HOLYOKE PROJECT
(FERC NO. 2004)

THREATENED AND ENDANGERED SPECIES PROTECTION PLAN

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HOLYOKE PROJECT
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1.0 INTRODUCTION

The 43.8 megawatt (MW) Holyoke Hydroelectric Project (FERC No. 2004) is located on the Connecticut River at mile 80 in Hampden, Hampshire, and Franklin counties, Massachusetts. The Connecticut River is the longest river in New England, originating 2,625 feet above sea level in the Fourth Connecticut Lake and accumulating water from several major tributaries as it flows south at a slope of about 6 feet per mile. The waterway serves as the boundary between New Hampshire and Vermont, then runs through Massachusetts and Connecticut before emptying into Long Island Sound, over 400 miles from its source. An area of about 8,309 square miles is drained by the river at the Holyoke dam. The main facilities of the project are located in the City of Holyoke and the Town of South Hadley, Massachusetts.

Originally licensed in 1949, the project consists of a 30-foot-high, 985-foot-long dam topped by five 3-1/2 foot high inflatable rubber dam sections. The project impounds a 2,290 acre reservoir with a normal maximum surface elevation of 100.6 feet National Geodetic Vertical Datum (NGVD). A three-level canal system extends through the lower areas of the City of Holyoke and provides water for industrial and hydropower generation. The Holyoke project includes twenty-two generating units and several upstream and downstream fish passage facilities. The canal system also provides water to 16 other hydroelectric generating stations. The City of Holyoke Gas and Electric Department (HG&E) owns four of these stations and the other twelve are privately owned. HG&E is required to provide water to these private non-project facilities according to industrial water rights agreements.

The previous owner, Holyoke Water Power Company (HWP), was granted a new license by FERC for the Holyoke Hydroelectric Project on August 20, 1999. By Order dated September
20, 2001, the Federal Energy Regulatory Commission (FERC) approved the transfer of the Holyoke Project from HWP to HG&E, and the sale closed on December 14, 2001. This transfer of license ordered HG&E to comply with all license conditions and compliance plans associated with the new license.

Relative to compliance plans, on October 26, 2001, HWP and HG&E filed with FERC a joint request for extension of time to file compliance plans for license articles 405-414 and 416. FERC issued an order on December 31, 2001, revising the dates for filing the aforementioned compliance plans.

During the license transfer process and prior to the closing, HG&E began informal consultation with federal, state and local stakeholders and non-governmental organizations to begin addressing the development of compliance plans related to the Holyoke Project. Upon financial close, HG&E initiated a cooperative consultation process with stakeholders to discuss compliance issues, and the terms and conditions of the license as well as other mandatory conditioning documents (401 WQC, Biological Opinion, Section 18 prescriptions). HG&E held stakeholder meetings on December 19, 2001, February 7, April 3, and June 14, 2002. Participants included the United States Fish and Wildlife Service (USFWS) and the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge), National Marine Fisheries Service (NMFS), Massachusetts Division of Fish and Wildlife (MDFW), Massachusetts Department of Environmental Protection (MADEP), Massachusetts Executive Office of Environmental Affairs (MEOEA), Trout Unlimited (TU), and Connecticut River Watershed Council (CRWC).

License Article 416 (Appendix A) requires the Licensee to prepare a Threatened and Endangered Species Protection Plan that includes the federally listed endangered shortnose sturgeon (Acipenser brevirostrum) and dwarf wedgemussel (Alismidonta heterodon), the federally threatened bald eagle (Haliaeetus leuccocephalus) and Puritan tiger beetle (Cicindela puritana) and the state listed endangered yellow lampmussel (Lampsilis cariosa). The plan will specifically include the following:

- Measures to enhance bald eagle nesting sites (i.e., by erecting eagle nest platforms) and to protect and enhance eagle perching and feeding activities;
- A commitment to cooperate with USFWS, MDFW, and Massachusetts Department of Environmental Management (MDEM) to continue educating the public and managing recreational activities at Puritan tiger beetle habitat sites (particularly at Rainbow Beach), and develop other protective measures, such as no-wake zones;

- Measures to protect and enhance shortnose sturgeon habitat consistent with the measures developed as the result of the on-going shortnose sturgeon studies and the provisions of Articles 405, 406, 411, and 412;

- Measures to protect and enhance the yellow lampmussel and dwarf wedgemussel, as identified in the Comprehensive Canal Operations Plan (Article 409);

- A schedule for implementing the measures;

- A description of the method for monitoring the results of the implemented measures;

- A monitoring schedule; and

- A schedule for providing the monitoring results to USFWS, the Silvio O. Conte National Fish and Wildlife Refuge, NMFS, MDFW, and FERC.
LARGE-FORMAT IMAGES

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Set No.: 1 of 4
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2.0 OTHER COMPLIANCE PLANS AND THE T&E PLAN

Several other compliance plans for the Holyoke Project will either affect or be affected by the Threatened and Endangered Species plan (T&E). The following provides a brief description/analysis of these plans as they apply to the T&E plan. Where necessary, relevant sections from these plans may be reiterated or incorporated by reference into the plan.

2.1 Comprehensive Operation and Flow Plan (COFP) - (LA 405, 406, 407 and 408, WQC 9, 11, and 12)

This plan directly affects the T&E Plan, as the results of the COFP will determine the suitability of the bypass reach and canal flows for protecting and enhancing fish and mussel populations and habitat.

The COFP addresses the release of minimum flows into the bypass reach downstream of the dam. The outcome of this plan will affect flow distribution, which in turn may affect ZOP and fish habitat in the bypass reach.

2.2 Comprehensive Canal Operations Plan (CCOP) - (LA 409, WQC 13)

The Comprehensive Canal Operations Plan sets forth the order of dispatch of the canal units for different river flows, describes how minimum flows will be maintained in the canal, and presents the procedure for canal drawdowns. The CCOP show minimum flows will be maintained in the canal and presents the procedure for canal drawdowns. The CCOP also affects the T&E Plan, as it addresses monitoring of mussel populations in the canal system, and outlines measures to protect and enhance this mussel habitat.

2.3 Fish and Aquatic Habitat Monitoring Plan (FAHMP) (LA 410)

The FAHMP requires the licensee to monitor the effectiveness of the bypass reach and canal flows in protecting and enhancing fish and mussel habitat and populations, and to assess the need for additional enhancement measures. This plan will overlap/parallel the mussel monitoring program presented in the T&E plan.
2.4 Annual Fishway Monitoring Plan, Shortnose Sturgeon Monitoring Plan and Post-Construction Effectiveness Monitoring of New and Modified Fish Passage Facilities Plan (LA 414, WQC 14 and 15)

This plan specifically includes monitoring activities with the MADEP at the fishway. This monitoring will help provide population numbers of anadromous fish in the bypass reach. This plan also addresses monitoring of sturgeon to determine the effectiveness of measures taken, which may eventually result in changes to ZOP flows and timing, and changes to minimum flows in the bypass reach. Any changes to the ZOP flows or minimum flows may result in habitat alterations, changes to the fish assemblage, and ZOP flows for other anadromous species.

2.5 Invasive Species Monitoring Plan (LA 417)

The invasive species plan requires the licensee to monitor for purple loosestrife, water chestnut, and zebra mussels. Monitoring requires an annual boat trip in the impoundment and removal of invasives found. This plan will overlap with the T&E plan when the boat trip is used concurrently to examine Puritan tiger beetle habitat in the impoundment. Potential areas for transplanting beetles will also be evaluated.

2.6 Comprehensive Recreation and Land Management Plan (CRLMP) (LA 418)

The CRLMP requires the licensee to include conservation easements and strategies for maintaining open space on certain lands within the impoundment. Recreation aspects are considered as well, such as Rainbow Beach where the population of Puritan tiger beetles exists. The CRLMP will encompass measures outlined in the T&E plan to ensure that the endangered species, such as tiger beetles and bald eagles, are protected and management decisions will not adversely affect habitat.
3.0 AMERICAN BALD EAGLE

Measures to protect and enhance the bald eagle (*Haliaeetus leucocephalus*) habitat are required per LA 416. As required, this plan shall include measures to enhance bald eagle nesting sites and to protect and enhance eagle perching and feeding activities. WQC 19, the Riparian Management Plan, also serves to “protect riparian habitat areas and buffers for species which use the riparian area in conjunction with Project waters, including...bald eagle perch trees used for feeding.”

There is no single cause for the decline in the bald eagle population. When Europeans first arrived on this continent, bald eagles were fairly common. As the human population grew, the eagle population declined. The food supplies for eagles decreased, because the people hunted and fished over a broad area. Essentially, eagles and humans competed for the same food, and humans, with weapons at their disposal, had the advantage. As the human population expanded westward, the natural habitat of the eagles was destroyed, leaving them fewer places to nest and hunt, which caused the population of bald eagles to decline sharply by the late 1800s.

By the 1930s, people became aware of the diminishing bald eagle population, and in 1940 the Bald Eagle Act was passed. This reduced the harassment by humans, and eagle populations began to recover. However, at the same time DDT and other pesticides began to be widely used. Pesticides sprayed on plants were eaten by small animals, which were later consumed by birds of prey. The DDT poison harmed both the adult birds and the eggs that they laid. The eggshells became too thin to withstand the incubation period, and were often crushed. Eggs that were not crushed during incubation often did not hatch, due to high levels of DDT and its derivatives. Large quantities of DDT were discovered in the fatty tissues and gonads of dead bald eagles, which may have caused them to become infertile.

The bald eagle is making a comeback and was recently down-listed from federally endangered to federally threatened. The enforcement of federal endangered species laws and regulations and improved controls of herbicides and pesticides on agricultural lands has aided the recovery of this species. Wintering eagles and nesting pairs have been identified within the project area. The eagles perch in riverbank trees and circle over the river searching for food.
The bald eagle is found over most of North America, from Alaska and Canada to northern Mexico. About half of the world's 70,000 bald eagles live in Alaska. Combined with British Columbia's population of about 20,000, the northwest coast of North America is by far their greatest stronghold. They flourish here in part because the salmon. Dead or dying fish are an important food source for all bald eagles.

Relative to the Holyoke Project, HG&E will provide three bald eagle nesting platforms in order to enhance the return of this species to the project area. HG&E will work with the USFWS and MDFW to identify suitable areas for the platforms and begin construction. HG&E will look for sites that have three or more super-canopy trees within one-quarter mile of each nest as roosting and perching sites. Once the sites have been selected, HG&E will begin construction.

The platforms will be built in either hardwood or conifers trees that are taller than surrounding trees or at the edge of the forest stand in order to ensure a clear flight path. Nest platforms will be five to six feet in length and width. These platforms will also be protected from prevailing winds, have a southeast exposure to maximize sunlight in the early nesting season, and be built below the crown of the tree to provide shade in the summer. Consultation with the appropriate stakeholders will occur at various stages during the process to ensure compliance.

Based on HG&E's consultation with stakeholders, the MDFW believes that the above proposal is a proactive approach to eagle protection and will provide attractive areas for new nesting pairs. In addition, providing these nesting platforms in safeguarded areas, such as currently protected areas or an area with open space easements, is a proactive approach to eagle management. The method of keeping the eagle from establishing nests in potentially hazardous areas by attracting them to areas that they can be easily secured from danger has been used successfully in the past in other areas of Massachusetts and is encouraged by MDFW.

To protect perching and feeding trees as required by LA 416, HG&E will not remove trees within the impoundment that are actively used by bald eagles. This protective measure will ensure that HG&E does not take part in any tree removal activity. Enforcing this measure on lands not owned by HG&E is not possible, however, as HG&E does not have legal enforcement authority.
3.1 Protection and Enhancement Measures

- Investigate nesting sites with MDFW and USFWS by July 31, 2003
- Procure materials by August 31, 2003
- Complete construction by October 31, 2003
- Begin monitoring after construction is completed to verify that eagles are utilizing platforms

3.2 Monitoring

For the first five years following nest construction:

- HG&E will visit the nest sites each spring to observe the nest and determine if nests are being used
- HG&E will return during the late spring-early summer and observe nests to determine the number of eaglets fledged
- HG&E will provide by December 31 a written report to USFWS, The Conte Refuge, MDFW and FERC on nest use and number of eaglets successfully fledged
- As part of the invasive species annual monitoring, HG&E will observe trees along the impoundment, record any problems, and act accordingly with "No Trespassing" signs to protect perching and feeding trees
4.0 PURITAN TIGER BEETLE

The Puritan tiger beetle (*Cicindela puritana*) is found in shoreline habitat along the Connecticut River in New England and the Chesapeake Bay in Maryland (Hill and Knisley 1993). This species has disappeared from a large part of its range in New England. Due to its declining range and vulnerability to natural and human-related threats, this species was listed as federally threatened in August of 1990 (USFWS, 1990). The Puritan tiger beetle is also listed as endangered by the Commonwealth of Massachusetts. LA 416 requires HG&E to cooperate with USFWS, MDFW, and MDEM to continue educating the public and policing recreational activities at habitat sites. Other protective measures are also being developed.

Historically, the Puritan tiger beetle occupied riverine beaches along the Connecticut River from Claremont, New Hampshire to Cromwell, Connecticut. Currently, only two populations of Puritan tiger beetles remain: one near Cromwell, Connecticut and the other in Northampton, Massachusetts at Rainbow Beach. The Rainbow Beach population is the primary concern of this plan because it is located within the project boundary.

The Puritan tiger beetle is a medium-sized terrestrial beetle. Their coloration is dark bronze-brown to bronze-green with cream-colored markings on the elytral surfaces. Puritan tiger beetle larvae on the Connecticut River generally are found among scattered herbaceous vegetation at the upper portions of sandy beaches and occasionally near the water’s edge.

Puritan tiger beetles usually undergo a two-year larval period before emergence. Larvae hatch in late July or August. Larvae tend to be most active in the fall with lesser numbers appearing in the spring and summer. Adults emerge from late June to early July in the Connecticut River. Puritan tiger beetles are prey to robber flies, jumping spiders and taphiid wasps. It is suspected that many larvae die when winter storms shear off large sections of the beach. Larval mortality associated with winter storms may contribute to the dramatic local fluctuations observed in these populations.

The USFWS lists (1) hydraulic changes caused by dams, (2) reduced beach habitat,
(3) reduced bank erosion, bank stabilization, and (4) pollution as factors that may have contributed to this species' decline. It is believed that recreational uses along the river imperil the remaining Puritan tiger beetle populations as well as reintroduction sites. For example, camping, beach recreation, and collecting threaten the Rainbow Beach site. Woody plants are invading the Puritan tiger beetle habitat as secondary succession occurs. Returning the land to early conditions could mitigate the lack of potential habitat.

Personnel from the MDEM, MDFW and USFWS have conducted both biological and interpretive work at Rainbow Beach. During 1997, signs were posted and fencing was placed around the Puritan tiger beetle larval habitat and interpreters were sent to the site to discuss with beach users the importance of staying out of the beetle larval habitat. A detailed discussion of the work conducted during the 1997 season can be found in "Rainbow Beach, Final Report" (Davis, 1997) (Appendix B).

MDFW has conducted research focusing on understanding the beetle's habitat requirements. Research consisted of monitoring the population (larvae and adults), and examining alterations to habitats due to alterations in the river's hydrology. The previous licensee provided historic water level elevation data and impoundment maps in support of the research. Explanatory signage is currently used to educate Rainbow Beach users about the tiger beetles.

Through the consultation process, the USFWS submitted several recommendations as part of the T&I plan. These measures include providing alternative camping and day-use areas to relieve recreational pressure at Rainbow Beach. Other recommendations included providing funding for any or all of the following: (1) research on recreational impacts on tiger beetle feeding and reproductive behavior; (2) population augmentation on Rainbow Beach; (3) research on vegetation management in order to maintain existing habitat and/or create additional habitat; (4) staff to enforce no-wake zones; (5) development, production, and distribution of education material targeted at recreational users (boaters) of Rainbow Beach; and (6) monitoring the Rainbow Beach population. The USFWS also recommended acquisition of tiger beetle habitat in the area around Rainbow Beach and/or potential habitat identified by qualified biologists, and providing assistance in removing invasive plant species in areas identified as potential habitat (either staff, equipment, and/or funding).
HG&E concurs with the USFWS concerning the recreational pressure at Rainbow Beach. HG&E also notes that there are other existing resources on the Holyoke impoundment that offer similar recreational opportunities. Two in particular are under-utilized, Elwood Island and Mitch's Island. To help reduce use at Rainbow Beach HG&E will erect displays informing the boating public of the recreational opportunities available at Elwood Island and Mitch's Island. The displays will be located at marinas on the impoundment and include a location map and a description of the recreational opportunities available at these two areas.

On or before December 31, 2002 HG&E will file the Comprehensive Recreation and Land Management Plan (CRLMP). The CRLMP will include a more extensive inventory of recreational usage on the impoundment and an evaluation of the need for additional facilities.

HG&E will support research on recreational impacts on tiger beetle feeding and reproduction behavior. Much of the prior research was performed by volunteers and/or students. To support similar efforts going forward, HG&E will provide in-kind services. These services will include providing data, staff support and paying a share of the research expenses.

HG&E will also work with stakeholders to identify suitable and preferable habitat on HG&E property within the project boundary for use in protecting the tiger beetles. HG&E will designate employee(s) as volunteers to aid the USFWS with research on, and transplanting and monitoring of, tiger beetles. This volunteer(s) will be available to do any and all of the above as requested. If HG&E property is used for tiger beetle relocation, HG&E will establish a protected use area and mark with signs, if appropriate and/or recommended by USFWS. If the USFWS or MDEM determines that Rainbow Beach is the only suitable habitat, HG&E will work in the same manner outlined above to transplant, monitor, and conduct research on the tiger beetles in that area.

HG&E does not have the legal authority to establish and/or enforce no-wake zones on the Connecticut River. State agencies have the authority and responsibility for enforcement. HG&E can and will, however, support the state's efforts to establish additional no-wake zones. HG&E will consult with and request from MDEM a no-wake zone near Rainbow Beach and other beetle habitat sites (as determined by USFWS) and will be incorporated these no-wake zones into the CRLMP (LA 418). Additionally, HG&E will continue to work with USFWS and MDFW to
provide in kind services, such as historic water level elevation data, impoundment maps, and hydrology information, as requested to better understand the beetle’s habitat requirements. A water level monitor has been installed at Rainbow Beach in order to obtain an understanding of the fluctuations that occur there.

HG&E will cooperate with USFWS, MDFW, and MDEM as a partner to continue educating the public about the Puritan tiger beetle. HG&E will provide brochures highlighting the importance of the endangered tiger beetle. The brochures will be available to the public at the Holyoke Dam fish viewing facility and also be distributed to marinas on the Holyoke impoundment. An interpretive display outlining the importance of protecting tiger beetle habitat will also be available for viewing at the fish viewing facility. An additional interpretive display will be constructed at the Norwottuck Rail Trail, which is visited by both cyclists and pedestrians. The displays will list the cooperative partners in the effort to protect the tiger beetles, including HG&E, USFWS, and any other agencies that are willing to partake. This should greatly enhance the public education effort as thousands of people visit these facilities annually.

At Rainbow Beach, MDEM has already provided signs outlining a protected area. As needed, HG&E will supply additional signs that inform the public of the protected area, without mentioning that an endangered species exists there. To further ensure that the public will be informed about protected areas, HG&E will construct displays aimed at recreational boaters at the marinas (with permission) and at public launches.

As an additional education measure, HG&E will describe the beetles on their website, and also provide other information about what is being done to protect threatened and endangered species. Information about what the public can do to help will also be included on the website, as well as possible links to other sites, such as the USFWS.

As part of the Invasive Species Monitoring Plan (filed by HWP on August 21, 2001), HG&E schedules a boat trip each August to monitor invasive species in the impoundment. In 2002, the invasive species monitoring will include a determination of potential tiger beetle habitat. The Invasive Species Monitoring Group will also monitor the succession of woody plants in the prime beetle habitat and work towards a plan to remove unwanted vegetation. The
CRLMP will include a section on tiger beetles and management efforts that will be in place to protect them.

4.1 Protection and Enhancement Measures

- Display signs at marinas and public boat launches to educate the public about protected areas and encourage the use of alternative sites such as Mitch’s Island and Elwood Island

- Construct interpretive displays at both the fish viewing facility and the Norwottuck Rail Trail by April 2003

- If brochures are determined to be a good education tool, HG&E will design and provide brochures to the public at the fish viewing facility at the Holyoke Dam as well as marinas on the impoundment.

- HG&E will continue to work with USFWS and MDIFW’s research efforts to provide in kind services, such as historic water level elevation data, impoundment maps and hydrology information, as requested, to better understand the beetle’s habitat requirements

- HG&E will also provide staff support and share in the research expenses.

