telephone: 814-234-4090).

The above reasonable and prudent measures, and the implementing terms and conditions are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that up to 537 northern riffleshell in Conewango Creek between Carter's Dam and the Allegheny River confluence could be incidentally taken (killed, injured, stressed) during and after the removal of Carter's Dam. An additional unquantifiable number of northern riffleshell will be harmed or harassed upstream and downstream of the dam.

If during the course of the action, the numerical or narrative levels of incidental take are exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. Take due to spills of contaminants (*e.g*., fuel), or failures of erosion and sedimentation controls, is not covered by this opinion, and must be reported to the Service immediately. The ACOE must immediately provide an explanation of the causes of the taking, and review with the Service the need for possible modification of the reasonable and prudent measures, and terms and conditions.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Endangered Species Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service has identified the following actions which, if undertaken by PADEP and/or the ACOE, would further the conservation and assist in the recovery of the northern riffleshell.

1. Participate in the development of a conservation plan for the northern riffleshell in Pennsylvania, along with agencies that carry out activities that potentially affect these species (Recovery Plan, Task 1).

2. Seek opportunities to participate in efforts to recover northern riffleshell throughout the species historic range (Recovery Plan, Task 4).

3. Support research to determine captive husbandry techniques suitable for propagation of the clubshell and northern riffleshell. This action would partially meet the objectives of the Recovery Plan (Tasks 4.23, 4.24, and 4.3) for these species and may offset project-related effects elsewhere.

4. Within the Allegheny River watershed, implement and/or support projects that would improve water quality by reducing non-point source pollution. Such projects would include, but are not limited to, wetland preservation, wetland restoration, streambank fencing, and streambank restoration (via establishment of native plant species). This action would partially meet the objectives of the recovery plan (Recovery Plan, Task 2.2) for these species and may offset project-related effects elsewhere.

5. Develop best management practices (BMP's) for dam removal in areas occupied by threatened and endangered freshwater mussels, and conduct outreach to make successful BMP's available to various interest groups in the range of the species (Recovery Plan, Task 2).

6. Monitor the upstream headcut to the 5th Avenue Bridge (666 m), and downstream to the Pennsylvania Avenue Bridge (140 m) at weekly intervals for 1 year post-removal to search for stranded mussels. If mussels are exposed due to shifting stream flows post dam removal, immediately salvage and relocate any exposed mussels into the interior of the stream channel.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of the conservation recommendations carried out.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the information presented with the U.S. Army Corps of Engineers, June 25, 2008, request for initiation of formal consultation. As written in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law), and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

5-13-09

David Densmore, Supervisor

Date

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