- HG&E will request a no wake zone at Rainbow Beach from MDEM

- If a no wake zone is approved and established by MDEM, within 45 days of approval HG&E will provide no wake signage at Rainbow Beach and help set up buoys, channel markers, and posted speed limits

- A no-wake zone near Rainbow Beach and other beetle habitat sites (as determined by USFWS) will be incorporated into the CRLMP (LA 418) by December 31, 2002
• HG&E will consult with stakeholders to identify HG&E land within the project boundary that may be suitable habitat and provide in kind services (volunteers) on a consistent basis to facilitate in relocating beetles

• If suitable HG&E lands are used for relocation of tiger beetles, HG&E will work with USFWS to designate the lands as a restricted use area and mark with signs as appropriate

• As part of the invasive species monitoring, HG&E will examine potential habitat on the impoundment

• HG&E will include the tiger beetles in the CRLMP submitted by December 31, 2002

• HG&E will describe the tiger beetles and other endangered species on their website as an additional measure to educate the public, including links to the USFWS home page

4.2 Monitoring

• As appropriate, HG&E will work with the USFWS, Conte Refuge, MDFW and MDEM to maintain existing signs

• HG&E will provide researchers with hydrology information of the Connecticut River within the project area, as needed

• HG&E will provide employees to volunteer to aid in research, transplanting, and monitoring tiger beetles

• For five years, HG&E will provide an annual written report to USFWS, the Conte Refuge, MDFW, MDEM and FERC on Puritan tiger beetle activities within the project area
5.0 YELLOW LAMPMUSSEL & DWARF WEDGEMUSSEL

*Lampsilis cariosa*, commonly known as the yellow lampmussel, is a freshwater species, a mollusk characterized by a bivalve shell. The key characteristics of this Massachusetts endangered species are the bright yellow color without rays and the oval shape of its shell. Federally, the yellow lampmussel was proposed for a Category 2 listing in 1991 (Federal Register Vol. 56, No. 225, pg. 58817), but with the disbanding of these prelisting categories it has no federal listing status. Historically, records of the yellow lampmussel from the Connecticut River have been few and always from observations made below the Turner’s Falls rapids. The only other southern New England population occurred in the Merrimack River, but that population became extinct by the early 20th century.

*Alismidonta heterodon* is commonly known as the dwarf wedgemussel. The mussel was listed as endangered by the USFWS in 1990. The largest of the dwarf wedgemussel populations, which numbers in the tens of thousands, can be found in two stretches of the Connecticut River flowing between New Hampshire and Vermont. The dwarf wedgemussel is an oval-shaped, clam-like creature with a smooth, thin shell. It lives in rivers and creeks of varying sizes, settling on sand and gravel bottoms. It can be found in water a few inches to over 20 feet in depth, generally in a firm substrate. Both the yellow lampmussel and dwarf wedgemussel are included in the T&E Plan as required by FERC I.A 416.

Since the early 1990s, several studies have identified specimens or populations of individuals that have changed the current understanding of the distribution and diversity of freshwater mussel populations in the Holyoke Project area of the Connecticut River. In 1992, Charles A. Menzie reported collecting one juvenile yellow lampmussel within 50 feet of the shore from the west side of the Connecticut River, downstream of the Holyoke tailrace. This was the first finding since the early 1970s and as a result new surveys were undertaken to identify the source population. In 1996, D.G. Smith and D. McClain conducted a survey of the Holyoke canal system and located four live juvenile or young adult yellow lampmussels (*Lampsilis cariosa*). This verified that yellow lampmussels still existed within the canal system.

During a 1997 mussel survey of the Connecticut River, a single live specimen of dwarf wedgemussel (*Alismidonta heterodon*) was found just below the Hadley Falls Station tailrace.
(NUEI, 1997), representing the first reported occurrence of this species in the Massachusetts section of the Connecticut River. Most recently (October 1998 - June 1999), survey findings documented yellow lampmussels (six females) in the main stem of the Connecticut River north of the Holyoke Dam and just down river of the Calvin Coolidge Bridge, Route 9, Northampton, MA (Werle 1999). Subsequent to this survey (August 1999), Werle located another five yellow lampmussels: three juvenile or young adult females, one large adult female, and one adult male (personal communication, D.G. Smith). The significance of these most recent reports is that they represent the first findings since the 1970s of yellow lampmussels in the main stem of the Connecticut River not attributable to the remnant canal system population.

License Article 409 requires a description of the operational and maintenance measures that will be used to protect and enhance mussel populations in the canal system. This includes specific procedures for installing a sandbag weir, or other appropriate measures, to maintain watered conditions in areas of the canal necessary to maintain mussel habitat. LA 416 calls for measures to protect and enhance the yellow lampmussel and dwarf wedgemussel. WQC 13 requires a 5 year plan for protection and monitoring of aquatic resources, including mussel populations, in the canal system. The required 5 year plan shall include an evaluation of the frequency and necessity of canal drawdowns.

With input from USFWS and MDFW, as well as other stakeholders, HG&E has decided upon a number of measures described in this plan. These include: (1) installing a sandbag weir at the beginning of the First Level Canal to enhance mussel habitat in the canal system, (2) monitoring habitat, (3) providing minimum canal flows, and (4) implementing the new drawdown procedure to maintain watered conditions in mussel habitat areas.

In addition, two mitigation efforts have already been implemented in the canal system that will enhance mussel survival and habitat conditions under this license. Providing a minimum canal flow (see below) and moving the annual maintenance drawdown to October will improve water quality within the canal system and minimize drawdown effects on mussel populations. Minimum flows will be provided through a combination of leakage, releases through overflows, and generation, and will increase the opportunities for host fish to enter the canal. This measure serves two purposes: (1) it enhances opportunities for the fish to become infected with mussel larvae (glochidia), and (2) enhances survival of host fish and glochidia.
which will result in an increase in the number of juvenile mussels that may ultimately be released into suitable habitat in the canal system. In addition, any urban or industrial pollution to the canal system will be diluted by the continual flushing of the canal system mussel habitats with river water.

In the past, maintenance drawdowns were typically performed during July and August (low flow months) to minimize lost generation. Moving the canal maintenance drawdowns from July and August, the hottest periods of the year, to October, when water and air temperatures are typically cool and similar, should not only favor adult mussel survival, but the survival of recently recruited juveniles. The juveniles live in the top few millimeters of sediment and are greatly affected by conditions in the sediment/air interface.

Even though some of the disturbances in the canal system are unavoidable, such as the semi-annual maintenance drawdowns described above, HG&E has developed methods to draw down the canals in spring and fall to maintain watered areas between Boatlock Station and Riverside Station (Section 5.4). This area has been identified as prime mussel habitat. Mussel populations, especially common freshwater mussels (*Elliptio complanata*) and the Alewife floater (*Anodonta implicata*), in the canal system appear to be thriving in areas where riverine type habitat and suitable substrate is available. During drawdowns, prime mussel habitat in pools within the canal system will be documented and maintained at established transects (see Figure 5.1). Transects will be established with agency input, and evaluated and re-established as necessary. If zebra mussels, *Dreissena polymorpha*, or quagga mussels, *D. bugensis*, become established in the canal system, canal maintenance activities will increase dramatically, impacting canal mussel populations to a much greater extent than those in the mainstem of the river.
HG&E proposes the following specific protection, mitigation, and enhancement measures.

### 5.1 Habitat Enhancement

The following discussion of habitat enhancement measures focuses primarily on watering critical areas in the First Level Canal, and parallels the drawdown procedures described in the CCOP section 3.4.1.

Following recommendations from USFWS and TU at the June 14 and 27, 2002 meetings (Appendix D), HG&E will mitigate any effects that may be caused by the dewatering of the First Level Canal by building an experimental sandbag weir at the beginning of that canal just upstream of the railroad bridge. The top of the weir will be approximately four feet high at its tallest point, maintaining watered conditions at least 750 ft into the First Level Canal. The top of the weir will be approximately at EL 85.5 (NGVD) and will result in a wetted area of approximately 1.8 acres. Other methods of maintaining watered conditions were explored, such as stop logs, but are not feasible because of the silty substrate. The final height, width, and location will be determined by engineering analysis, with the final design submitted to the stakeholders for review. Installation of the experimental sandbag weir is scheduled for the Fall 2002 drawdown.

Because the insertion of a weir at the beginning of the First Level Canal may alter the ecology of the area, sediment build-up and erosion, as well as velocity and flow, field studies will be performed on the upstream and downstream sides of the weir during the next two drawdowns. Evaluation will occur both in Fall 2002 and Fall 2003, to track changes in both mussel habitat populations and siltation. A topographic survey will be conducted both upstream and downstream of the weir to identify any changes to siltation patterns. Habitat/populations studies will be performed as described in Section 5.2, below. A draft report of the findings will be submitted to the stakeholders, encompassing a determination of the effectiveness of the weir, any necessary modifications, and potential additional evaluation studies.
Other enhancement measures are outlined below, including the new drawdown procedure and recent upgrades to methods used in river monitoring.

5.2 Habitat Monitoring

License Article 410 requires a plan to monitor mussel habitat and populations within the Holyoke canal system. Previous studies have identified sections of the Holyoke canal system as suitable habitat with moderate populations of Alewife floater (Anodonta implicata), and a sparse population of yellow lampmussel. HG&E plans to survey these areas and document the densest populations and the location of drawdown pools supporting mussel populations. The target areas for survey work are the more northeastern sections of the canal system where the yellow lampmussels have been reported.

The WQC calls for a 5-year plan to perform annual monitoring. At the request of USFWS, HG&E will perform the same number of surveys, but will perform the surveys every other year for twelve years. Interim reports will be filed every four years, and a final report will be submitted at the end of this period (see Table 5-1 below).

During the October canal drawdown, qualitative and quantitative mussel surveys will be conducted every other year within the canal system to estimate the health and abundance of mussels. The qualitative surveys will focus on documenting the relative abundance of rare (<1% of the total population) species of mussels and identification of invasive mussel species (zebra and quagga mussels). Based on qualitative surveys, permanent transects in representative habitats will be permanently marked and established for quantitative sampling efforts in both the First and Second Level Canals. Transect locations will be determined in conjunction with MDFW. All species of mussels collected at each transect will be counted during each October drawdown and species composing less than 5% of the total population will be measured. Along each transect, eight 0.125 m² samples of sediment will be screened to 2 mm and the juvenile mussels counted, preserved and identified to the lowest practical taxonomic grouping. Surveying for mussels may be expanded with more transects if yellow lampmussels are found.
In addition to the biennial Holyoke canal system mussel surveys in October, a qualitative and quantitative survey for resident mussels, including the yellow lampmussel, will be conducted over an eighteen-mile section of the Connecticut River in the area of the Holyoke impoundment every four years. Qualitative assessments of mussel abundance will be made from the North Hadley and Hatfield areas to Bachelor Brook in the South Hadley and Holyoke areas. Seven areas over this section of the Connecticut River will be surveyed. Both shallow ($\leq 2$ m) and deep water ($2-10$ meters) areas will be sampled using SCUBA, snorkeling and wading with the aid of underwater viewers. Divers will be trained to identify the glochidia of the different species. When located, deposits of mollusk shells left by river otters (otter middens) or other predators will be inspected to obtain voucher specimens and further document the relative abundance of mollusk species in the river.

Every four years a quantitative assessment of adult mussels will be conducted in the area below the Holyoke Dam bypass to assess the effects of bypass minimum flow on mussel populations as required in License Article 410. In this area, general surveys will be conducted to locate concentrations of adult mussels. Five distinctly different areas (varying depth, sediment type, current, etc.) in an approximately one-mile stretch of river will be sampled using a 100 meter transect line. Each linear transect will be selected to maximize the number of mussels sampled for an area. Biologists using SCUBA will identify all adult mussels within one meter of each side of the 100-meter line.

Table 5-1 Schedule of Monitoring and Reporting

<table>
<thead>
<tr>
<th>Date</th>
<th>Canal Survey</th>
<th>River/Bypass Survey</th>
<th>Report</th>
</tr>
</thead>
<tbody>
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<td>October, 2003</td>
<td>First Canal Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October, 2005</td>
<td>Second Canal Survey</td>
<td>First River/Bypass Survey</td>
<td>First Interim report</td>
</tr>
<tr>
<td>March 31, 2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October, 2007</td>
<td>Third Canal Survey</td>
<td>Second River/Bypass Survey</td>
<td>Second Interim Report</td>
</tr>
<tr>
<td>October, 2009</td>
<td>Fourth Canal Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>March 31, 2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October, 2011</td>
<td>Fifth Canal Survey</td>
<td>Third River/Bypass Survey</td>
<td>Third Interim Report</td>
</tr>
<tr>
<td>October, 2013</td>
<td>Sixth Canal Survey</td>
<td></td>
<td>Final Monitoring Report</td>
</tr>
<tr>
<td>March 31, 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 1, 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.3 Minimum Canal Flows

Minimum project flows for the Holyoke Project, including flows into the canal system, are detailed in LA 406 and WQC Condition 12. Minimum flows are required per LA 409 in part to maintain mussel habitat. LA 406 requires the following seasonal minimum flows in the canal: (1) from April 1 through November 15, "at least 810 cfs, or impoundment inflow minus fish passage and bypassed reach minimum flows, whichever is less," and (2) from November 16 through March 31, "at least 400 cfs, or impoundment inflow minus fish passage and bypassed reach minimum flows, whichever is less." The WQC, on the other hand, calls for a year-round continuous minimum flow of 400 cfs downstream of the louver bypass. The WQC assigns this canal flow the highest priority of any minimum flow, including flows into the bypass reach. HG&E's plan to provide minimum flows for the entire Holyoke Project is detailed in the Comprehensive Operation and Flow Plan (COFP), which was developed in conjunction with the Comprehensive Canal Operations Plan (CCOP).

5.4 Canal Drawdown

The procedure in place for canal drawdowns ensures that existing mussel habitat in the Second Level Canal remains watered. The spring outage usually lasts one or two days and the longer fall outage typically lasts five to seven days. The spring drawdown has two purposes: (1) to prepare for the spring freshet via cleaning various structures and performing any emergency repairs, and (2) to inspect the canal system infrastructure and develop a scope of work for the fall drawdown. Based on the spring drawdown, HG&E will develop a scope of work, plan, and schedule the fall outage. To the extent possible, HG&E will include maintenance work planned by other owners on the canal system. The plan will be submitted to the stakeholders 30 days prior to the fall outage.

An area of particular concern during drawdowns involves a stretch of canal on the Second Level Canal, downstream of Boatlock station. HG&E will attempt to reasonably expedite work performed during future drawdowns, and will attempt to undertake such work in a manner that least impacts aquatic resources. The FERC license calls for maintaining minimum flows during drawdown. This is not possible, however HG&E.
will follow the procedures outlined below to maintain whatever flow is possible during the drawdowns. Below are HG&E's drawdown procedures for the First and Second Level Canals.

5.4.1 First Level Canal

A concern of the stakeholders is the practice of hauling sediment from in front of Boatlock station and depositing it into the head of the First Level Canal branch. The previous owner began this practice approximately five years ago, prior to this the sediment and debris were removed from the canal. In the future, HG&E will use a clamshell to clean the area in front of Boatlock station and remove the sediment and debris from the canal.

With the installation of full depth louvers and a trash rake before the Spring 2003 drawdown, the need for heavy machinery in the canal and the time it takes to remove debris at Boatlock should be significantly diminished. If heavy machinery is necessary, HG&E will provide cones and mark boundaries to reduce vehicular traffic in the First Level Canal during maintenance drawdowns. Should additional measures become necessary (such as clearing areas of mussels), HG&E will consult with stakeholders regarding appropriate procedures.

5.4.2 Second Level Canal

The following discussion of drawdown procedures for the First Level Canal reiterates the description contained in the CCOP’s section 3.4.2.

During the Spring 2002 drawdown, modified procedures were utilized in an effort to provide the maximum amount of wetted canal floor in the Second Level Canal downstream of Boatlock Station. Stakeholders were on-site to observe the effects of these procedures, and all present were generally satisfied with the conditions. Therefore, the drawdown procedures will be replicated for future outages as feasible. HG&E will attempt to coordinate drawdown efforts
with other station owners to maintain maximum wetted areas. Below are the general procedures HG&E will follow under normal (non-emergency) conditions:

1) Before the canal drain begins all HG&E and customer units except Boatlock and Riverside Stations must be shut down.

2) The canal headgates will be closed, beginning the canal drainage.

3) Boatlock station units will be operated until the water level in the First Level Canal reaches El. 92.5 ft (NGVD). After the water elevation reaches El. 92.5 ft Boatlock feed gates will be opened to continue draining the First Level Canal.

4) One or more waste gates at the No. 1 Overflow will be opened to assist the draining process. These waste gates will have to be carefully regulated as to not overflow the fishway attraction system and/or allow the attraction water system and 4-ft diameter drain pipe to the Hadley tailrace to fill with debris.

5) The No. 2 Overflow will remain closed during the drawdown, until the end, as maintenance activities require. Should HG&E find that the No. 2 Overflow does not maintain sufficient water levels due to leakage, HG&E will consult with stakeholders about the feasibility of installing a weir in front of the No. 2 Overflow.

6) When the Second Level Canal reaches El. 74.5 ft (NGVD), all but one of the Riverside station generating units will be secured. A unit on the Second Level will be operated at speed/no load to drain the Second Level Canal. This eliminates the previously employed step of securing all units at Riverside station, opening penstock drain valves on Units 4 and 5. The waste gates at the No. 2 Overflow will be opened during the last 24 hours of the outage for inspection of both the civil works and safety on each unit. Drainage will occur slowly to allow for
maximum wetting of the canal floor. Slow drainage typically takes 6-8 hours; emergency drainage lasts 2 hours.

7) At the start of the drawdown, the waste gates at the No. 3 Overflow will be opened to facilitate draining the other end of Second Level Canal. When the Second Level Canal reaches El. 70.5 ft (NGVD), the No. 3 Overflow will be closed, as maintenance activities require, maintaining pooled areas between Boatlock and Riverside.

8) The No. 4 Overflow gates will be opened to drain the Third Level Canal.

HG&E may need to occasionally deviate from the above drawdown procedure to perform essential maintenance work. This may include drawing the Second Level Canal down deeper to gain access to certain structures and equipment. These types of drawdowns are infrequent and HG&E will make all reasonable efforts to minimize the duration of the drawdowns.

Typically during drawdowns there is some leakage past the headgates, which serves to provide a minimal amount of flow through a portion of the canal system. To the extent it does not interfere with maintenance activities, HG&E will not completely seal off leakage past the headgates. This will provide a minimum flow during the outage.

5.5 Protection and Enhancement Measures

- A four-foot high experimental sandbag weir will be constructed at the beginning of the First Level Canal, just upstream of the railroad bridge. The exact dimensions and locations of the experimental weir will be determined by engineering analysis.
- The area surrounding the weir will be evaluated and a topographic survey conducted to estimate the amount of siltation and the abundance of mussel populations

- Based upon the results of the surveys, HG&E will consult with the stakeholders concerning the need to make any modifications or additional evaluations

- HG&E will conduct river and canal mussel surveys as described above

- The canal maintenance drawdown practices as described in Section 5.4 will be continued

- During the October canal drawdown, qualitative and quantitative mussel surveys will be conducted within the canal system to assess the health and abundance of mussels

- HG&E will provide cones and mark boundaries to reduce vehicular traffic in the First Level Canal during maintenance drawdowns until the trash rake is installed

- HG&E will not completely shut off leakage during drawdowns in order to maintain flow throughout the canal system

- A qualitative and quantitative survey for resident mussels will be conducted over an eighteen-mile section of the Connecticut River on a biennial basis

- Beginning in 2002, minimum canal flows will be provided to improve water quality within the canal system and minimize drawdown effects on mussel populations
5.6 Monitoring

Beginning in 2002, every 2-3 years for 12 years:

- HG&E will continually follow research that monitors the canal population of dwarf wedgemussels and yellow lampmussels.

- HG&E will conduct river and canal mussel surveys as described above.

- HG&E will provide a written report to USFWS, the Refuge, MDFW, and FERC on results of the two surveys by March 31 of the following year.

- Based on mussel survey information collected over 12 years, HG&E will determine what if any future work and/or surveys should be undertaken.
6.0 SHORTNOSE STURGEON

The shortnose sturgeon (*Acipenser brevirostrum*) is currently listed as an endangered species pursuant to the Endangered Species Act (ESA), as amended, 16 U.S.C. Section 1531 et seq. NMFS has authority over this species under Section 4(a)(2) of the ESA, 16 U.S.C. Section 1533 (a)(2). The shortnose sturgeon was placed on the endangered species list in 1967 (32 Fed. Reg. 4001 (1967) by the USFWS. The USFWS restated the endangered status of the species in the 1973 edition of *Threatened Wildlife of the United States.* NMFS published final regulations on November 27, 1974 (39 Fed. Reg. 41367-77) confirming NMFS jurisdiction over shortnose sturgeon and maintaining the species as endangered under the ESA. At present all populations of shortnose sturgeon throughout its present range remain listed as endangered species pursuant to the ESA.

Compared to the other resources in the project area, little is known about shortnose sturgeon. Therefore, a Connecticut River Shortnose Sturgeon Working Group (Work Group) was formed early in the Holyoke Dam relicensing process (1996) because shortnose sturgeon had been passed upstream of the dam (Table 6-1). The Work Group, composed of representatives from NMFS, FERC, USFWS, MDFW, Connecticut DEP, Conte Lab, HWP and HG&E, was formed to assess the impacts of the Holyoke Dam on shortnose sturgeon. The Work Group focused on determining the need for sturgeon passage and designs of upstream and downstream passage facilities.

Three issues exist regarding the downstream passage of shortnose sturgeon: canal passage, passage at Hadley Falls Station and the No. 1 Overflow. The first, passage through the canal system, is being addressed by the installation of full depth louvers (Figure 6-1). On June 3, 1999, NMFS submitted a Federal Power Act Section 18 Fishway Prescription to FERC. The full depth louvers are mentioned in the NMFS prescription, which requires studies at the downstream bypass in the canal system. Instead of studying the need for the full depth louvers, HG&E will install full depth louvers in the Holyoke canal system in Fall 2002 to enhance shortnose sturgeon guidance.
LARGE-FORMAT IMAGES

One or more large-format images (over 8 1/2" X 11") go here. These images are available in FERRIS at:

For Large-Format(s):
Accession No.: 20020615.0446

Security/Availability:
☐ PUBLIC
☐ NIP
☐ CEII
☐ NON-PUBLIC/PRIVILEGED

File Date: 7.15.02 Docket No.: P2004

Parent Accession No.: 20020718.0287
Set No.: 3 of 4
Number of page(s) in set: 1

TRF-G REV-4/2003 (yellow)
The design of the full depth louvers is based upon a louver flume test conducted at Alden Lab using the Connecticut River shortnose sturgeon and a louver array similar to the existing partial depth louvers in the First Level Canal. The results from the laboratory studies indicate that louver arrays angled at 15-degrees to the approach flow appear to have considerable potential to guide downstream migrants. However, the tests, which were conducted under ideal laboratory conditions (clear water, laminar flow) using a full-depth bypass and relatively short lengths and shallow depths of bar racks and louver, may have produced guidance efficiency estimates that are different than would be expected for a field application. Therefore, field tests will be conducted to verify the laboratory results.

As agreed upon at the December 19, 2001 agency meeting, planning for a Spring 2003 field test is underway and a release-recapture study could be conducted by marking fish, releasing them upstream of the louvers, and recapturing them in the bypass collection facilities or in sampling gear located downstream of the louver array (see Appendix D: Meeting notes relevant to T&E). Radio telemetry or PIT tags could also be used (alone or in combination with conventional mark release-recapture techniques) to monitor fish movement along the louver array and through the bypass system. There may be constraints associated with the evaluation of shortnose sturgeon because of their endangered species status. Plans to field-test the Holyoke canal system full depth louvers will be developed in consultation with stakeholders.

The second issue regards downstream passage at Hadley Falls Station. As part of their prescriptions, NMFS and USFWS required an angled bar rack for downstream passage guidance at the Hadley Falls intakes. The Work Group, realizing that there was no evidence to prove if sturgeon would actually be guided, initiated a research program to study the angled bar racks. Phase 1 of the research involved the development of a computer model to evaluate the effectiveness of the bar rack. Alden Laboratory has developed a computational fluid dynamic model of the Hadley Falls intake area and presented their findings to HG&E and stakeholders. The model has been revised based on agency comments to simulate additional scenarios, referred to as Phase 2 Research. The Phase 2 Research program is currently ongoing.

To facilitate the shortnose sturgeon research efforts, HG&E proposes to reconvene the Work Group. The group's primary goal will be to develop a practical method for downstream sturgeon passage. Because this issue impacts both downstream and upstream passage of other
species, the Work Group will strive attain a consensus based solution for sturgeon passage at the Holyoke Project.

NMFS will have the technical oversight and provide overall direction for the Work Group. HG&E will fund the Work Group's efforts and serve as the group's overall coordinator. The Work Group will meet in September 2002 to review the findings of the Phase 2 Research and establish a plan and schedule for successful work. This may include additional research, identifying potential technologies for downstream passage, and evaluating the technologies through computer models, physical models, or field work. To accomplish its goal, the Work Group may have to obtain more information on habitat and movement of sturgeon. Status reports will be submitted to FERC every 6 months.

Once the Work Group finds a solution for downstream passage for shortnose sturgeon, HG&E will consult with stakeholders to ensure that a consensus based solution is developed. HG&E will then submit a conceptual plan to FERC for review and approval. Upon approval from FERC, HG&E will implement the downstream passage facilities.

The third issue regarding sturgeon involves the Number 1 Overflow. The No. 1 Overflow is located on the First Level canal upstream of the louvers and discharges into the river downstream of the dam. Sturgeon have been observed entering the intake of the No. 1 Overflow and returning to the river. To prevent the passage of sturgeon through this structure, an exclusion rack for the No. 1 Overflow will be installed during the Fall 2002 drawdown (Figure 6-2). The exclusion rack was developed in consultation with the stakeholders and meets established criteria for bar spacing and velocity.

HG&E is proposing the following specific measures:

6.1 Protection and Enhancement

• By September 1, 2002, HG&E will work with stakeholders to reconvene the Work Group to assist in developing and directing research efforts.
LARGE-FORMAT IMAGES

One or more large-format images (over 8 ½" X 11") go here. These images are available in FERRIS at:

For Large-Format(s):
Accession No.: 20020665·0447

Security/Availability:

☑ PUBLIC
☐ NIP
☐ CEII
☐ NON-PUBLIC/PRIVILEGED

File Date: 7·15·02 Docket No.: 7·2001

Parent Accession No.: 20020718·0287
Set No.: 4 of 4
Number of page(s) in set: 1
• HG&E will, upon consensus of the group, implement the recommendation of the Work Group

• HG&E will modify the louvers in the Holyoke canal system in the Fall of 2002 and have the full depth louvers functional by the end of the year

• HG&E will fund Alden labs' modeling of the angled bar rack (Phase 2 Research)

• When Alden research results are available and louver effectiveness studies completed, the Work Group will convene to decide how to proceed

• HG&E will continue to participate in the Work Group to develop guidance or exclusion options for the Hadley Falls intake and to continue assessing impacts of the Holyoke Dam on shortnose sturgeon

• An exclusion rack for the Number 1 overflow will be installed during the Fall 2002 drawdown

• HG&E will submit annual reports to FERC on the progress of the above items

6.2 Monitoring

• HG&E will conduct additional research to determine the success of the full depth louvers

• HG&E will conduct additional research to determine the success of any Hadley Falls guidance system
Table 6-1. Number of Shortnose Sturgeon Lifted at Holyoke Dam Annually (1975-2001).

<table>
<thead>
<tr>
<th>Year</th>
<th>Number Lifted</th>
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</tr>
<tr>
<td>2001</td>
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</tr>
<tr>
<td>Total</td>
<td>112</td>
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</table>

* Two sturgeon entered lift but returned downstream per NMFS
7.0 LITERATURE CITED


APPENDIX A

RELEVANT PASSAGES FROM CONDITIONING DOCUMENTS
APPENDIX A

License Order:

Article 416

Within one year after the date of issuance of this license, the licensee shall, after consultation with the U.S. Fish and Wildlife Service (FWS), Silvio O. Conte National Fish and Wildlife Refuge (Refuge), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW), and Massachusetts Department of Environmental Protection (MDEP), as appropriate, file for Commission approval a Threatened and Endangered Species Protection Plan (T&E Plan) for the Holyoke Project. The T&E Plan shall include the federally listed endangered shortnose sturgeon (Acipenser brevirostrum), and threatened bald eagle (Haliaeetus leucocephalus) and Puritan tiger beetle (Cicindela puritana), and shall include, but not necessarily limited to, the state listed endangered yellow lampmussel (Lampsilis cariosa) and dwarf wedge mussel (Alismidonta heterodon).

The T&E Plan shall include, but not be limited to, the following:

1. Measures to enhance bald eagle nesting sites (i.e., by erecting eagle nest platforms) and to protect and enhance eagle perching and feeding activities; a commitment to cooperate with the FWS, MDFW, and MDEP to continue educating the public and policing recreational activities at Puritan tiger beetle habitat sites (particularly at Rainbow Beach), and develop other protective measures, such as no-wake zones; measures to protect and enhance shortnose sturgeon habitat consistent with the measures developed as the result of the on-going shortnose sturgeon studies and the provisions of Articles 405, 406, 411, and 412; and measures to protect and enhance the yellow lampmussel and dwarf wedgemussel, as identified in the canal operations plan (Article 409);

2. a schedule for implementing the measures;

3. a description of the method for monitoring the results of the implemented measures;

4. a monitoring schedule; and

5. a schedule for providing the monitoring results to FWS, the Refuge, NMFS, MDFW, and the Commission.
The licensee shall include in the T&E Plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to FWS, the Refuge, NMFS, MDFW, and MDEP, and descriptions of how the agencies' comments and recommendations are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the T&E Plan, including any changes required by the Commission.
Regarding Fish Passage and Shortnose Sturgeon:

Article 405

The licensee shall operate the project in a run-of-river mode and maintain a minimum impoundment elevation of 100.6 feet National Geodetic Vertical Datum with an allowable fluctuation of ±0.2 foot for the protection of water quality, aquatic and fishery, and recreational resources of the Holyoke Project and Connecticut River.

The licensee shall at all times act to minimize the fluctuation of the impoundment surface elevation by maintaining a discharge from the project so that, at any point in time, flows, as measured immediately downstream of the project tailrace, approximate the sum of the inflows to the project impoundment.

The run-of-river mode operation and minimum impoundment surface elevation may be temporarily modified if required by operating emergencies beyond the control of the licensee (e.g., extreme runoff events, droughts, ice conditions, equipment failure, or flood storage requirements), and for short periods upon mutual agreement between the licensee, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Massachusetts Department of Environmental Protection, and the Massachusetts Division of Fisheries and Wildlife. If project operations are so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each incident.
Article 406

The licensee shall release seasonally-adjusted minimum flows into the bypassed reach and canal system for the protection and enhancement of water quality and aquatic and fisheries resources.

The licensee shall release continuous instantaneous minimum flows to the bypassed reach as follows:

<table>
<thead>
<tr>
<th>Period</th>
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<td>July 16 through March 31</td>
<td>at least 420 cfs, or impoundment inflow, whichever is less</td>
</tr>
<tr>
<td>April 1 through July 15</td>
<td>at least 800 cfs, or impoundment inflow, whichever is less</td>
</tr>
</tbody>
</table>

The licensee shall release continuous instantaneous minimum flows to the canal system as follows:

<table>
<thead>
<tr>
<th>Period</th>
<th>Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1 through November 15</td>
<td>at least 810 cfs, or impoundment inflow minus fish passage and bypassed reach minimum flows, whichever is less</td>
</tr>
<tr>
<td>November 16 through March 31</td>
<td>at least 400 cfs, or impoundment inflow minus fish passage and bypassed reach minimum flows, whichever is less</td>
</tr>
</tbody>
</table>

The licensee shall operate the Holyoke Project according to the following flow prioritization scheme: (1) fish passage flows (Articles 411, 412, and 413); (2) bypassed reach flows; (3) minimum canal flows; and (4) hydroelectric generation, to the extent that such priorities do not conflict with Condition 16 of the Section 401 water quality certification attached as part of this license.

The licensee shall specify the methods for operating and releasing bypassed reach and canal system minimum flows as required by Article 407 of this license, and shall monitor compliance with the minimum flows as required by Article 408.

Releases from the Holyoke Project may be temporarily modified if required by operating emergencies beyond the control of the licensee (e.g., extreme runoff events, droughts, ice conditions, equipment failure, or flood storage requirements), or for short periods upon mutual agreement between the licensee, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Massachusetts Department of Environmental Protection, and the Massachusetts Division of Fisheries and Wildlife. If the flows are so modified, the licensee shall notify the Commission in advance if known or as soon as
possible otherwise, but no later than 10 days after each such incident, and shall provide the reason for the modified flow.

Article 411

The licensee shall install, operate, and maintain downstream fish passage facilities at the Holyoke Project to provide efficient downstream fish passage for a variety of anadromous fish species past the project.

Within 180 days after the date of issuance of this license, the licensee shall file, for Commission approval, a plan to install, operate, maintain, and, as appropriate, evaluate downstream fish passage facilities at the Holyoke Project that includes, but is not limited to:

1. provisions for the continued operation of the canal louver bypass facility and the Boatlock station downstream fish passage facility (as necessary), as well as the operation of the proposed Bascule gate downstream fish passage facility once installed;

2. a provision to operate the downstream fish passage facilities, as identified below, during the designated migration period whenever the Hadley Falls station is operating or generation flows are provided in the First Level canal --

<table>
<thead>
<tr>
<th>Species</th>
<th>Downstream</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic salmon</td>
<td>4/1 - 6/15 (juveniles)</td>
<td>Fall/Winter (adult)</td>
</tr>
<tr>
<td>American shad &amp;</td>
<td>6/1 - 7/31 (adults)</td>
<td></td>
</tr>
<tr>
<td>Blueback herring</td>
<td>9/1 - 11/15 (juveniles)</td>
<td></td>
</tr>
<tr>
<td>Shortnose sturgeon</td>
<td>4/1 - 11/15 (adults)</td>
<td></td>
</tr>
<tr>
<td>American eel</td>
<td>8/15 - 11/15</td>
<td>Undetermined spring run</td>
</tr>
</tbody>
</table>

3. a schedule for implementing the provisions of this plan, including the installation of all facilities and structures, except as specifically noted, within two years of license issuance;

4. provisions to notify the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW), and Connecticut River Atlantic Salmon Commission (CRASC) of any extensions of time to comply with the provisions of this plan;

5. provisions for: (a) maintaining the fish passage facilities in proper order and keeping such facilities clear of trash, logs, and material that would hinder passage; (b) performing maintenance such that the fish passage facilities would operate effectively prior to and during the migratory periods; and (c) developing a fish passage maintenance plan describing the anticipated maintenance, a maintenance schedule, and contingencies;
(6) a provision to allow agency personnel access to the project site and to pertinent project records, for the purpose of inspecting the fish passage facilities;

(7) a provision to construct the downstream fish passage facility at the spillway Bascule gate (i.e., fly-over), with a surface intake, conforming to the design depicted in hydraulic model studies undertaken by Holyoke Power, including measures to manage flows that are shed through the structure to eliminate interference with the spillway fishlift attraction flows;

(8) specification of the operational flows for the Bascule gate [i.e., 600 cubic feet per second (cfs)], louver bypass, and Boatlock station downstream fish passage facilities;

(9) a provision to design, model, and install an angled (>)45°) bar rack in the Hadley Falls station forebay, with 1-inch clear bar spacing, leading to a downstream fish bypass entrance/conveyance structure located at the existing Bascule gate, or at the rubber dam;

(10) an evaluation of the existing surface bypass and partial-depth louver structure in the First Level canal, as well as other reasonable measures, for providing downstream passage of shortnose sturgeon and American eel;

(11) a provision to continue operating the existing Boatlock station downstream migrant facility, and an evaluation of the facility to determine whether the facility should cease operation;

(12) the estimated capital cost of installing the facilities, the estimated annual costs of operating and maintaining the facilities, and the cost, in lost generation, of operating the facilities; and

(13) provisions for providing any proposals to modify existing facilities and/or install new facilities, relative to the evaluations of Items 9, 10, and 11 above, as well as the monitoring required by Article 414, to the aforementioned agencies and the Commission.

**Article 412**

The licensee shall install, operate, and maintain upstream fish passage facilities at the Holyoke Project to provide efficient upstream fish passage for a variety of anadromous fish species past the project.

Within 180 days after the date of issuance of this license, the licensee shall file with the Commission, for approval, a plan to install, operate, maintain, and, as appropriate, evaluate upstream fish passage facilities at the Holyoke Project that includes, but is not limited to:

(1) provisions for the continued operation of the tailrace and spillway fishlifts;
(2) specification of the design population for each target species (i.e., 1,000,000 each for American shad and blueback herring; 6,000 for Atlantic salmon; unquantified for American eels; and an estimated 500 shortnose sturgeon);

(3) a provision to operate the upstream fishlifl system during the designated migration seasons, as identified below, at flows up to 40,000 cubic feet per second (cfs), as measured at USGS Gage No. 01172003 --

<table>
<thead>
<tr>
<th>Species</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic salmon</td>
<td>4/1 - 7/15</td>
</tr>
<tr>
<td></td>
<td>9/15 - 11/15</td>
</tr>
<tr>
<td>American shad &amp; Blueback herring</td>
<td>4/1 - 7/15</td>
</tr>
<tr>
<td>Shortnose sturgeon</td>
<td>6/1 - 11/15</td>
</tr>
<tr>
<td>American eel</td>
<td>4/1 - 11/15</td>
</tr>
</tbody>
</table>

(4) a schedule for implementing the provisions of this plan, including the installation of all facilities and structures, except as specifically noted, within two years of license issuance;

(5) provisions to notify the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW), and Connecticut River Atlantic Salmon Commission (CRASC) of any extensions of time to comply with the provisions of this plan;

(6) provisions for: (a) maintaining the fish passage facilities in proper order and keeping such facilities clear of trash, logs, and material that would hinder passage; (b) performing maintenance such that the fish passage facilities would operate effectively prior to and during the migratory periods; and (c) developing a fish passage maintenance plan describing the anticipated maintenance, a maintenance schedule, and contingencies;

(7) a provision to allow agency personnel access to the project site and to pertinent project records, for the purpose of inspecting the fish passage facilities;

(8) a provision to make necessary physical modifications to the upstream fishlift system to ensure operation up to 40,000 cfs, and to provide at least 12 inches of freeboard from operating water levels in the fishlifts to the top of the fishlift walls and fish crowders;

(9) a provision to expand the spillway and tailrace fishlifl by (a) increasing width of the spillway entrance and the spillway entrance channel to 8 feet, (b) providing attraction flows of 200 cfs at the spillway fishlift entrance and 120 cfs at each of the tailrace fishlift's entrance, (c) increasing the tailrace fishlift hopper capacity to 330 cubic feet, (d) increasing the spillway fishlift hopper capacity to 460 cubic feet, (e) increasing the width of the fishlift exit channel to 14 feet from the fishlift hoppers to the counting station and 10 feet beyond, and (f) providing an adjustable back lit panel at all fish counting station windows;
(10) a provision to install a second fish trapping and counting station in the fishlift exit channel;

(11) a provision to (a) install a new fish trapping and hauling system, as proposed by HG&E (see response to additional information request, Item 6.C.3, filed December 23, 1998), or, (b) if such a facility is determined not to be feasible, evaluate other mechanisms and/or procedures to enhance trapping and hauling operations at the Holyoke Project, and provide any relevant proposals in this regard;

(12) provisions to remove the rock-outcropping at the entrance of the tailrace fishlift below Unit #2 to allow efficient operation of this entrance, and provide bottom-level access to the tailrace and spillway fishlifts, as necessary;

(13) a provision to construct a barrier at the confluence of the Hadley Falls tailrace and the Overflow No. 2 channel; and

(14) the estimated capital cost of installing the facilities, the estimated annual costs of operating and maintaining the facilities, and the cost, in lost generation, of operating the facilities.

(15) provisions for providing any proposals to modify existing facilities and/or install new facilities, relative to the monitoring required by Article 414, to the aforementioned agencies and the Commission.

Regarding Canal Operations:

Article 409

Within 180 days from the date of issuance of this license, the licensee shall file, for Commission approval, a comprehensive canal operations plan. The plan shall describe the operational and maintenance measures that will be used to protect and enhance water quality and mussel populations in the canal system.

The plan shall include, but not be limited to: (1) a description of how the minimum flows required by the license will be circulated through the three-level canal system to improve and maintain water quality and aesthetic conditions; (2) specific procedures for installing a sandbag weir, or other appropriate measures, to maintain watered conditions in areas of the canal necessary to maintain mussel habitat; (3) description of any modification of structures necessary to achieve minimum canal flow requirements and conditions protective of mussels during maintenance drawdowns; (4) a description of how the minimum canal flows required by this license will be maintained during canal maintenance drawdowns; and (5) a method and schedule for monitoring the effectiveness of minimum canal flow requirements in protecting and enhancing mussel populations per Article 410.
The plan also shall include a schedule for: (1) implementation of the monitoring plan; (2) consultation with the appropriate federal and state agencies concerning the results of the monitoring; and (3) filing the results, agency comments, and licensee’s response to agency comments with the Commission.

**Canal Operations and Monitoring Mussels**

**Article 410**

Within 180 days after the date of issuance of this license, the licensee shall file, for Commission approval, a plan to monitor fish and aquatic habitat and fish populations within the bypassed reach and the Holyoke canals. The plan shall provide for monitoring the effectiveness of the bypassed reach and canal flows and other measures in protecting and enhancing fish and mussel habitat conditions and populations, and to determine the need for additional enhancement measures.

The plan shall include methods to monitor and assess: (1) the adequacy of bypassed reach flows to provide a safe zone of passage for anadromous fish through the bypassed reach; (2) the occurrence of fish stranding in the bypassed reach; (3) fish populations in the bypassed reach; and (4) changes in canal mussel populations and the adequacy of the sandbag weir, minimum flows, and drawdown procedures for protecting mussel populations in the canal system.

As part of the monitoring plan, the licensee shall determine the need for additional measures to ensure or enhance the safe passage of shortnose sturgeon through the bypassed reach as required by Articles 412 and 416. Such measures may include, but not be limited to: (1) changes in zone-of-passage flows and/or timing (pulsed flows); (2) changes in bypass aquatic habitat flows; and/or (3) bypass reach channel modifications. The plan shall include working in conjunction with the Connecticut River Shortnose Sturgeon Working Group and/or its findings to determine the most beneficial project modifications that would meet plan requirements and protection measures for the shortnose sturgeon.

The plan shall include a schedule for: (1) implementing the plan; (2) consulting with the appropriate federal and state agencies concerning the results of the study and any additional measures needed to protect aquatic and fisheries resources and mussel populations; (3) reporting on a biannual, or other appropriate interval, on anadromous fish and mussel populations, with a final report and recommendations at the end of the agreed-to monitoring period; and (4) filing the results, agency comments, and the licensee’s response to agency comments with the Commission. The final report shall: (1) identify the changes in populations over time; (2) outline the proposals for changes in operations or structures, if any, to protect and enhance fish or mussel populations; and (3) discuss the basis and need for continued monitoring.
From the 401 Water Quality Certificate:

19. Riparian Management Plan

(b) The riparian zone shall be sufficient to:

(i) Serve as a vegetative filter to substantially reduce non-point source discharges of oil and grease, sediment, nutrients and fertilizers, pesticides, and other contaminants that may be transported to Project waters in overland runoff from existing or potential adjacent residential, commercial or agricultural uses or roads;

(ii) Protect near shore fish, aquatic life and wildlife habitat from degradation resulting from adjacent uses and disturbances and from alterations to the shoreline including docks, riprap, and other structural modifications;

(iii) Include significant wildlife habitats and buffers adequate to avoid disturbance from adjacent uses, for species utilizing Project waters and associated wetlands, including but not limited to rare, threatened, or endangered wildlife species, or other state or federally listed species of concern; and

(iv) Protect riparian habitat areas and buffers for species which use the riparian area in conjunction with Project waters, including turtle nesting areas, and bald eagle perch trees used for feeding;...
APPENDIX B

"RAINBOW BEACH: FINAL REPORT"
Rainbow Beach
Final Report
MA DFW NHESP
December 20, 1997
Chris Davis

The 1997 field season for the biological and interpretive work at Rainbow Beach began on May 21, 1997 with a work day to install symbolic fencing of Cicindela puritana larval habitat, post signs and assess vegetative density in larval areas. Participants included personnel from: Massachusetts Department of Environmental Management, Massachusetts Division of Fisheries and Wildlife, Natural Heritage Endangered Species Program, River Rover volunteers and Dr. Phil Nothnagle.

Due to rather aggressive vegetative management at the beginning of the 1996 field season, Dr. Nothnagle recommended some very light removal of vegetation and fallen tree limbs. Symbolic fencing to prevent foot traffic and subsequent trampling of larval burrows was installed in areas Dr. Nothnagle has identified as the best available larval habitat.

Interpretative Training

A meeting was held on May 29, 1997 at the USFWS Connecticut River Resource Management Complex, Sunderland, MA to briefly review the River Rover Program for 1996 and plan training of River Rovers for the 1997 field season. Additionally, we outlined the areas interpreters were needed and established procedures for scheduling and reporting. Jennifer Palaia, DEM summer staff, volunteered to coordinate scheduling for all volunteer activities.

Participants: Massachusetts Department of Environmental Protection, USFWS Conte Refuge, CT River Coordinator, DFW NHESP.

River Rover training took place on June 19, 1997 at the USFWS Connecticut River Resource Management Complex, Sunderland, MA. Training included an overview of the USFWS and the roles and responsibilities of several divisions, i.e., refuges,
Sunderland Office of Fisheries Assistance, CT River Coordinator, etc. and federal activities within the Connecticut River watershed such as anadromous fish restoration, land acquisition, endangered species management, fishing pole loan programs and habitat enhancement.

Volunteers were provided with a River Rover manual containing background on other volunteer opportunities, maps of dams and fish passage facilities in the Connecticut River watershed and life histories of anadromous fishes and freshwater mussels.

A trip to the Sunderland boat launch included an electrofishing boat demonstration, geologic history of the area, and discussion of endangered species and nuisance exotic wildlife. A tour of the Cronin Salmon Station concluded the day.

Participants: Massachusetts Department of Environmental Protection, USFWS Conte Refuge, CT River Coordinator, Sunderland Office of Fisheries Assistance, Massachusetts Division of Fisheries and Wildlife NHESP.

**Tiger Beetle Training**

Tiger beetle training was held on June 30, 1997 for River Rovers specifically interested in Rainbow Beach. Training included a trip Cromwell, CT to the most northern and largest population of Cicindela puritana in Connecticut. Numbers of C. puritana were good and we had difficulty finding C. repanda, a common species occurring there.

Dr. Nothnagle explained his discovery of C. puritana at this site and some of the issues associated with rare species occurring on private property. Adult C. puritana were captured, sexed and identifying characteristics explained. Several C. repanda larvae were dug up from larval tubes and the life histories of C. puritana and C. repanda were compared and contrasted.

During an afternoon trip to Rainbow Beach C. repanda were captured and examined. Four C. puritana were netted, marked and released.

Dr. Nothnagle suggested that Beach Clotbur, *Xanthium echinatum* and Japanese Knotweed, *Polygonella cuspidatum* be removed from some of the larval habitat.
later in the summer. Both species grow quickly and can shade large areas thereby eliminating areas for C. puritana ovipositing.

Media

Terry Blunt, DEM issued a press release prior to the River Rover volunteer training on June 19, 1997. Media present at the training included: Springfield Union, Greenfield Recorder, WFCR, WGGB channel 40 and WWLP channel 22.

The Daily Hampshire Gazette ran an article on Rainbow Beach and unfortunately chose to focus on the controversy surrounding the use of the beach and the negative response to WMA regulations and tiger beetle research.

Volunteers

8 River Rovers volunteered time at Rainbow Beach during the 1997 field season. The dates and number of volunteers that participated in C. puritana research:

<table>
<thead>
<tr>
<th>Date</th>
<th>Volunteers</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/28/97</td>
<td>1</td>
</tr>
<tr>
<td>6/29/97</td>
<td>2</td>
</tr>
<tr>
<td>6/30/97</td>
<td>2</td>
</tr>
<tr>
<td>7/4/97</td>
<td>1</td>
</tr>
<tr>
<td>7/5/97</td>
<td>2</td>
</tr>
<tr>
<td>7/6/97</td>
<td>3</td>
</tr>
<tr>
<td>7/12/97</td>
<td>2</td>
</tr>
<tr>
<td>7/13/97</td>
<td>2</td>
</tr>
<tr>
<td>7/15/97</td>
<td>2</td>
</tr>
<tr>
<td>7/20/97</td>
<td>2</td>
</tr>
<tr>
<td>7/27/97</td>
<td>3</td>
</tr>
<tr>
<td>8/3/97</td>
<td>1</td>
</tr>
<tr>
<td>8/17/97</td>
<td>1</td>
</tr>
</tbody>
</table>

Scheduling of volunteers was coordinated by Jennifer Palaia. We spoke 1-2 times per week to discuss coverage for the upcoming weekend. As with any volunteer effort, consistency of participation was the greatest challenge. Most volunteers became quite good at spotting C. puritana's among the C. repanda even without binoculars.
**Interpretive Contacts and Beach User Impact**

Beach users at Rainbow Beach Wildlife Management Area can be placed in one of four Categories:
1. First time users
2. Occasional users
3. Regular users
4. Party users

The quality of the interpretive contact varied with each type of user.

**First time users** are often unaware of the presence of tiger beetles and are usually interested in the project. Some expressed support and were glad that "someone" is watching the beach and helping take care of it.

**Occasional users** may or may not know about the tiger beetles. Many seem to be accepting of the need to protect the habitat and seem not to be greatly inconvenienced by the WMA regulations.

**Regular users** are there nearly every weekend and many have a long personal history with the beach, some having been brought there as children. Most are family groups. These people are highly invested in "their" beach and their perceived rights to its use. Interpretive contacts can be challenging and we often encountered hostility towards the beetle and regulation of the beach, in particular, the no camping regulation. They seem to respect the beach in terms of litter and can be observed picking up trash at the end of the day. Many in this group tend to beach their boats in the same location. This group has staked out the wide sandy center of the beach. This forces other users to the north and south ends of the beach where most of the arrivals and departures can be observed during the course of a day.

**Party users** have a very low investment in the beach as their main activity seems to be the consumption of alcohol. They can be belligerent and are not receptive to WMA regulations or tiger beetle research.
During the course of the field season, the need for interpretive contacts declined. Many of the regular users knew us by name and re-contact, other than in a casual manner and unless initiated by a beach user, was unnecessary. In fact, once the regular users accepted the fact that their use of the beach had to change, an interpretive presence seemed counterproductive to good public relations. The false perception that we were in an enforcement role seriously jeopardized our efforts to educate and build trust with beach users. Interpreters are in a difficult situation as we are a visible and easy target for any reaction a beach user may have.

Foot traffic and beaching of boats at the shoreline, occurring mainly at the center of the beach, appears to have no significant negative impact on adult C. puritana. While not fully understood, foot traffic near the vegetation at the edge of the flood plain forest may contribute some beneficial disturbance in the maintenance of larval habitat.

**Environmental Police Officers**

Coordination with EPO's generally went well with the acceptance of not being able to reach them by radio on occasion. Most weekend days patrols passed by the beach 3-4 times. We received reports from beach users of enforcement of the no camping regulation. The EPO's continued to express their frustration over the lack of resources to adequately meet boating and safety responsibilities but still responded well to requests to include Rainbow Beach in their patrols. Regular procedure included a Saturday and Sunday morning check-in with EPO's to review the previous night's activity at the beach.

**Tiger Beetle Research- Adults**

Capture procedures consisted of 1-4 people slowly walking perpendicular to the shoreline approximately 5 feet apart covering an area of between 5-20 feet depending on the number of observers. Tiger beetles were observed with the naked eye or through binoculars and C. puritana were located among C. repanda. General body shape, presence of a white line on abdomen side and overall lighter and wider markings on elytra distinguish C. puritana from C. repanda.
Unmarked C. puritana are netted, sexed and marked with a unique color combination to enable visual "recapture" and eliminate subsequent netting of previously marked beetles.

29 C. puritana were netted, sexed, marked and released. This represents 18 males and 11 females. Marking methodology followed recommendations from Dr. Nothnagle based on mark-recapture studies with C. puritana at Connecticut sites.

C. puritana were marked with 1 or 2 colored dots. Males were marked on the left elytra and females on the right. For example, a male marked BT1BL1 has one blue dot on the thorax and one blue dot on the left elytra in the #1 position at the humera luna. A female marked TOBR2 has no mark on the thorax and one blue dot on the right elytra middle position.

No predation of marked C. puritana was observed. Copulation was also not observed. However, two marked males attempted copulation during a fifteen minute observation period. On 8/8/97 at the north banks, TORL3 mounted YT1BL1. Five minutes later, YT1BL1 mounted TORL3. Both males were observed walking up and down a 70 yards section of beach feeding at the shoreline and presumably looking for females.

C. puritana were observed, captured and marked in three areas: the north end of the beach directly opposite the northern fenced larval habitat, the south end roughly between 50 yards north and 100 yards south of the double snag and at the "north banks" 3/4 of a mile north of Rainbow Beach, west side of the Connecticut River.

C. puritana Marking Data:

N in location for the north end represents the northern most sign of the fenced area. For reference purposes signs are numbered starting at the north proceeding south N1, N2, N3 and so on. The numbering begins again at one for the southern fenced area, S1, S2, etc.
Length of resighting and dispersal

The table below represents the # of days from initial capture and marking and the last resight.

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>28</td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

C. puritana larvae survey

Two fenced enclosures were erected at the north end of Rainbow Beach based on Dr. Nothnagle's observations of larval sites in previous years. The symbolic fenced worked well to exclude visitors from those areas.

During the course of the field season, Dr. Nothnagle, Tim Simmons and myself developed a set of assumptions for the habitat requirements for C. puritana larvae. Factors that influence selection of egg laying locations and survival of larvae likely include but are not limited to: aspect, soil composition, vegetation composition, vegetation density, root structure, flooding, ice scouring, mean level above water table and other natural and man made disturbances. Rather than implement habitat management based on an incomplete understanding of these requirements and risk negatively impacting reproduction, we decided to survey for C. puritana larvae during September when activity was most likely to occur. A total of 30 C. puritana larvae were found at Rainbow Beach and the North Banks.

North Banks

13 C. puritana larvae were distributed on first and second terrace-shelves in sandy, silty substrate in small clusters along an approximately 180 ft. section of riverbank. Cover estimates of vegetation were 5-10% and included: Equisetum
arvense, Salix nigra, Pncium sp., Populus seedlings, Xanthium, Calamagrostis canadense and 25 other species. Some larvae were observed directly beneath the leaves of Equisetum.

Estimates of elevation of larvae above mean high water: 34 inches and 42 inches.

Instars observed:

1st instar - 2  2nd instar - 6  3rd instar - 5

Rainbow Beach

17 C. puritana larvae were observed. Larvae were distributed in clusters near vegetation (sparse cover <25%). One larva was located within the southern enclosure near fence post 5s. 7 larvae were observed in a frequently used trail immediately south of the southern enclosure. 3 larvae were located among the stems of the clump of sandbar willow (Salix exigua, state threatened) and one 3rd instar was observed 30 feet south of the southern edge of the sandbar willow.

Estimates of elevation of larvae above mean high water: 42 inches.

Instars observed:

1st instar - 3  2nd instar - 12  3rd instar - 2

Results of the larval survey seem to indicate that C. puritana select at least two different types of habitat for egg laying. Both the terraced banks north of Rainbow Beach and the sandbar willows and trail area were favored over more densely vegetated areas. With the exception of the north banks, it is interesting to note that the areas of highest adult activity at Rainbow Beach were some distance both north and south of the areas selected for egg laying. It is quite possible that egg laying occurred on terraced shelves on the east bank of the Connecticut river across from Rainbow Beach. Additional study is needed to gain a fuller understanding of the optimal conditions for larval habitat.
Recommendations for 1998

C. puritana Research

The presence of adult and larvae at sites north of Rainbow Beach indicate that even with a relatively low population, emigration and reproduction are occurring away from what has historically been considered the core of the population. This strongly indicates the need for expansion of the research area to include all historic and/or likely suitable habitat both upriver and down river of Rainbow Beach. The southern end of the recommend research area would include the Oxbow and mouth of the Mill River, proceeding northward to include Elwell Island and the sandy point approximately 1/2 mile upriver. All suitable habitat should be searched for adult C. puritana during July and early August and for larvae during September.

Capture and marking of adult C. puritana should again be conducted in 1998 in order to continue to collect valuable data on habitat requirements for adults, population estimates and dispersal. It is recommended that unique color combinations be used again to allow for ease in resighting marked individuals and to maximize the data collected from each marked animal.

Vegetation

Since C. puritana appear to be opportunistic with regard to selection of egg laying locations and the influence of natural and man made disturbance is poorly understood, it is recommended that no vegetation clearing/management, with the possible exception of exotics, be implemented in 1998. An additional season of research will greatly increase our understanding of the locations and habitat requirement for larvae.

Interpretation

Interpretive goals for 1997 included: education of the beach users to the presence of C. puritana and the need for research, informing about WMA regulations and attempting to de-link the regulations with C. puritana, to provide an opportunity for dialogue regarding use of the beach and to request their
assistance in avoiding the fenced enclosures. In large measure these goals were met. Very few people were seen going into the enclosures and few tracks indicating activity within the enclosures were observed. However, as noted above, some misperceptions and problems resulted from our efforts. Even with the very low key, non confrontational approach we employed our role was interpreted as one of enforcement. A continued interpretive presence seems to antagonize rather than educate or enlist support. The message has been received and while few are happy about it, they realize that their use of Rainbow Beach has changed and that those changes are here to stay. My recommendation for 1998 is to eliminate interpretive contacts while maintaining signage explaining WMA regulations, need for enclosures, etc.

**Enforcement**

Continue to liaison with MA ELE to support them in their enforcement of WMA regulations at Rainbow Beach. If possible, advocate for additional resources for Connecticut River patrols which could provide a greater enforcement presence for Rainbow Beach.

**Publicity**

Media coverage of the River Rover training was positive and aided in informing the public of the volunteer opportunity at Rainbow Beach. However, future publicity around the research being conducted on C. puritana at Rainbow Beach and elsewhere is likely to be counterproductive, particularly in light of the occurrence of C. puritana on private property. While C.puritana have been recorded at other locations the controversy surrounding their presence is recent and rancorous. Future negative publicity could seriously impact landowner cooperation.
I Submitted by Tim Simmons
Restoration Ecology
Division Of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581
(508) 792-7270 ext 126
Tim Simmons@state.ma.us

II Title: Determination of puritan tiger beetle (Cicindela puritana) distribution, habitat dynamics and habitat requirements along the Connecticut River in Massachusetts

Abstract. The puritan tiger beetle remains in danger of extirpation in Massachusetts in part because its habitat is extremely rare and in part because its habitat requirements are poorly understood. The lack of critical information impedes protection and conservation decision making. Monitoring the population (larvae and adults), examining alterations to habitats due to alterations in fluvial hydrology of the river, and systematically measuring and evaluating the physical and biological features of occupied habitat are three research approaches which will be applied to increasing the understanding of both beetle population dynamics and the dynamics of the habitats and natural communities associated with this section of the Connecticut River.

III. Project Description.

Location: The proposed project is located in the towns of Northampton, Hadley and south Hadley, in Massachusetts (see attachment 1).

Scope of work: The puritan tiger beetle, a federally endangered and state endangered species occurs in Massachusetts only along a short stretch of the Connecticut River. The small population which appears, in recent years, to be making a slight recovery from alarmingly low numbers, is associated with Rainbow Beach which is owned by the Division of Fisheries and Wildlife (DFW) and the town of Northampton and managed by DFW.

Research sponsored by the Challenge Cost Share program and conducted in 1997 resulted in several important findings concerning the conservation and management of the animal and raised questions. The answers are crucial to the preservation not only of the population but also for the management of adjacent natural communities.

Specifically, larvae were found not only at Rainbow Beach but also within the sandy cliffs upstream of the beach. Adults, marked at Rainbow beach, were also observed upstream of the beach. Plant cover, especially exotic species, has increased dramatically at Rainbow Beach in areas formerly occupied by larvae. The sand cliffs are also partially vegetated mostly by exotic or weedy plant species. Larvae appeared to be found most consistently in an elevation band approximately 3 feet above average river altitude in early autumn when larval activity is high.

Restoring the Massachusetts population of puritan tiger beetles to more stable conditions requires a more thorough understanding of life history, habitat requirements of larvae and adults and processes and factors that influence the dynamics and habitability of the riparian communities upon which they depend.

Four fundamental questions have been identified.

- Have alterations in hydrological processes such as flooding, erosion and deposition resulted in habitat degradation by encouraging exotics or otherwise decreasing available habitat for puritan tiger beetles and other significant riparian communities?
- What are the characteristics of optimal habitat for larvae and where are these areas likely to be found currently and in the future?
- What specific measures, in terms of vegetation and user management are required to guarantee a future for the population and associated natural communities?
• What impact are invasive exotic plant species having upon important riparian communities and puritan tiger beetle habitats?

Objectives.
Objective 1. Design and implement a research plan to address the four questions while continuing to educate beach users and the public.

Objective 2. Conduct a modified and expanded Indicators of Hydrological Alterations assessment including evaluations and field verification of ecologically relevant water levels.

Objective 3. Conduct surveys for adults and larval puritan tiger beetles on all potential habitat from Elwell Island to the mouth of Mill River.

Objective 4. Conduct multivariate analyses of occupied larval habitat and adjacent unoccupied habitat.

Methodologies.

Indicators of Hydrological Alteration Assessment. The methodologies for the hydrological alterations assessment are found in Richter et. al 1997 (attached). This methodology will be applied to the stretch of the river between Elwell Island and the mouth of Mill River in Northampton. The exercise will be performed by Philip Nothnagle Ph.D. in cooperation with Tim Simmons. The only stream gage available for evaluation is the USGS gage in Montague. This data will be supplemented by accessing, if available, stage data from the Holyoke dam. In addition, staff gages for the establishment of relationships between stream gage and hydrological stage at 5 important sites along the river will be installed. This will allow for the evaluation of the timing, frequency, duration, and magnitude of flooding for floodplain forest and other riparian communities.

Puritan tiger beetle population monitoring and public outreach. Surveys will be performed in spring summer and fall by an intern hired to continue work performed last year. The intern will be trained by Dr. Nothnagle and Tim Simmons who will also assist in the surveys. In addition, this person will serve as volunteer coordinator and liaison with the various agencies and the general public.

Multivariate study design, data collection and analyses. These tasks will be designed and performed by Dr. Nothnagle in consultation with Tim Simmons. The intern will also be responsible for collecting data in order to increase our understanding of habitat parameters important to the beetle population a systematic evaluation of locations where larvae and adults are found is necessary. Among the information fields considered significant are vegetation composition and structure, soil characteristics (particle size and stratification), distance to water vertically and horizontally and elevation relative to water surface and established datum points.

Results and products.
A report on the assessment of indicators of hydrological alteration will be completed by 30 October 1998. The report will focus on hydrological effects on biotic resources in the study area, especially puritan tiger beetle habitats and floodplain forest communities.

A report on the multivariate habitat analyses will be completed by 1 December 1998.

A report on puritan tiger beetle population monitoring and beach user education will be completed by 15 November 1998.

A report on management recommendations summarizing the practical applications of all the research and monitoring will be completed by 1 December 1998.
Puritan Tiger Beetle Proposal to Conte Wildlife Refuge Cost Share Program 5 November 1997

Timeframe: Starting Date - 5 January 1998 Completion Date - 1 December 1998

Applicant: The applicant serves as restoration ecologist at the Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program and administers the ecological restoration component of the Biodiversity Initiative. I also have considerable experience working with tiger beetle populations and have collaborated with Dr. Nothnagle on another federally listed beetle population in Massachusetts.

Partnerships: This project will continue to be a partnership involving the Conte National Fish and Wildlife Refuge, MA DFW, MA DEM via the river rovers program and the Connecticut River Program, the MA DFWELE Environmental Police and The Wildlife Conservancy.

Ownership: The ownership of the lands on which the project occurs are DFW and the town of Northampton for Elwell Island and Rainbow Beach. Several private landowners, who will be asked for permission prior to any activity, own portions of riverbank.

Additional: Multiple factors have contributed to the decline of puritan tiger beetle including river management, recreational use of habitat, collecting, riverbank stabilization, invasive exotic plant species, combinations of these forces and unknown factors.

IV. Project Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Challenge Cost Share Request</th>
<th>Biodiversity Initiative Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary for beach/beetle intern</td>
<td>$6,700.00</td>
<td>$3,500</td>
</tr>
<tr>
<td>Dr. Nothnagle Stipend IHA</td>
<td></td>
<td>$2,200.00</td>
</tr>
<tr>
<td>Dr. Nothnagle Stipend MVA-habitat</td>
<td></td>
<td>$1,100</td>
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<tr>
<td>Restoration Ecologist</td>
<td></td>
<td>$300.00</td>
</tr>
<tr>
<td>Equipment-soil sample tubes, miscellaneous</td>
<td></td>
<td>$225.00</td>
</tr>
<tr>
<td>Administrative Support</td>
<td></td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Travel Costs</td>
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<td>$9,625.00</td>
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<tr>
<td>Total</td>
<td>$6,700.00</td>
<td></td>
</tr>
<tr>
<td>Project total</td>
<td></td>
<td>$16,325.00</td>
</tr>
</tbody>
</table>
APPENDIX C

MUSSEl. MONITORING STUDY ON CT RIVER
CONNECTICUT RIVER SURVEY IN THE VICINITY OF THE HOLYOKE DAM FOR THE YELLOW LAMPMUssel

Introduction

The yellow lampmussel, *Lampsilis cariosa*, once common to Connecticut River, is only rarely reported in mussel collections today and for seven to eight years was thought to no longer populate the river. Dr. Douglas G. Smith, University of Massachusetts, documented the occurrence of this mussel in the Holyoke canal system on July 5, 1984 and the next specimen was not collected until NU divers, working with Menzie-Cura (an environmental consultant), collected a juvenile yellow lampmussel below the Holyoke Dam in October 1992. Currently, this species is listed as "Endangered" by the State of Massachusetts and is listed as "Special Concern" in Connecticut. Federally, *L. cariosa* was proposed for a "Category 2" listing in 1991 (Federal Register, Vol. 56, No. 225, pg. 58817), a listing which is an awareness notification only and does not require any mandated management. Very little is known about the biology and ecology of this mussel. The reasons for the declining numbers of *L. cariosa* are not clear, but loss of suitable habitat and urban pollution are considered contributing factors (D.G. Smith, personal communication).

In light of the 1992 discovery of a live yellow lampmussel during a coal tar deposit survey in the Connecticut River, the U.S. Fish and Wildlife Services requested that data be gathered on the population size of this mussel below the Holyoke Dam. This survey was conducted on August 14 and 15, 1995 by personnel working for the Aquatic Services Branch of the Environmental Department of Northeast Utilities. Dr. D.G. Smith, an authority in the field of invertebrate taxonomy for this area of the Connecticut River, was contracted to verify the identifications of mussels collected in the field. Patricia Huckery, representing the Massachusetts Fish and Wildlife (non-game species) Department, participated in field work conducted on August 14, 1995.

Material and Methods

A qualitative and quantitative survey for resident mussels, including the yellow lampmussel, was conducted over an eighteen mile section of the Connecticut River. On August 14, 1995, qualitative assessments of mussel abundance were made from the North Hadley and Hatfield area to Bachelor Brook in the South Hadley and Holyoke area (Fig. 1). Seven areas over this section of the Connecticut River were surveyed during a nine hour period. Both shallow (<2 m) and deep water (2-10 meters) areas were sampled using SCUBA, snorkeling and wading with the aid of underwater viewers. All mussels were identified live and returned to the river bottom. When located, deposits of mollusk shells left by river otters (otter middens) or other predators were inspected to obtain voucher specimens and further document the relative abundance of mollusk species in the river.

A quantitative assessment of adult mussels was conducted on August 15, 1995 in the area from which the most recent specimen of yellow lampmussel was collected, i.e., below the Holyoke Dam. In this area, general surveys were conducted to locate concentrations of adult mussels. Five distinctly different areas (varying depth, sediment type, current, etc.) in about a one-mile stretch of river were sampled using a 100 meter transect line. Each linear transect was selected to maximize the number of mussels sampled for an area. Along the first two transects, two biologists using...
SCUBA collected all adult mussels within one meter of each side of the 100 meter line. Mussels were counted, identified to species, and returned to the river bottom alive. The low numbers of mussels and the ability of the divers to identify them on the bottom allowed transects three, four and five to be sampled by bringing only unusual looking mussels to the surface for verification. Otter middens or similar shell deposits were censused for relative species abundance. This sampling effort required approximately 6 hours to complete.

Results

Qualitative survey. Yellow lampmussels were not found in any of the areas sampled. The only living mussels collected were the eastern elliptio, *Elliptio complanata* (Table 1). Of all the seven sites surveyed, Site 1, the shoal in the North Hadley/Hatfield area, was considered to have the best potential habitat for the yellow lampmussel based on its coarse gravel substrata and varied types of niches (e.g., water depths ranging from 0 to 2 meters, substrata ranging from coarse gravel/cobble to mud/clay, vegetation ranging from none to dense mats along the eastern shore). The densities of eastern elliptios were greatest at Site 1 and, for this reason, we allocated 1.5 hours using two biologists diving and three biologists wading with viewers for a total of 7.5 search hours, the most effort expended at any site. Sites 6 and 7 were considered the next best areas based on the numbers of mussels found. Survey times ranged from 0.5 to 1.5 hours using from 4 to 5 biologists (2 to 7.5 hours of total search effort) per site and were dependent on the extent of mussel aggregations in each area.

Quantitative survey. Yellow lampmussels were not found in any of the transect areas. Although the eastern elliptio was the most common species, a few alewife floaters, *Anodonta implicata*, were collected (Table 2). The highest densities of the eastern elliptio were located along Transect 1, averaging nearly 4 mussels/m² (779 mussels/200 m²). However, a 100 meter transect covered many different density aggregations of mussels which ranged from <1/m² to >50/m². The first 25 meters of the Transect 1 yielded 46% of the mussels collected over the entire 100 m. Of the five transects sampled, Transects 1 and 2 had the greatest numbers of eastern elliptios, but the most alewife floaters were collected from Transect 5. General surveys conducted along the shore, wading using viewers and SCUBA divers drifting along the bottom of the Holyoke Dam tailrace canal, yielded only eastern elliptio.

Discussion

The qualitative study was designed to assess the presence or absence of yellow lampmussels north of the Holyoke Dam. This effort was conducted because the identification of other aggregations of yellow lampmussels would better place into context the existence of aggregations below the Holyoke Dam. The quantitative survey in the area below the Holyoke Dam was designed to determine the size of any aggregations of yellow lampmussels that might remain in this river area where a juvenile has been collected in 1992.

The absence of the yellow lampmussel indicates this freshwater mussel, if present in this area of the river, is extremely rare. Of the two species collected, eastern elliptio and alewife floater, the most common mussel over the eighteen mile study area was the eastern elliptio. Alewife floaters, although documented, were rare in occurrence with only three live specimens being collected.
during the two days of effort. These data suggest that the yellow lampmussel juvenile collected in 1992 was an anomaly. Adults may still exist in this section of the river, but they are probably quite solitary and sparsely distributed.

**Conclusion**

The yellow lampmussel, *Lampsilis cariosa*, is extremely rare or absent from the eighteen mile stretch of the Connecticut River extending from North Hadley, Massachusetts down river to just below the tailrace canal for the Holyoke Dam. The most common freshwater mussel in this stretch of river is the eastern elliptio, *Elliptio complanata*. 
FIGURE 1. The sites and transects on the Connecticut River that were surveyed on August 14 and 15, 1995, respectively, for presence of the yellow lamp mussel, *Lampsilis cariosa*. 
TABLE 1 | General site descriptions and relative abundances of the eastern ellipsid, *Elliptio complanata*, during the August 1995 yellow lamppmussel survey of the Connecticut River over an eighteen mile area above the Holyoke Dam

<table>
<thead>
<tr>
<th>SITE</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>ABUNDANCE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>North Hadley-Hatfield</td>
<td>Shallow area in middle of river, exposed substrata approx. 100 m long and 30 m wide</td>
<td>Moderate</td>
<td>Surveyed by wading with viewer; substratum was coarse gravel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Western shore of river in deepest water, depth approx. 3 m</td>
<td>Moderate</td>
<td>Surveyed by divers; substratum was coarse gravel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eastern shore, north of shal, heavily vegetated, water depth approx. 1-2 m</td>
<td>Heavy</td>
<td>Surveyed by wading with viewer; substratum was fine sand and mud</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outer channel, eastern shore</td>
<td>Heavy</td>
<td>Hundreds of shells above water-line (clay/mud), all but two shells were <em>E. complanata</em>, two shells were <em>Anafronta implica</em></td>
</tr>
<tr>
<td>2</td>
<td>Canary-Scott Island</td>
<td>Very shallow area, approx. water depth 0-1 m, most of effort spent around Scott Island</td>
<td>Sparse</td>
<td>Surveyed by wading/viewers and snorkeling; bottom sandy, probably a lot of boat disturbance in area</td>
</tr>
<tr>
<td>3</td>
<td>0.5 miles west of Elwell Island</td>
<td>Natural rocky substrata on southern shore, water depth over 10 m fairly close to shore</td>
<td>Moderate</td>
<td>Surveyed by wading/viewers, shore walks and SCUBA; considerable amounts of fluffly sediments on rocks; all mussels <em>E. complanata</em>, generally the mussels were larger than those observed up-river</td>
</tr>
<tr>
<td>4</td>
<td>Elwell Island</td>
<td>Sampling primarily from east side of island, where water depths ranged from 0.2 m; backside of island stagnant with soft bottom and no mussels</td>
<td>Moderate</td>
<td>Surveyed by wading/viewers, shoreline walks and snorkeling; mussels very small, less than 2 cm in shell length, approx. 2-4 year olds, high energy waves (boat traffic) washing many of the mussels on/off the beach</td>
</tr>
<tr>
<td>5</td>
<td>Shepherd Island</td>
<td>Western side of island stagnant with a soft bottom covered by floating, suspended and attached algae, eastern side much deeper, but many submerged trees, mussels surveyed on eastern side of river</td>
<td>Sparse</td>
<td>Surveyed by wading/viewers and snorkeling, shallow sandy substrata, high energy waves (boat traffic)</td>
</tr>
<tr>
<td>6</td>
<td>Mule's Island</td>
<td>Entire perimeter of island surveyed, but mussel concentrations were highest at northeastern end of island</td>
<td>Moderate-Heavy</td>
<td>Surveyed by wading/viewers and snorkeling, shallow (0-2 m) sandy substrata; 100% <em>E. complanata</em>, all sizes of mussels present; growth appeared good</td>
</tr>
<tr>
<td>7</td>
<td>Bachelor Brook</td>
<td>West side of river opposite brook mouth, water depth over 3</td>
<td>Moderate-Heavy</td>
<td>Surveyed by SCUBA, 100% <em>E. complanata</em>, coarse sandy substrata.</td>
</tr>
</tbody>
</table>

Yellow Lamppmussel Survey, 1995

Holyoke Dam 5 of 6
on east side of river, mussels were not collected in the mouth of Bachelor Brook, which had a silky soft bottom and was heavily vegetated

*Relative abundance: sparse (1-10 mussels m²), moderate (1-50 mussels m²), and heavy (1-50 mussels m²)
<table>
<thead>
<tr>
<th>TRANSEC</th>
<th>LOCATION DESCRIPTION</th>
<th>ABUNDANCE ( \times 100 ) m²</th>
<th>SHELL LENGTH Min-Max</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Starting south of tailrace for the Holyoke Dam on the western side of river, approximately 35 m from shore, running 100 m up river and ending in front of the #3 overflow of the third level canal</td>
<td>770</td>
<td>40-98 mm</td>
<td>Surveyed using SCUBA with general surveys of shore line and shallow areas by wading using viewers 100% E. complanata, nearly half of the mussels collected along the transect were taken in the first 25 meters heading from south to north (from down river end), substrata fine sandy silt down river progressing to coarse gravel up river, some vegetation present</td>
</tr>
<tr>
<td>2</td>
<td>Starting approximately 40 m from western shore, east of the #3 overflow of the third level canal, running 100 m across the river, ending 50 m from the eastern shore</td>
<td>290</td>
<td>28-97 mm</td>
<td>Surveyed using SCUBA, only, 200 E. complanata and 1 Amphistegina compressa (38 mm), substrata cobble and sand across entire river, current very strong at times, giving the divers problems with staying on the transect line</td>
</tr>
<tr>
<td>3</td>
<td>Starting at the Holyoke Dam Boat Ramp on the east side of river, running 100 m down river approximately 20 m from shore</td>
<td>71</td>
<td>N/A</td>
<td>Surveyed using SCUBA, only, 100% E. complanata, identified by divers on bottom, substrata heavily vegetated (Fucus and Potamogeton)</td>
</tr>
<tr>
<td>4</td>
<td>Starting below Rt 116 Bridge and above the tailrace, approximately 20 m off a sandy peninsula in the center of river, running 100 m down river</td>
<td>4</td>
<td>N/A</td>
<td>Surveyed using SCUBA, only, 100% E. complanata, identified by divers on bottom, a large section of coal tar observed</td>
</tr>
<tr>
<td>5</td>
<td>Starting on the eastern shore of river just below Rt 116 Bridge and approximately 300 m above the Holyoke Dam Ramp, running 100 m down river approximately 20 m off shore</td>
<td>4</td>
<td>70-71 mm</td>
<td>Surveyed using SCUBA, only, 4 E. complanata and 2 A. compressa (105 &amp; 113 mm), identified by divers on bottom and brought to surface for measurement</td>
</tr>
</tbody>
</table>

*N/A - not applicable, because diver-identified E. complanata were not brought to surface for measurement*
APPENDIX D

MEETING NOTES RELEVANT TO T&E PLAN
MEETING NOTES SUMMARY

ATTENDEES: Paul Ducheney-IG&E
Joe Clark-IG&E
John Warner-USFWS
Ben Rizzo-USFWS
Bob Stira-NGS
John O'Leary-MA I'OEA
Caleb Slater-MA Division of Fisheries & Wildlife
Don Pugh-Trout Unlimited
Charlie Olchowski-Trout Unlimited
Tom Miner-CT River Watershed Council
Fred Szufnarowski-Kleinschmidt Associates
Kelly Schaeffer-Kleinschmidt Associates
Dave Robinson-Kleinschmidt Associates
Randy Dorman-Kleinschmidt Associates
Chris Frese-Kleinschmidt Associates

DATE: December 19, 2001

LOCATION: Holyoke Gas and Electric, Holyoke, MA

PURPOSE

Review the results of the December 5, 2001 flow demonstration and discuss the following: 1) full-depth louvers; 2) proposed solution to sturgeon entering the upstream attraction water supply system; 3) T&E plan for tiger beetles and mussels; 4) need for the Alden weir and floating apparatus; 5) Alden phase 2 research; and 6) the January 2002 agency meeting.

SUMMARY

Introductory Comments

Paul Ducheney opened the meeting and welcomed the participants. He announced that Holyoke closed the deal with Northeast Utilities on Thursday, December 13, 2001 at midnight.

Paul also mentioned that the rubber dam is in service and is working extremely well.

Paul concluded by reminding everyone that the City of Holyoke and Holyoke Gas and Electric Department are separate, distinct entities. Statements made by the City and political officials may not represent IG&E’s position.

Discussions

1. John Warner asked about the transition of the project from HWP in terms of personnel who will operate the project.
   • Paul explained that he has a core staff that are experienced in the operations of the Holyoke project. Paul personally selected these individuals based on their qualifications and commitment to IG&E’s operational philosophy.
Holyoke Meeting Notes

December 19, 2001

2. Paul discussed the distribution of water through the canal system. With the integration of the HG&E and IIWP units into the canal operations plan, water is now circulating through the entire 3-level canal system.

3. John O’Leary mentioned that Slim Shad Point is not accessible to persons with disabilities and would like to know when this facility will comply with the ADA. Paul said that this could be addressed as part of the CLRMP.

4. There will be an official consultation meeting on January 18, 2002. Specific dates and times were discussed. See Attachment A for a preliminary agenda and meeting details.

FLOW DEMONSTRATION

Fred summarized the December 5, 2001 flow demonstration and distributed draft-meeting notes for the agencies’ review and comment. Final notes will be distributed prior to the January 18, 2002 consultation meeting. Overall, the flow demonstration accomplished its purpose. Some problems were incurred maintaining the position of the bascule gate. HG&E will correct these problems by upgrading the bascule gate operating system in the first quarter of 2002.

Remaining work includes: 1) installing a permanent staff gage as well as an electronic gage at the Texon building; 2) repeating the zone of passage (ZOP) flow demonstration after the upgrades to the bascule gate operating system are complete; 3) performing the ZOP flow demonstration using the West rubber dam section; 4) performing the habitat flow demonstration using the East rubber dam section and the attraction water gate/bascule gate; and 5) repeat the ZOP flow demonstration during the spring migration season.

John O’Leary asked how the rubber dam would operate during high water conditions. Dave presented an overview of the rubber dam operations (Attachment B). The agencies prefer that the bascule gate not be operated first during fish passage season.

With the rubber dam and new license conditions, the impoundment will be operated much differently than in the past. Paul asked for the agencies support in contacting property owners and upstream users concerning the new reservoir elevations and operations of the rubber dam. Tom Miner of the CT Watershed Council suggested that this issue be included in the next Channel Marking Committee meeting (January/February 2002). Tom offered to coordinate this effort.

FERC may require some sort of safety warning when the bladders of the rubber dam are about to deflate. Paul mentioned that HG&E would likely install surveillance cameras in the bypass reach.
FULL DEPTH LOUVERS

The existing half-depth louvers (10-ft panels in the 20-ft deep canal) are very effective guiding surface migrants downstream. The new license requires evaluating alternatives like full-depth louvers to guide sturgeon and eels migrating downstream in the canal. HG&E would like to explore accelerating the installation of the full-depth louvers to take advantage of the fact that contractors are not as busy during winter months and fabrication costs tend to be lower. Installing the full-depth louvers would also enable HG&E to simplify canal/project operations and also help expedite development of various compliance plans required by FERC.

Dave Robinson led a discussion concerning the following design parameters:

a. Bar Racks or Louvers

Bar racks are perpendicular to the axis of the structure and louvers are angled 15 degrees. Research by Alden suggests that bar racks are slightly more effective at guiding bottom migrants when using a bottom overlay. John Warner pointed out that the louvers are much more effective at guiding surface migrants. Given the benefits for surface migrants, the consensus was to use louvers and to expedite their installation.

b. Bottom Overlay/Skirt

Research by Alden suggests that the full-depth louvers are more effective at guiding bottom migrants when the bottom 30-cm (approximately 12 inches) is solid. Reducing the louver panel area may be counter-productive due to higher velocities across the louvers.

Another concern is scour under the lower panels. Dave inspected the canal during the fall outage and found areas upstream of the louvers filled in with sticks, debris and silt; while other areas have not filled in.

The following plan was developed to address the above concerns. For the downstream most 40-ft section of louvers, the entrance ramp should provide adequate protection for this area. All of the eleven 40-ft. bays have a 12" high steel tube below the bottom of the louver panel. For the second 40-ft section, install a closure panel on the upstream face of the louvers. Cover the bottom one to two feet between the steel tube and the canal bottom to protect against scour. The need for any further modifications will be addressed after effectiveness testing.

c. Evaluation

Studies will be required to evaluate the effectiveness of the louvers for both surface and bottom migrants under all flow conditions. The effectiveness of the partial-depth louvers has been evaluated under certain flow conditions. The agencies suggested that it might be possible to use this data for evaluating effectiveness if the flow patterns and velocities do not change with the full-depth louvers. As appropriate effectiveness may also be evaluated using mark and recapture techniques,
Holyoke Meeting Notes
December 19, 2001

observations, and existing data and with new technologies (biotelemetry and x-vision). Further discussion on an appropriate evaluation measure is needed.

d. Trash Rake

Full-depth raking is essential for the full-depth louvers to be effective. A full-depth rake will be installed concurrent with the full-depth louvers.

e. Schedule

The window for installing the full-depth louvers and rake is before or after the upstream migration season. The canal must be kept in service during the migration season to provide attraction water. Dave checked with the preferred rake manufacturers and delivery before May (when the upstream season typically starts) will be difficult. Another factor affecting an expedited installation is the NMFS consultation. Due to the sale and transfer, communications with NMFS has been minimal and it is uncertain where the NMFS stands with the use of the louvers. Orders will have to be placed with fabricators in January 2002.

STURGEON AND UPSTREAM ATTRACTION WATER

The intake for the upstream attraction water supply is located at the bottom of the canal. At the Number 1 overflow, there are reports of sturgeon getting caught in the attraction water and being passed back into the river. Dave presented the proposed “Gooseneck” solution (Attachment C). The “Gooseneck” would effectively raise the attraction water intake to mid-canal depth. Ben Rizzo said the proposal would exceed the USFWS maximum velocity of 2 fps and require bar racks with 1-inch clear spacing. This effectively made the “Gooseneck” solution unworkable.

The agencies suggested exploring other alternatives including a surface intake (and evaluating whether or not surface species can survive the experience of going through the attraction water system) and exploring how to address the problem on the downstream end of the system. Dave agreed to look for other design alternatives and provide a status report at the January 2002 meeting.

ALDEN PHASE 2 RESEARCH

Dave presented the results of NU and IIG&E’s November 16, 2001 meeting with Alden Labs and will review and provide comments at the January 18, 2002 meeting. Another meeting with Alden will likely be required.

Don Pugh asked why the angled bar rack was not being considered for Phase 2. From Don’s perspective, the objective is fish exclusion and not guidance. Other team members noted that there are several technical issues associated with bar racks, including impingement.

John O’Leary asked if we know how and where the sturgeon are moving. The agencies acknowledged that there is a huge information gap. John Warner said that we do not want to be in a rush to build something and then find out that it does not work.
Caleb Slater acknowledged that the schedule in the 401 Certificate does not provide adequate time for the additional studies. He said that at this point, it would be sufficient to demonstrate progress and maintain a consistent effort in addressing the downstream passage issue.

**ALDEN WEIR APPARATUS**

With the rubber dam in service, HG&E would like to remove the Alden weir and associated apparatus on a trial basis. Ben Rizzo said that the effectiveness of the Alden weir is known whereas the rubber dam is unknown. Ben explained that the West rubber dam section is located further away from the Hadley Falls intake and he is concerned that the downstream migrants may not be able to find it. Alden has done a lot of research on this and Ben suggested that we contact them to get their thoughts on the proposal.

**THREATENED AND ENDANGERED SPECIES (T&E) COMPLIANCE PLAN**

HG&E is drafting a compliance plan for the T&E species with the exception of sturgeon and Atlantic salmon. To complete the draft, Chris Frese reviewed a list of talking points to get stakeholders input (Attachment D). The primary topics of the T&E plan will be mussels (in the canal), bald eagles, and the Puritan tiger beetle.

**Bald Eagles**
- Nesting platforms
- Preserving large white pines to accommodate natural nesting and perches
- Revisit buffer zone management – ensure appropriate set backs from river
- Protect known sites from disturbance, especially recreation
  - Couple of nests exist upstream (North) of the Oxbow
- Eagle count will take place over next couple of weeks – this might provide additional information on nesting and existing eagle population

**Puritan Tiger Beetle-Rainbow Beach**
- Enhancement-ROR-minimize fluctuations
- USFWS, MDFW and MDEP have developed an education program at Rainbow Beach
- Additional signage
- Fence off habitat
- Buoys and signs
- Mooring area or boat dock to limit people going ashore
- Puritan tiger beetles have also been found North of Rainbow Beach
  - Erosion, including sloughing banks may be a problem – need to identify and examine these other areas as well as alternatives to protect them
- Additional beetle surveys are scheduled this year
  - National Heritage might be taking the lead on those surveys. John O’Leary will find a contact (or an organizer)
  - Susan Vonoeppi is the USFWS contact for Puritan tiger beetles
Holyoke Meeting Notes
December 19, 2001

**Mussels**

The presence of one federally listed endangered species (dwarf wedge mussel) has been confirmed in the Connecticut River. The yellowlamp mussel is listed as a federal category 2, but currently has no formal listing status. The yellow lampmussel, which is a state-endangered species, has been known to exist in the 2nd level canal.

John Warner would like to expand mussel habitat in the canal to the extent practical and try to minimize drawdowns and associated operational impacts. This includes decreasing human contact on the mussels and no equipment on mussel beds.

The agencies said there was not enough water in the habitat areas of the canal during the 2001 drawdown. They noted that the water levels maintained during the fall 2000 drawdown were much better. In general, the leakage flows are doing a good job preventing stagnation. Weirs or some other means are needed to form pools in the habitat areas and facilitate more water in the 2nd level canal. The pools may have to be staggered to accommodate the slope of the canal invert. As far as pool depth, Don Pugh offered two criteria: 1) protect the mussels from predation, and 2) avoid over-stressing.

The (permanent) compliance plan for canal drawdown was due in October 2001. Due to the sale and license transfer, the schedule for completing the compliance plan is July 15, 2002. HG&E will perform a qualitative assessment of the above issues and review this with all parties before the spring outage so that during the spring 2002 outage, the mussels are protected. This should enable completion of a final canal drawdown plan prior to the 2002 fall drawdown.

John Warner suggested that we involve Tom French of National Heritage. John will also discuss the T&E plan with Susan Vonoeppi (USFWS). Caleb recommended that we contact Marlene Curran to get MA DEM input.

Before proceeding any further with T&E plan development, the agencies will provide their comments regarding bald eagles, puritan tiger beetles, and mussels.

**CONSULTATION MEETING**

The next stakeholder consultation meeting will be held on Friday, January 18, 2002 at 9:30 a.m. at 1 Canal Street in Holyoke, MA. The following draft agenda has been developed.

1. Stakeholder input on additional compliance plans. HG&E will develop a list of talking points/outline for the plans.

2. Discuss the scope of the Alden Phase 2 research effort. Agencies will provide their comments to the November 16, 2001 ARL meeting notes.

3. Discuss ADA angler access to Slim Shad Point.

4. Coordination of pond levels/rubber dam operations with marina owners. Tom Miner will take the lead on scheduling a meeting.
Holyoke Meeting Notes
December 19, 2001

5. HGi&E will review the water quality certificate and develop a draft schedule for the remaining compliance plans.

6. Discuss the functional design drawing.

A follow-up consultation meeting has been tentatively scheduled for April 3, 2002.
MEETING NOTES SUMMARY

ATTENDEES:
Paul Ducheny-HG&E
Ben Rizzo-USFWS
John Warner-USFWS
Caleb Slater-MDFW
Bob Stira-Northeast Generation Services
Joe Clark-HG&E
Tom Miner-CRWC
Bob Kubit-MADEP
John O’Leary-MAEFOA
Jen Anderson-NMFS
Carrie McDaniel-NMFS
Don Pugh-Trout Unlimited
Fred Szufnarowski-Kleinschmidt
Dave Robinson-Kleinschmidt
Kelly Schaeffer-Kleinschmidt
Randy Dorman-Kleinschmidt
Chris Frese-Kleinschmidt
Susan Board-Kleinschmidt

DATE: February 7, 2002

LOCATION: Holiday Inn, Holyoke, MA

PURPOSE

Team meeting to discuss progress and receive agency input on compliance plans.

SUMMARY

1. **Spring Flow Demonstration.** Overall, the agencies expressed satisfaction with the results of the December flow demonstration, and reiterated their desire to see the bypassed reach during the spring fish run. Caleb Slater noted that he also wanted to see flows discharged from points other than the bascule gate, including ZOP flows using rubber dam section 5 (Holyoke Side), the modified bascule gate and possibly rubber dam section 1 (South Hadley Side) and the bascule gate or rubber dam section 5. Caleb also wanted to see habitat flows using rubber dam section 1. Kleinschmidt will provide a summary table showing how the bascule gate and rubber dam sections will be operated to achieve these target flows.

John Warner questioned the 0.13’ shortfall on zone of passage (ZOP) flows, and asked how HG&E would operate the project during the spring run, without having first verified the specific gate settings that will produce the target ZOP water surface elevations. The team discussed the possibility of scheduling another flow demonstration before the spring run begins, and Kleinschmidt will investigate this possibility. One limiting factor is that the demonstration would have to occur after the bascule gate upgrade, which is scheduled for the middle two weeks of March.
HG&E Meeting Notes
February 7, 2002

As part of a discussion on reconciling the FERC license order with other mandatory conditioning documents, the group felt that focusing the discussion on water surface elevations, rather than cfs values, would be the best way to verify compliance to the satisfaction of all parties.

2. Alden Weir. David Robinson summarized the discussions held at the December meeting on the weir, and described the results of his investigation into the possibility of not replacing the weir this spring. HG&E believes that the weir is currently in disrepair, provides uncertain benefits, and is ultimately an interim measure. HG&E is also concerned that the weir interferes with upstream attraction water.

However, neither USFWS nor MADFW were receptive to removing the weir, particularly given the uncertain timeline for implementing permanent solutions. Despite any possible shortcomings, the effectiveness of the weir is a known quantity and, in the absence of modeling data, should be considered the default option. After further discussion, three possibilities were considered: (1) repair and install the weir, (2) perform effectiveness testing without the weir, and (3) keep the weir but remove the pier extension.

3. Full Depth Louvers. Louvers will be installed in fall 2002, to be followed by an inspection during the spring 2003 outage to ensure that erosion is not creating a gap beneath the bottom of the louvers. The louvers would have the same clear spacing as the partial-depth (2 in.) Flow patterns will be evaluated to see if existing tests from partial depth louvers can be reused. USFWS suggested participating in a field inspection of the substrate and topography under the louver array during the spring canal drawdown, to assess if a gap exists below the lowermost structural member and bottom of canal.

4. Fishway Attraction Water Intake (Gooseneck 2). David Robinson provided a description of the revised designs, which have been reviewed by Ben Rizzo. The new design for the intake structure limits surface velocities at 2 fps or less. The agencies approved the design and asked that it be submitted in writing for formal approval.

5. FERC Process. Kelly Schaeffer provided an overview of the upcoming relicensing of the Number 4 Hydro Project (FERC No. 7758). Number 4 is a canal project owned by HG&E; a notice of intent (NOI) will be filed by the end of February. HG&E also owns three other canal units, each of which has a separate FERC license. HG&E is proposing to relicense all four stations as a single FERC project. The agencies appeared generally receptive to this idea.

6. Mandatory Conditioning and Fishway Prescriptions. Kleinschmidt provided an updated matrix of fishway prescriptions, which details parallel conditions between the license order, 401 certificate, NMFS Section 18 prescription, and USFWS Section 18.
HG&E Meeting Notes  
February 7, 2002

The group worked through the matrix, identifying any issues that contain inconsistent or contradictory prescriptions. In general, most conditions were in agreement, and the few exceptions could usually be reconciled due to qualifying language in the prescriptions. Only a few items appeared to be fundamentally in conflict.

The group then discussed how to most effectively reconcile the conditioning documents. The goal as described by Kelly Schaeffer would be for the group to provide FERC with a unified group of prescriptions that (a) everyone agrees to, and (b) could be incorporated into the license. Possible options ranged from reopening the original prescription documents, to issuing addendums, to submitting to FERC a document outlining unified prescriptions. MADEP, USFWS, and NMFS all expressed reluctance over reopening their prescription documents. Both John Warner and Carrie McDaniels agreed to consult with legal counsel for their respective agencies, in order to determine how best to proceed and have an answer by February 21, 2002.

7. Canal Drawdown. Caleb Slater will provide pictures of the 2000 drawdown, when the No. 1 overflow was closed and water levels in the canals were higher. Don Pugh is interested in examining mussel habitats in the entire canal system, including whatever can be found of the yellow lampmussel in the substrate. All agree that mussel experts should be involved, and the 2000 drawdown plan should be repeated. An interim plan will be filed before the spring drawdown.

8. Operating Plans. Dave Robinson reviewed a graph showing trip points set by the manufacturer with the rubber dam. The elevations will likely be revised based on actual operating experience. A table summarizing the dispatch of canal units was also circulated and discussed.

9. Threatened and Endangered Species. Chris Frese is going to contact the T&E specialists from USFWS and MADFW. Sturgeon are being addressed in the passage plans and after further evaluation, they will be included in the T&E plan as well. A draft plan will be submitted in April.

10. CRLMP. Kelly Schaeffer detailed HG&E's ongoing efforts to revise the CRLMP. Several outstanding issues remain unresolved, including about 160 acres of Bachelor Brook and Stony Brook that are still HWP land, with conservation restrictions on about 30 acres. NU did not include these parcels in the sale of the project, and has valued the property at approximately one million dollars. Plans will be put together regarding Slim Shad Point and circulated among the agencies. The final issue discussed concerned the large number of rental properties on the project impoundment. HG&E is pursing options to address these properties.

HG&E has formally requested FERC to hold in abeyance the plan submitted by HWP, an action mirroring a request made by CRWC and several other stakeholders. A final CRLMP will be filed by Dec. 31, 2002.
11. **ARL, Phase 2 Research.** The group decided to proceed with ARL’s recommendations for the Phase 2 research program, and to schedule a team meeting after initial results were in.

12. **Upstream Fish Passage.** David Robinson presented a proposed schedule for completion of upstream fish passage, using two construction seasons. 2002 work is concentrated on functional design drawings, and construction will occur in the 2003 and 2004 fall seasons. An updated schedule showing how fish will be lifted in spring 2004 will be provided. Attempts will be made to minimize interruption during the fall seasons, and the feasibility of trapping during the fall season will be investigated. The conceptual design and preliminary drawings will be reviewed with resource agencies. John Warner emphasized the need to plan construction activities to ensure passage during the spring 2004 season.

13. **Accepted FERC Plans.** Kelly Schaeffer reviewed the five plans that have already been accepted by FERC including invasive species, water quality monitoring, shoreline erosion, and low flow contingency. All of the team members were content with the plans as submitted.

14. **HG&E.** Action Items will be summarized and prioritized, and smaller working groups will be formed. The next meeting is scheduled for April 3, 2002.
MEETING NOTES SUMMARY

ATTENDEES:

Paul Ducheney-HG&E
Ben Rizzo-USFWS
John Warner-USFWS
Caleb Slater-MDFW
Bob Stira-NGS
Chris Tomichek-HG&E
Joe Clark-HG&E
Tom Miner-CRWC
John O'Leary-MAEOIA
Jen Anderson-NMFS
Don Pugh-Trout Unlimited
Fred Szufnarowski-Kleinschmidt
Dave Robinson-Kleinschmidt
Randy Dorman-Kleinschmidt
Chris Frese-Kleinschmidt
Susan Board-Kleinschmidt

DATE: April 3, 2002

LOCATION: HG&E, One Canal St., Holyoke, MA

PURPOSE

Aquatics and Fisheries Team meeting to discuss progress and receive agency input on compliance plans.

SUMMARY

1. The revised February 7, 2002 meeting notes were reviewed and accepted.

2. Spring Canal Drawdown: Chris Frese reviewed the procedures that were followed to maintain watered conditions in the canal during the March 26-27, 2002 drawdown. The agencies agreed that conditions in the second level canal between Boatlock and Riverside Stations were much improved over the fall of 2001 and to their liking. John Warner suggested closing the No. 1 overflow as soon as work at Boatlock Station and full-depth louvers is complete. A suggestion was also made that the No. 2 overflow be inspected at the end of the spring outage, and that HG&E investigate keeping No. 3 overflow closed as much as possible. Comments were made regarding the full depth louvers, suggesting that they may reduce debris loading into the canal, which may reduce cleaning requirements and the amount of vehicular traffic in the canal.

Paul Ducheney noted that HG&E had received several complaints about the drawdown from owners of other canal projects, who could not get into their units during the drawdown to perform maintenance as expected. HG&E will notify affected customers of the modified procedures so appropriate steps can be undertaken.

Concerning future drawdowns the following suggestions were offered:
Holyoke Meeting Notes
April 3, 2002

• To meet FERC inspection requirements the No. 2 overflow needs to be inspected once each year. The inspection should be the last maintenance activity undertaken during the spring drawdown.
• Following the March 26 mussel survey several individuals visited additional sections of the canal, and noted that the upper portion of the second level canal is sloped toward the No. 3 overflow. HG&E will investigate keeping the No. 3 overflow closed during canal drainage procedures, which should allow water to pond in the upper portion of the second level canal.
• Although unknown at this time comments were made regarding the full depth louvers, suggesting that they may reduce both debris loading and equipment traffic between Boatlock station, the lower structure and the railroad bridge.

3. Canal Minimum Flow Plan: A draft plan was distributed for review and comment. The new license and water quality certificate require a continuous minimum release of 400 cfs into the canal. To verify compliance the water must be passed through turbines. The plan proposed by HG&E takes into account headgate openings and existing leakage to achieve the required 400 cfs minimum flow.

HG&E estimates leakage to be on the order of 400 cfs, +/- 100 cfs. This is significant because the priority of dispatch requires that the first 400 cfs of river flow be released into the canal. This means that during low flow conditions up to 900 cfs (400 cfs through generation + up to 500 cfs leakage) is dispatched into the canal before any water is released into the bypass reach.

Overall, the agencies expressed approval, however the suggestion was made to measure flows and velocities at various locations to confirm that water is moving through the three levels of the canals. HG&E will draft a plan that identifies the proposed locations of the velocity measurements and the method to be used. Based on measurements, operation tables may be modified to account for leakage.

4. Canal Operations Plan: Items 2 and 3 listed above will be compiled into a comprehensive canal operations plan that will be submitted to the agencies for review and comment. The plan is due at FERC on July 15, 2002.

5. ARL Phase 2 Research: The agencies agreed that modeling and analyzing the existing situation (i.e. Alden weir in place) does not need to occur. The meeting at Alden Labs for presentation of the initial research results will take place in late June or early July.

6. Sturgeon Exclusion: USFWS has reviewed and approved the conceptual design plan of the proposed exclusion structure at the No. 1 overflow and attraction water. NMFS also reviewed and approved the design and will send an official letter indicating their concurrence with the conceptual plan. Installation of the device is scheduled to occur during the 2002 fall canal drawdown.
Holyoke Meeting Notes
April 3, 2002

7. Full Depth Louvers and Rake: The louvers were inspected during the spring drawdown, and some gaps were found between the bottommost member and the substrate at the upstream and downstream ends. The gaps will be filled during installation of the full depth louvers. USFWS and NMFS reviewed and approved the conceptual design plans, and NMFS will send an official letter. The installation is currently scheduled for the fall dewatering (October 19 through 26, 2002). Critical path is delivery of the full depth rake is expected to take 6 months.

8. Basculle Gate Upgrade: A 2-day outage is necessary for installation, and will be scheduled for the end of the spring fish passage season.

9. Water Quality Report: The water quality report that was submitted to FERC and MDEP on April 1, 2002 was distributed. The temperature spike at noon on Day 4 of the constant monitor results monitored at the Project's intake, tailrace, and bypass (Table 2, Figure 1) was noted.

10. Invasive Species Report: A draft of the 2001 invasive species monitoring report was distributed, and HG&E reconfirmed that they will continue monitoring as has been done in the past. Monitoring will be discussed further at the annual meeting between HG&E, the Massachusetts Executive Office of Environmental Affairs (John O'Leary), and Conte Refuge staff.

11. April Flow Demonstration: The flow demonstration is scheduled for April 12, 2002 at 9:30 a.m. at Hadley Falls, river flows permitting. If the river flows are less than 28,000 cfs, we will observe Basculle gate and rubber dam #5 releases for interference with attraction water flows. If the river flows are less than 16,000 cfs, we will also observe ZOP flows in the bypass for the following three scenarios: 1) Basculle gate and attraction water flows; 2) Basculle gate, attraction water flows and rubber dam section #5; and 3) rubber dam sections no. 1 and 5. Until the spring flow demo is completed, the -0.15 ft reading on the Texon building staff gauge will be used for ZOP flows. Approach patterns at the Alden weir will be observed without the pier wall extension in place.

12. Comprehensive Operations and Flow Plan: A draft of the plan was distributed. Potential issues discussed included false attraction and apron surfing of fish under certain rubber dam operating scenarios. The agencies agreed to HG&E acquiring rubber dam operating experience and observing upstream fish passage under a variety of conditions. Site visits were scheduled for May 14, 21, 29, and June 4, 2002 to check for these conditions. In addition, the agencies suggested having Gene Lavoie and the fishway counting staff check the bypass reach and spillway apron for these conditions and note them on a standardized form. Based on this information, the plan for rubber dam releases may be changed to improve fish passage. Comments on the plan are due on April 17, 2002.

13. Fishlift Operations (Readiness): The louvers, the tailrace lift, and the AI. weir are ready for the fish passage season. The spillway lift is ready except for the hoist cable,
Holyoke Meeting Notes
April 3, 2002

14. Access, Security, and Safety: The protocol for site access was distributed and the agencies agreed that safety is a priority. Agencies will contribute names to form a standard list for access.

15. Fishway Operating Guidelines: The agencies received draft plans for review and comment. Two phone numbers were listed incorrectly, and are being changed. Caleb Slater requested that HG&E provide him with a list of potential fishway employees, which would afford MADFW the opportunity to screen potential applicants. HG&E also indicated that since the counting activities occur under the direction of MADFW that Caleb Slater or his designee should review operating and safety procedures with the seasonal fishway employees at the beginning of the spring passage season.

16. Evaluation of Tailrace modifications: A draft plan was distributed for comment. From a historical perspective Caleb Slater indicated that the entrance in the collection gallery located at Unit 2 was not working when Unit 2 was operating and Unit 1 was shut down. He suggested specifically testing the entrance with Unit 2 running and Unit 1 shut down. He also indicated random observations should focus on daily periods of peak shad activity (11 AM to 4 PM) during the peak of the passage season (10 May to 31 May) John O’Leary suggested using Gene Lavoie to observe the modifications’ effectiveness. Videotapes of fish using various entrances will be viewed by seasonal fishway employees as time permits.

17. T&E: The eagles and mussels can be drafted into the compliance plan at this time. The sturgeon issue cannot be addressed until unified fish prescriptions are developed and FERC accepts the BO. In addition, the tiger beetles need to be addressed first in the CRLMP, followed by the T&E plan. An extension of time request is going to be submitted to FERC for the T&E plan. However, during the extension period, HG&E will continue to work on mussel and tiger beetle issues with the appropriate agency staff.

T&E Follow-up Subsequent to the meeting HG&E learned that the FERC will accept a compliance plan that includes further research and development on shortnose sturgeon. HG&E will prepare a 4-section plan covering the tiger beetles, eagles, mussels and sturgeon. The first three sections will be complete. For the fourth section we will develop the sturgeon part as much as possible and then file the plan. We’ll amend section four as necessary as more information is developed on the sturgeon.
DRAFT
MEETING NOTES SUMMARY

ATTENDEES:
Paul Duchaney-HG&E
John Warner-USFWS
Caleb Slater-MDFW
Chris Tomichak
Joe Clark-HG&E
Tom Miner-CRWC
John O’Leary-MAESEA
Jen Anderson-NMFS
Don Pugh-Trout Unlimited
Fred Szufnarowski-Kleinschmidt
Dave Robinson-Kleinschmidt
Kelly Schaeffer-Kleinschmidt
Susan Board-Kleinschmidt

DATE: June 14, 2002

LOCATION: HG&E, One Canal St., Holyoke, MA

PURPOSE

Team meeting to receive agency input on Project Operations, Canal Operations, and T&E compliance plans.

SUMMARY

1. The April 3, 2002 meeting notes were reviewed. The discussion regarding removal of debris in front of Boatlock Station needs to be added (page 2, item 4).

2. Status Updates

   a) Full Depth Louvers: The structural steel contract is going out to bid in the next couple of weeks to install the louvers during the October drawdown. The same RFP is also being distributed for the sturgeon exclusion structure at the attraction water intake. The full depth rake will also be installed after the drawdown as soon as it is received. Until then, the top panels of the racks will be cleaned by hand.

   b) Eel Passage: Dave Robinson is working on the conceptu with Alex Haro of The Conte Lab and will report back to agencies within the next couple of weeks. Installation is scheduled for 2003. The possibility of conducting sampling and determining lift efficiency was discussed.

   c) Bascule Gate Upgrades: There will be a 1-2 day outage in July or August to conduct the work.

   d) Alden Phase 2 Research: Initial modeling is well underway and is about 75% completed. A meeting will be held during the week of August 12 to discuss findings.
c) Functional Design Drawing: The drawing currently consists of 6 sheets that are about 50% completed. There will be a dewatering this summer to survey and photograph the area to finalize the drawing. A construction plan and schedule will be submitted to FERC in December 2002.

d) Hadley Falls Unit 2 Entrance: HG&E will clean, restore, and relocate the V gate closer to Unit 1 during the dewatering. The gate will be modified for full travel. The above work will be completed in time for the 2003 season. Preliminary indications are that the modifications to the west side entrance have improved effectiveness. The geometry of the structure will be evaluated to determine what modifications can be made to make it operate more like the east side entrance.

g) ZOP Flows in Bypass: The Flow Demo notes were distributed. The wording of Item 3 will be revised to read “close Bascule Gate for 45-60 minutes several times a day.” The obstruction to upstream fish passage on the Holyoke channel will be investigated when the Habitat Flow Demo is performed during the week of August 12. Kleinschmidt will distribute a draft report of the May flow demonstration for review and comment. As noted in the flow demonstration notes, HG&E believes that Scenario 1 is more conducive to fish passage. For the immediate future however, they will operate the project for ZOP flows according to Scenario 2 (a reading of -0.05’ +/-0.1’ on the Texon gage).

3. Comments to the Comprehensive Operation and Flow Plan
   a) incorporate results of 5/29/02 flow demo
   b) Figure 1-1 should number the rubber dam sections
   c) Separate Parsons and Aubin
   d) Table 2-1-Priority 5 should read “to Unit 1 capacity”
   e) Table 2-1-Priority 7 should read “Hadley Falls 2 to capacity”
   f) Incorporate canal leakage into meeting the canal minimum flow
   g) Page 15: update target WSELs and staff gage
   h) Page 16-18: develop standard consistent language for notifications—use 401 language
   i) John Warner shared his experience with automatic data collection and emphasized that the data needs to be QC’d.

4. Comments to the Threatened and Endangered Species Protection Plan
   a) Detailed comments from the USFWS will be provided by Mike Amaral on the bald eagles, and Susi von Oettingen on the mussels and tiger beetles. They will review the plan and send comments via mail.
   b) Experts within the MDFW would like to submit comments as well. A meeting with state and federal experts will be arranged.
   c) Bald Eagles: Don Pugh would like the plan to address protection and enhancement of perching and feeding trees per the FERC license.
   d) Tiger Beetles: HG&E to meet with state and federal scientists
      i. HG&E to come up with a position on signage—either it used to educate or avoided because of potential vandalism
      ii. A pond level recorder will be added at Rainbow Beach
      iii. FERC never initiated consultation. If an agreement cannot be reached, USFWS will request formal consultation
HG&E Meeting Notes
June 14, 2002

- Shortnose Sturgeon: The working group is being reactivated
  i. a meeting will be held in the beginning of August
  ii. language will be added to the plan that the licensee will implement
  iii. findings of the working group
  iv. language will also be added to the plan that NMFS will have technical
      oversight and provide overall direction. HG&E will facilitate the group.
  v. John O’Leary suggested adding more detail on the working group, such as
     a schedule and periodic updates
  Jen Anderson would also like to see more detail on the working group in
     the plan

5. Comments to the Comprehensive Canal Operations Plan
   a) HG&E will make the Canal Operations Plan consistent with the Project
      Operations Plan
   b) Elevation in introduction is local datum, it needs to be changed to NGVD
   c) Page 9: include fall passage
   d) Pages 9 and 10: maximum canal capacity is listed as both 6590 and 6000 cfs.
      Change all to 6000 cfs
   e) Page 14: using leakage to meet minimum flows will not be approved until a study
      is conducted demonstrating adequate flow distribution and water quality
   f) Plan will state that HG&E will develop a field study plan to verify flow
      distribution with the agencies
   g) John Warner expressed his concern about leakage of habitat water over the
      duration of larger outages. Suggestions include:
      i. feeding more water through the headgates
      ii. raising the sill at the Riverside intake
      iii. expediting work on the first level canal and refill as soon as possible
   h) Agencies were happy with the drawdown procedure that took place in March, but
      the plan needs to reflect that. The plan will be modified to reflect that the No. 3
      overflow will be closed until the last day of the outage. As noted above (item
      5.g), the leakage issue was questioned for the longer fall outage
   i) Page 15: The plan needs to explain why it is not practical to build a weir to
      backwater the habitat in the first level canal. Survey data should be included in
      this. Don Pugh would like to see the first 1200-1400 ft of the first level canal
      watered
   j) Page 16: The plan needs to specify which species will be relocated (just state
      listed). If mussels are moved, it should not be done during the spring, suitable
      habitat should be chosen, and the population should be monitored to evaluate
      survival
   k) Page 17: Add “No. 2 Overflow stays closed.” This will water the first level canal
      as soon as possible
   l) Page 18: Item 8 should describe how mussels will be identified
   m) Page 18: There are no Atlantic Spike mussels in the CT River
   n) Page 18, Section 4, 2nd paragraph: According to the FERC license, the objective is
      to enhance/expand the habitat
   o) Page 19: The license calls for annual monitoring for 6 years. USFWS believes it
      is better to monitor over a longer period time every 2 or 3 years
6. Wrapping-Up

a) The tiger beetle meeting will be scheduled
b) The mussel meeting is scheduled for June 27, 2002
c) Some of the compliance plans cannot be completed at this time and will contain sub study plans to address information that will become available in the future.
d) Schedule a kick-off meeting for SNS working group
e) ARL Phase 2 meeting is scheduled for August 13-15, 2002
f) The bypass flow demonstration and investigation of channel modifications will be scheduled for August 13-15, 2002
MEETING NOTES SUMMARY

ATTENDEES: Pat Huckery-NHESP/DFW
Don Pugh-TU
John Warner-USFWS
John O’Leary-EOEA
Chris Tomichek-HGi&E
Chris Frese-Kleinschmidt Associates
Susan Board-Kleinschmidt Associates

DATE: June 27, 2002

LOCATION: Holyoke, MA

PURPOSE

To discuss comments to the Threatened and Endangered Species Protection Plan and discuss measures to effectively protect and enhance species identified.

SUMMARY

1. Mussels

   a) An experimental weir will be built at the end of the first level canal. Its purpose is to pool water during future drawdowns.

      - The weir will be made of sandbags, since an engineering analysis of stop logs and other construction materials was determined not to be feasible due to silt deposition in the Canal

      - Agency members would like to see a weir constructed that ponds water in the first level canal up to the first intake (Aubin) which is located approximately 750 ft up the first level canal from the railroad bridge located at the head of this canal. To pond water in the first level back to the Aubin intake, a four foot weir needs to be constructed (see attached table). Although agency members indicated that they would like the weir to pond four feet of water it was understood that final weir design would be based on results of further engineering and operational analysis. It was also understood that the weir may not pond water as desired.

      - The experimental weir has the potential to change sediment deposition and/or the distribution of mussels in the first level canal and/or the second level canal in the immediate vicinity of the weir. As a result a plan will need to be developed to assess the affects of the weir.

      - The plan will be include a monitoring program to access effects on the mussel population, and sediment build up or erosion including the effects of water velocity. It is anticipated that monitoring will be conducted on both sides of the weir.
Holyoke Meeting Notes
June 27, 2002

- During the fall 2002 drawdown, the weir will be installed and monitoring sites and/or transects will be identified by members of the mussel team

b) Canal Drawdown Procedure

- Except for this fall, the headgates at No. 3 overflow will be closed
- New bullet should be added stating that the No. 2 overflow remains closed throughout the fall drawdown (Note: once gate has been tested during spring drawdown no need to open during fall drawdown unless required to facilitate maintenance activities)
- Since the water continued to drain from the canals during the March 2002 drawdown, the agencies agree that the No. 1 overflow needs to be opened first. Once maintenance activities have been conducted, such as examining the louvers, debris removal, and scheduled maintenance activities, the overflow should be closed, allowing water back into the second level canal as soon as possible
- Although the license order states that minimum flows must be maintained, all agreed this was impossible but would like language in the plan indicating that a feasible attempt will be made to keep some water flowing during drawdowns in the three canals around scheduled maintenance activities.
- Include that heavy machinery will only be added when necessary

c) Canal Monitoring

- Agencies reinforced that the plan should mention monitoring mussels every 2-3 years for 12 years
- agencies would like the plan to include a monitoring schedule
  the schedule can say “amended as operation continues”
- During the fall drawdown, transects will be sited in the first and second level canals. Transect selection will meet the requirements of “adaptive cluster sampling” which will allow the plan to meet multiple objectives including: 1) identification of rare mussels and 2) density determinations of resident mussels.
- transects will not be placed every 100 feet, placement needs to be based on where mussels are concentrated
- HG&E should hire someone (names of several grad students were mentioned) to assist with transect placement as well as conduct the survey
- Most transects should be located in the first level canal, however there are two areas in the second level canal where transects should be located (in pooled area near discharge of Boatlock station and near the entrance to Riverside Station)
- Include a map in the plan showing where the transects used to be and where the proposed transects will be located
- Agencies would like to see more in the plan discussing the necessity and frequency of drawdowns
Holyoke Meeting Notes
June 27, 2002

River Monitoring
- Mussels sampling in the river should be conducted differently than in the past
  1. In the past, divers would bring up mussels from the river bottom to be identified
  2. Divers should instead be trained to look for glochodia when mussels are displaying. Rare mussels and common mussels display differently
  3. Transects should be set up to look for species, then when rare mussels are found conduct cluster surveys

Last report on river survey should be added as an appendix

Note: Add details and specifics to Plan when possible. When plan is not specific, explain why.

2. Puritan Tiger Beetles
   a) Overall, the tiger beetle portion of the plan needs more specifics and more integration between plans is necessary. For instance, the invasives species plan, shoreline plan, and land management plan should be cross-referenced with the T&E
   b) Vegetation management is a good idea, but if too much is cleared, especially on Rainbow Beach, invasives will grow
   c) HG&E must send a proposal to the Dept. of Environmental Law Enforcement saying they want to set up a no-wake zone at Rainbow Beach
   d) Cove Island would be a great place to transplant tiger beetles. If the island becomes available for public recreation, the city should first set up protected areas where no trespassing is allowed. Therefore, the public will not have beach area “taken away” from them as on Rainbow Beach

3. Discussion of Puritan Tiger Beetles with Susi von Oettingen (June 28, 2002)
   a) Even though the CRLMP is not completed, the plans should still mention protective measures that each is going to take
   b) When HG&E offers help with research, she would like to see something more consistent. The USFWS needs to know that if they need help, they will be able to call someone and get it
   c) HG&E needs to be a full-fledged partner in helping to save the beetles
   d) A cooperative agreement with the state should be established to help put up signs, buoys, channel markers, and post speed limits
   e) A number 1 priority is public outreach — flyers should be distributed at the marinas and public launches
      - Flyers will tell people to start using Mitch’s Island as a rec site
      - Warn public to avoid protected areas
      - Material will put HG&E, USFWS, and possibly the state, CRWC, and TU as partners in trying to protect habitat
   f) An interpretive display would be helpful at the bike path
Holyoke Meeting Notes  
June 27, 2002

4.

- The boat trip for invasive species needs to be scheduled for early August, and it will become a tiger beetle habitat search as well.
APPENDIX E

SCHEDULE
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*Note: The dates correspond to the timeline on the diagram.*
APPENDIX F

STAKEHOLDER COMMENTS
June 7, 2002

Fred Szufnarowski  
Project Manager  
Kleinschmidt  
PO Box 1050  
Deep River, CT 06417

Re: Holyoke Project (FERC No. 2004)  
LA 416: Threatened and Endangered Species Plan

Dear Fred:

I have reviewed the May 2002 draft “Threatened and Endangered Species Protection Plan” (the Plan) and have a number of comments on Sections 2 and 3 dealing with, respectively, American bald eagle and Puritan tiger beetle protection. I am concerned that the Plan articulates little in the way of substantive effort by HG&E to protect these important species as required by Article 416.

Introduction

In the list of attendees at the December 19, 2001 stakeholder meeting, the Plan lists the Conte Refuge; however, the meeting notes (Appendix C) do not indicate that anyone from the Refuge attended, nor do I recall anyone present. (Also, the full name of the Refuge is the Silvio O. Conte National Fish & Wildlife Refuge - the Plan left out “Fish.”) To my knowledge, all consultation with the Refuge has been conducted separately from the cooperative stakeholder process.

Section 2 – American Bald Eagle

The only measure proposed by the Plan to protect and enhance bald eagle habitat is for HG&E to provide an unspecified number of nesting platforms in safeguarded areas (safeguarded area described as currently protected areas or an area with open space easements). The Plan proposes a schedule for action a year from now. These actions are characterized as a “proactive approach.”

CRWC finds the Plan to be seriously deficient, and hardly proactive. It provides no information about the bald eagle population in the project area, nor any assessment of existing and potential habitat. More important, the Plan includes no measures to protect bald eagle habitat as required by Article 416.

To remedy these deficiencies, CRWC believes the Plan should include a map of the project area that identifies existing and potential nesting, perching and feeding sites. Further, it should detail what actions HG&E will take immediately and over the life of the license to protect primary sites and the buffer they require. An effective plan will require a commitment of funds to acquire easements, or fee interest if appropriate, to protect bald eagle habitat.
CRWC Comments - Threatened & Endangered Species Plan

CRWC sees no reason why HG&E cannot initiate the nesting platform measures described in Section 2.1 this year. Monitoring (Section 2.2) should be carried out in consultation and partnership with MDFW and USFWS and include nesting, perching and feeding sites. The Plan should indicate that monitoring will occur over the life of the license, not just for the first five years. The entire Plan should be reviewed in consultation with MDFW and USFWS and updated as needed at least every ten years.

Section 3 - Puritan Tiger Beetle

The Plan should include a map of existing and potential Puritan tiger beetle habitat in the project area and a detailed map of Rainbow Beach (which is located in Northampton, not Easthampton).

The Plan lists five principal threats to the globally significant Puritan tiger beetle in the project area – hydraulic changes caused by dams, reduced beach habitat, reduced bank erosion stabilization, pollution, recreational use of the Connecticut River, and encroachment of woody plants into the beetle’s primary habitat. While the change of project operation to run-of-river addresses the first threat, the Plan itself does little to address the other threats. Providing educational brochures and a display at the Barrett fish viewing facility, which is open only six weeks a year, and consulting with MDEM about a no-wake zone cannot be considered a commitment to cooperate with state and federal agencies to educate the public and police recreational activities as required by Article 416.

We believe the Plan should identify all existing and potential Puritan tiger beetle habitat in the project area and present a plan of action by HG&E for their protection. (While this is beyond educating and policing the public, it is fully within the scope of Article 418, the Comprehensive Recreation and Land Management Plan.) The Plan should assess the degree of threat from each of the threats cited in the above paragraph, and identify measures to be taken by HG&E to address each. This should include consideration of acquisition of fee interest or easements to insure protection of threatened areas of habitat.

Unquestionably, the greatest threat to Puritan tiger beetles is recreational use of the Connecticut River and Rainbow Beach. A no-wake zone is highly unlikely in this heavily used section of the River by large and small powerboats. Even if one were created, its enforcement would be virtually impossible without the constant presence of the MA Environmental Police. The most appropriate measure is public education aimed at recreational boaters, as well as the general public.

Public education has to be an ongoing effort from May to October over the life of the license, and provided directly to boaters, not at a usually closed facility below the Holyoke Dam. HG&E should prepare brochures and signage that can be displayed and distributed at all marinas and boat launches serving the Holyoke Pool. Public outreach must also include the many property owners with docks on the River in the project area. Again, this has to be an ongoing effort.

Data on this Puritan tiger beetle population are essential for an effective effort to protect and enhance this species. HG&E should do more than just “follow research” (Section 3.2). We believe the Plan should include a commitment to support this research. And based on the research, the Plan should include provisions for new and/or expanded efforts by HG&E to insure this globally significant species is protected over the life of the license.
Thank you for the opportunity to comment on the Plan. I hope these comments will lead to revisions that will provide the protection of threatened and endangered species required by Articles 416 and 418.

Sincerely,

Tom Miner
Executive Director

cc: Paul Ducheny, HG&E
Distribution List (via email)

Distribution List
Jennifer Anderson, NMFS
Beth Goettel, Conte Refuge
Bob Kubit, MDEP
Terry Blunt, MDIEM
John O’Leary, MEOFA
Pat Huckery, MDFW
Ben Rizzo, USFWS
Susi von Oettigen, USFWS
John Warner, USFWS
Don Pugh, TU
DEERFIELDS/MILLERS CHAPTER

June 21, 2002

10 Old Stage Road
Wendell, MA 01379

Fred Szufnarowski
Kleinschmidt
PO Box 1050
Deep River, CT 06417

Dear Fred,

Following are Trout Unlimited’s (TU) comments on HG&E’s Threatened and Endangered Species Protection Plan (Plan).

Bald Eagles

Federal Energy Regulatory Commission (FERC) requires protection and enhancement of eagle perching and feeding activities. HG&E only proposes building nesting platforms in the area of perching and feeding trees. This does not constitute protection or enhancement of perching or feeding activities. Protection or enhancement would seem to require ensuring that these trees are not cut down and that human activities in the vicinity of these trees does not disturb or interfere with perching or feeding.

As the effects of the project will be ongoing, monitoring and reporting should be for the term of license.

Puritan Tiger Beetles

As the effects of the project will be ongoing, monitoring and reporting of Puritan tiger beetles should be for the term of the license.

Freshwater Mussels

The structure of past and present drawdowns, essentially one in the same, is described. Drawdowns occur in the spring for a short time period and in the fall for a more extended period. The impact of the fall drawdown is of much greater consequence for mussels in the canal. The canal drains much more completely during this period and reaches of the canal that may not become dry in a day or two become dry in 5 to 7 days. Section 13 (d) of the Water Quality Certificate requires the evaluation of the need for and the frequency of canal drawdowns. HG&E should describe why two days in the spring and a week in the fall is required for drawdowns as well as measures that will be taken to shorten these periods.

Article 409 of the FERC license requires that the canal operations plan include a “(3) description of any modification of structures necessary to achieve minimum canal flow requirements and conditions protective of mussels during (emphasis added) maintenance drawdowns; ...”. There
is no indication in the FERC license that the minimum flow in the canal during drawdowns is different or anything less than the FERC requirement of 810 cfs from April 1 to November 15 and 400 cfs from November 16 through March 31 (Article 406). The Plan should describe how minimum flow would be passed during canal drawdowns and any structures necessary to achieve this goal.

Elliptio complanata is the correct spelling. The common name is Eastern Elliptio. The common name of Elliptio producta is Atlantic spike.

The citations for “NUEL 1997” and “Werle 1999” should be provided.

While discoveries of yellow lamp mussels in the mainstem of the Connecticut River are encouraging, the total number reported is only eleven. Of these animals, only one is a male and the sex of three is not identified. This is hardly a vigorous population or necessarily one that is expanding. Considering the broadcast method of reproduction, if the location of the male is downstream of the females this population if functionally extinct. Rather than being viewed as a resurgent population, these animals may be a remnant of a population on the decline, as is the entire population in the Connecticut River. The lack of prior surveys in the area precludes drawing conclusions as to the status of this mainstem population in regard to whether it is resurgent or declining.

Reassessment of mussel populations in the canal, and the protection thereof, is appropriate and required by both the Massachusetts WQC and the FERC license. Reassessment of mussel populations does not mean redefining the canal system as something other than aquatic habitat. The canal system is a part of the waters of the state of Massachusetts. Nor does reassessment mean, in light of the location on a very small number of yellow lamp mussels in the mainstem of the Connecticut River, that the canal is no longer a refuge for yellow lamp mussels. Clearly it is a refuge.

Protection and enhancement of the population in the canal, rather than elimination (by relocation to the Connecticut River), should be the goal of the Plan. Protection and enhancement of the mussel population is the goal of Article 409 of the FERC license. The Plan should be a framework to enhance mussel populations through protection of the existing sections of the canal that have remained wetted during past drawdowns and increasing the area of the canal that remains wetted during future drawdowns.

Anodonta implicata (Alewife floater) and E. complanata are described on page 12 as thriving and on page 14 as moderate. A. implicata is not thriving in the canal system. Even in the areas where numerous E. complanata were observed during the drawdown site visit in the spring of 2002, few live A. implicata were observed. The population of E. complanata is reasonably described as moderate in some areas of the first and second level canals.

TU agrees with the Plan regarding zebra and quagga mussels and does not support their presence in the canal system.
HG&E implicitly acknowledges that the canal is aquatic habitat by providing minimum flows, fish bypass protection, and developing a plan to protect mussels. It sees, as one of the benefits of minimum flows, increased opportunities for fish to enter the canal and postulates that these fish can be hosts to glochidia. HG&E describes the additional deposition of glochidia in the canal as mussel enhancement. Unfortunately neither the fish nor the glochidia are aware of the reaches that HG&E seeks to keep watered during drawdowns. Deposition of glochidia in the canal is independent of drawdown conditions. Survival of glochidia is dependent on many factors: velocity, substrate, food supply, predation, and respiration. Dewatering is not considered favorable for survival.

Section 4.2
It is unclear that any dwarf wedgemussels have been located in the canal system.

TU is opposed to relocation of mussels from or within the canal except in very special circumstances. Relocation does not ensure adequate protection. Survival of mussels after relocation, as reviewed in Cope and Waller (1995), is highly variable with a mean success of only about 50% across the thirty-three studies reviewed in their paper. In addition to this significant mortality, all mussels would not located for transplanting due to burrowing, as a defense mechanism, upon dewatering (Samad and Stanley 1986) and the small size of juvenile mussels. Juvenile mussels are difficult to locate with visual searches (Hombach and Deneka 1996, Obermeyer 1998) and would constitute the large majority of mussels colonizing the canal between drawdowns.

Mussels in the canal are most directly impacted by dewatering during drawdowns. Maintaining water in reaches such as Boatlock to Riverside in the second level canal can be achieved by not opening the #2 overflow gates until the last 24 hours of the drawdown. A similar operational modification at the Holyoke #3 end of the second level canal could be employed to maintain water in that end of the canal. Backwatering of the first level canal from Boatlock to the bypass louvers should be done as soon as possible after debris in front of the Boatlock racks is removed. With installation of the full depth louvers in the fall of 2002 the need for dewatering in front of Boatlock may be eliminated. The positive impact of this will be considerable as heavy machinery will no longer be put in the canal to move this debris from in front of Boatlock Station and the reach will remain watered throughout the drawdown.

In addition to these operational modifications proactive measures are also needed to protect the 1st level canal segment that runs north to south. Construction of a weir, or a series of weirs, south of the railroad bridge at the north end of this canal segment would keep significant mussel habitat wetted. The FERC anticipated the need for weirs in Article 409: "(2) specific procedures for installing a sandbag weir, or other appropriate measures, to maintain watered conditions in areas of the canal necessary to maintain mussel habitat; ..."

TU agrees that the greatest likelihood of observing female yellow lampmussels occurs when they are displaying. Counting, measuring, and marking may be appropriate depending on monitoring or research needs but moving to another canal level is not. Mussels that are likely to be dewatered during drawdowns should have their locations marked so that during the fall drawdown, after the reproductive period, they can be relocated and moved to the nearest suitable
area in the same canal level. As sexually mature females are unlikely to occur in dewatered areas this condition will likely be very infrequent. With the construction of the weir/weirs in the north/south segment of the first level canal, the necessity for relocation will be greatly reduced.

During the October drawdown surveys only dewatered mussels should be relocated to the nearest suitable habitat in the same canal level. In the October survey all mussels other than *E. complanata* in dewatered habitat should be relocated. All mussels other than *E. complanata* should be counted and measured. *A. implicata* is the only species that might exceed the 5% threshold proposed for measurement. Determination of the percentage of *A. implicata* of the "total population" will likely be difficult during the survey. If this or another species rebounds to exceed some burdensome level for measurement, consultation with the parties should be undertaken to modify the above-recommended protocol.

Eight 0.25 m² samples 10 cm deep should be screened at each transect. Juvenile mussels should be identified and counted and returned to the substrate. Preservation of rare mussels is contrary to maintaining and enhancing their populations.

The locations of the seven areas in the mainstem Connecticut River, reasons for their selection, and specifics regarding the survey protocols should be provided in the final plan.

4.3

TU recommends the construction of a weir south of the railroad bridge in the north/south segment of the first level canal. The first level canal in the "Boatlock to railroad bridge" reach is historic yellow lampmussel habitat. Protection of the high quality habitat in the first level canal is justified. This is an area where thousands of live mussels were observed during the spring 2002 canal drawdown. It is also an area where many times more shells of dead animals were observed. Based upon the mobility of mussels and the relatively low velocities in the canal, shells in this area are likely a result of mussels that died in this area.

The procedure for clearing areas of mussels when required heavy machinery is necessary during drawdowns should be described. As greater than 50% of mussels may be under the substrate (particularly in the early spring and late fall) (Amyot and Downing, 1991) procedures for clearing these mussels should be described.

4.3.1

The area in front of Boatlock should be cleaned without putting heavy machinery in the canal. Sediments moved from in front of Boatlock in prior years should be removed from the north/south segment of the first level canal. This sediment has been placed in the general area that yellow lampmussels have been located in the past. It degrades habitat in an area of the canal that has good habitat where this debris and sand do not occur.

4.3.2

The modified procedures for drawdown of the second level canal in the spring of 2002 were satisfactory in so far as the size of the pool created from Boatlock and Riverside is concerned. The pool, though, dropped 1.8" per hour on March 27. While this cannot be expanded to accurately describe pool depth at the end of a 5-day period the daily drop, at this rate, would be
3.6 feet per day. Maintaining of the Boatlock to Riverside pool will require inflow through the drawdown.

Accomplishing this will require flow through the first level canal throughout the drawdown. Work in the first level canal will need to accommodate these flows. Exceptional construction projects (e.g. full depth louvers) may justify some flow minimization or require development of alternative means to maintain second level pool depths. Flows through the first level canal to the Boatlock station should be sufficient to backwater the first level canal to the louvers and to maintain the level of the pool from Boatlock to Riverside. Flows through the first level canal and backwatering of the first level canal will protect habitat from the Gatehouse to the Boatlock station and ensure that the pool from Boatlock to Riverside does not shrink through leakage and seepage.

Waste gates at the #3 overflow and any other means of draining that end of the second level canal should be closed until the final 24 hours of the drawdown to maintain water in that end of the second level canal. It is unclear how the #3 overflow gates can be used to maintain the pooled area between Boatlock and Riverside.

4.4
There is no description in the text of the Plan of the weir at the #2 overflow listed as a protection or enhancement measure on page 19. Conditions that would cause the weir to be necessary should be described as should the difference in protection from the present proposal of keeping the #2 overflow gate closed.

No machinery should be placed in the first level canal for routine clearing of debris in front of the Boatlock station.

4.5
Based on five years of mussel survey information HG&E should provide recommendations to MADEP, MADFW, and USFWS for future work required to protect mussel populations and for survey work to assess these measures or to ensure that canal operations do not negatively impact mussel populations during the remainder of the license term.

**Shortnose Sturgeon**

The Massachusetts WQC requires the installation of an angled bar rack or alternative structure at the Hadley Falls intake, "...". Ongoing consultation and evaluation of options will determine the nature of the protection structure that will be installed.

5.1
TU is unaware of previous field-testing of the partial depth louvers with sturgeon (bullet #3), the results of which are proposed for incorporation in the evaluation of full depth louvers. The results of these tests should be included as an Appendix.

Thank you very much for your consideration of these comments. If you have any questions, I can be reached at 413 863 3832 or at the above address.
Sincerely,

Donald Pugh

cc.

Paul Duchney, HG&E
John Warner, USFWS
Susi von Ottengen, USFWS
Caleb Slater, MADFW
Pat Huckery, NHESP
Bob Kubit, MADEP
John O’Leary, EOEA
Tom Miner, CRWC

Literature cited:


June 4, 2002

Susan M. Board
Kleinschmidt Associates
161 River Street
P. O. Box 1050
Deep River, CT 06417

Dear Ms. Board:

I reviewed the Draft HG&E Puritan Tiger Beetle Plan as requested in your April 18, 2002 letter and offer the following comments. My response also incorporates comments provided by the Silvio O. Conte National Fish and Wildlife Refuge and state biologists who reviewed the draft plan. Per our discussion via e-mail on May 14, 2002, I am providing some background information prior to my review of the draft plan.

Background Information

Historically, the Puritan tiger beetle (*Cicindela puritana*) was collected at numerous sites along the Connecticut River in the 1800s and early 1900s. Eleven historical records indicate that the tiger beetle occupied riverine beach habitat along the Connecticut River between Claremont, New Hampshire and Cromwell, Connecticut. Barry Knisley in a 1987 status report observed that "environmental disruption"—in particular, the building of dams—most likely was the major cause in the extirpation of these sites. The extirpation of nine of these populations occurred in the early 1900s. After 1936, no collection records were documented from the Connecticut River. At least two known sites (Claremont and Charlestown, NH) are now inundated. Two small populations are currently found on the Connecticut River, one on Rainbow Beach in Northampton, Massachusetts and one near Cromwell, Connecticut. There are probably no additional extant populations of the tiger beetle in the region.

The U.S. Fish and Wildlife Service (Service) determined that there were adverse effects to the Puritan tiger beetle from activities authorized in the license approved by FERC for the Holyoke Hydroelectric Project. Adverse effects included accelerated erosion of existing and potential habitat, recreational impacts on currently occupied habitat, and recreational impacts on tiger beetle feeding and reproduction (October 7, 1999 USFWS letter to FERC, May 26, 2000 USFWS letter...
to Northeast Utilities Service Company). In both letters, the Service stated that erosion of occupied and potential tiger beetle habitat may reduce the area available for egg deposition and larval habitat. The Service noted that erosion areas along the Connecticut River (within the scope of the project) were identified in the Final Environmental Impact Statement and included larval habitat north and east (opposite bank) of the currently occupied habitat. The FEIS noted that the erosion would continue in part due to "inflow variations, high flows, and natural and boat-induced wave action."

The Service provided potential measures to eliminate or reduce adverse effects in the October 7, 1999 letter to FERC. These measures included:

- Implementation of a "no wake" zone at occupied tiger beetle sites as well as potential habitat.
- Identification of potential tiger beetle habitat for protection, restoration and management.
- Minimization of recreational impacts to tiger beetles and their habitat through education and policing of recreational activities (i.e., enforcement of "no wake" zones and no camping restrictions).

**Plan Review**

Outreach and public awareness is an important component of Puritan tiger beetle recovery. The draft plan states that Holyoke Gas Electric (HG&E) will cooperate with the Service and Massachusetts state agencies in public education efforts, but does not clearly identify actions that HG&E might take. According to the draft plan, HG&E is willing to distribute informational brochures at the fish viewing facility, although these brochures currently do not exist. Moreover, we are uncertain as to how the brochures will minimize recreational impacts on Rainbow Beach, since we are unaware of a correlation between the visitors at the fish viewing facility and the recreational users at Rainbow Beach. The draft plan states that HG&E will provide explanatory and "no wake" signs at tiger beetle habitat. The creation of a "no wake" zone is vital, although signage without enforcement will be ineffective and will not result in increased protection. The draft plan did not provide measures to implement the "no wake" zone.

The in-kind services mentioned in the draft plan, e.g., historic water level elevation data, impoundment maps and hydrology information provided to the Service and the state upon request will be useful, but will merely describe the effects of water level variations on adults, larvae and habitat. This information will not minimize or avoid adverse effects, or result in beneficial effects if flow regimes or water release schedules cannot be subsequently affected.

And finally, we wonder what the basis of an annual report on tiger beetle activities will be, since HG&E has not proposed any research, concrete conservation actions or funding of activities benefiting tiger beetle recovery.
Recommended Conservation Measures

In order to comply with the conditions of the FERC license and develop an endangered species plan that addresses recovery actions as well as actions that would minimize adverse effects resulting from dam operations, we recommend that the following be incorporated into a revision of the draft plan:

1. provide alternative camping and day-use areas to relieve recreational pressure at Rainbow Beach;
2. provide funding for any or all of the following:
   a. research on recreational impacts on tiger beetle feeding and reproductive behavior;
   b. population augmentation (moving larvae) on Rainbow Beach;
   c. research on vegetation management in order to maintain existing habitat and/or create additional habitat;
   d. staff to enforce “no wake” zones;
   e. development, production and distribution of education material targeted at recreational users (boaters) of Rainbow Beach;
   f. monitoring the Rainbow Beach population;
3. acquire (through easements or fee-title) tiger beetle habitat in the area around Rainbow Beach and/or potential habitat identified by qualified biologists;
4. provide assistance in removal of invasive plant species in areas identified as potential habitat (either staff, equipment and/or funding).

The Service is also interested in protecting potential habitat downriver of the Holyoke Dam project and would be willing to discuss possible conservation actions with HG&E, although we realize that these areas are outside of the project’s geographic scope.

Thank you for your cooperation. If you have any questions regarding our comments, please call me at 603-223-2541 ext. 22.

Sincerely yours,

[Signature]

Susanna L. von Oettingen
Endangered Species Biologist
New England Field Office
CC:  Reading File
John Warner, FWS-NEFO
Michelle Babione, SOCNWR
Chris Davis
201 West Pelham Road
Shutesbury, MA 01072
Tim Simmons, MADFW

ES:  SvonOettingen 6-4-02:603-223-2541 ext. 22
Dear Mr. Szufnarowski:

We have completed our review of the draft *Comprehensive Canal Operations Plan (CCOP)*, transmitted by your letter dated May 31, 2002. Most of these comments were conveyed to KA and HGE at meetings on June 14, and June 27, 2002.

3.0 Canal Operation Plan

3.1.1 Spring Passage

Discharges from the Second Level Canal are passed through Riverside and Holyoke 3 at river flows below 5,390 cfs. At the June 14 meeting, it was explained that the flow would be split approximately evenly between the two. This should be stated in the plan.

3.1.2 Fall Passage

During the fall passage period, canal flows must remain at 400 cfs for water quality and canal flow circulation purposes, or be raised to 3,000 cfs, which is the minimum flow at which juvenile shad passage was evaluated.

3.2 Canal Minimum Flow Plan

The plan states that the agencies approved the HGE's plan to include leakage in calculating its minimum flow requirement to the canal. This is not accurate. The agencies accepted that leakage may be substantial and may provide adequate circulation throughout the canal. However, until canal flow distribution and flow velocities throughout the canal at leakage flow are established, we have not approved HGE's proposal.
The plan proposes the velocity measurements discussed above. The plan should state that a study plan will be developed and submitted for agency review and comment and that a report will be prepared for agency review and comment following the completion of the velocity measurements.

3.4 Canal Drawdown Procedure

3.4.1 First Level Canal

The concept of constructing a weir to retain wetted area in the first level canal branch is dismissed in this section as not practical. No explanation is given as to the size of wetted area that would be provided by one or more weirs, and the size of weirs that would be needed, while still permitting maintenance activities. At the June 27, 2002 meeting, data from the survey of elevations of the First Level Canal were distributed and discussed. Based on these results, HGE proposes installation of a small sandbag weir near the railroad bridge at the upstream end of the branch of the First Level Canal. The weir would be installed during the Fall 2002 outage. At that time, additional survey data of the 750 feet that would be pooled by the weir would be gathered, and mussel abundance established. During the Spring 2003 outage, the weir would be inspected to assess its structural integrity, water tightness and the amount of sedimentation deposited near the weir (possible resurvey). Similar inspections would occur in Fall 2003 and thereafter including reevaluation of mussels. We concur with this proposal as a reasonable approach to evaluate the feasibility of adding weirs in the canal. A brief plan for the installation and evaluation of the sandbag weir should be developed and circulated for review by agencies and other parties. If successful, additional weirs could be installed in the future.

In the Draft Plan, HGE proposed to mitigate impacts of canal drawdown by moving mussels to the second level canal. We had a number of concerns with this proposal. First, the proposal aimed only at moving the state-listed yellow lampmussel. The first level canal is populated by large numbers of other species, mostly common elliptio and these would not be protected. Moving rare species was also a concern, given that the habitat that the mussels would be placed would need to be established as being suitable. Also, moving mussels in June would likely mean that mussels would be moved during reproduction. This is not an ideal time to move mussels. If relocation of mussels was determined to be acceptable, monitoring the transplanted mussels would be needed to assure that relocated mussels survived. A plan for marking, moving and monitoring relocated mussels would need to be developed and provided to the agencies for review. Based on our concerns, HGE has abandoned this proposal and instead is proposing the sandbag weirs discussed above.

3.4.2 Second Level Canal

The drawdown procedures for the Second Level canal do not fully reflect what we had previously discussed. The agencies were generally satisfied that the drawdown procedure employed for this year’s spring drawdown worked well to maintain a large wetted area from the Boatlock Station discharge to Riverside Station. However, when we were on site, we discussed the need for monitoring of the water surface elevation of the pool throughout the drawdown period.
Data from the drawdown indicated that the water level in the Second Level Canal continued to fall throughout the drawdown. Since fall drawdowns last longer, the wetted area of the canal will continue to shrink under the conditions evaluated this spring. There appear to be two options to correct this problem. HGE could use sandbags or other temporary structures atop the sill in front of the Riverside intake to establish a higher temporary pool level. The larger pool would allow more time before it became dry. Alternatively, HGE could assure that flow from the gatehouse through Boatlock Station be re-established as soon as possible to compensate for the leakage from the canal. A combination of these two measures is likely needed to maintain the desired wetted conditions between Boatlock Station and Riverside during future canal drawdowns.

The procedures for draining the Second Level Canal should not state that the Number 2 Overflow will not be opened during the drawdowns. The Second Level drainage procedure 6 states that the Number 3 Overflow gate will be regulated during drawdown. We had previously discussed that unless maintenance or replacement of the Number 3 overflow gate were needed, that the Number 3 overflow would also remain closed except for the very end of each drawdown in order to maintain wetted area in that end of the Second Level Canal.

Procedure number 8 states that cones will be placed in the canal in areas that heavy equipment will travel in order to minimize impacts to mussels and their habitat. This should be done if heavy equipment is, in fact, needed in the canal, but a careful survey for mussels prior to cone placement would be needed. However, we understood that routine maintenance activities requiring heavy equipment were limited to clearing sediment from in front of Boatlock Station. HGE agreed that from now on, sediment that needs to be removed from in front of Boatlock would be removed from the canal with a clamshell and crane and not moved by a backhoe as in the past. Therefore, the need for heavy equipment on the canal is likely diminished.

4.0 Plan for Protection and Monitoring

This section of the draft plan states that the objective of the plan is to ensure maintenance of the present mussel habitat rather than creating more habitat. It goes on to state that the intent is to stabilize existing habitat without encouraging expansion of habitat for rare mussel species. These statements are completely wrong and should be stricken from the final plan. Protection of existing habitat and expansion of wetted areas to encourage increased production are, in fact, the dual purposes for canal minimum flows and revised drawdown procedures. HGE acknowledges this fact based on its proposals for the drawdown discussed above.

In order to monitor mussel populations, the draft plan proposes qualitative and quantitative sampling of the canal. At the June 14, 2002 meeting, John Warner of my staff provided comments and scientific papers on surveying for mussels. The preferred methods would include stratified random sampling and cluster sampling in the vicinity where yellow lampmussels were discovered. We discussed the need for HGE to develop a short study proposal outlining the proposed sampling method and location of survey sites/transects. The study plan should be provided to agency and other parties for review and comment. Sufficient time should be allotted for review and comment on the plan prior to the Fall 2002 drawdown.
We appreciate this opportunity to review the proposed designs and look forward to continued progress in implementing fish passage improvements at the project. If you have any questions, please contact John Warner at (603) 223-2541.

Sincerely,

William J. Neidermyer
Assistant Supervisor, Federal Activities
New England Field Office