September 30, 2011

Representative Ken Weyler
Chair, Fiscal Committee of the General Court
State House
Concord, NH 03301

and

The Honorable, Gary Hopper
Chair, House Fish and Game and Marine Resources Committee

and

The Honorable, Bob Odell
Chair, Senate Energy and Natural Resources Committee

In accordance with RSA 214:1-g VII, Annual Report: Fisheries Habitat Account. The Department is submitting the following report for fiscal year 2011:

20-07500-21270000 Fisheries Habitat Account

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<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
<td>Balance forward from fiscal year 2010</td>
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<td>Interest</td>
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<td>Federal Funds</td>
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<td>Less: Expenditures (see detail following)</td>
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<tr>
<td>Less: Encumbrances 06/30/11</td>
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<tr>
<td>Balance available 06/30/11</td>
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</table>

Respectfully Submitted,

Glenn Normandeau
Executive Director
Detail of expenditures:

Seasonal Personnel and supplies (Nash Stream Research Project and Eastern Brook Trout Joint Venture) $41,933.81
Nash Stream Restoration Project Implementation 3,843.42
Lake Horace Marsh Restoration 23,500.00
Homestead Woolen Mills Dam Removal (Ashuelot River Restoration) 50,000.00
Dam Registration Fees 9,775.00
Spectacle Pond Dam Rebuild Project 25,000.00
Administrative Fees 9,235.00
Audit Set Aside Fee 12.00
Total Expenditures FY 2011 $163,299.23

Summary of public benefits derived from the disbursements from the Fisheries Habitat Account:

Seasonal employees: Fisheries Habitat Account funds were used to hire seasonal personnel and to purchase supplies to conduct research on wild brook trout in three tributaries (Emerson, Johnson and Slide Brooks) in the Nash Stream Watershed. The funds used to pay for seasonal personnel and supplies for this project will be 100% reimbursed through a cooperative agreement with the United States Fish and Wildlife Service (USFWS), which funded the research project, and recently (September 2009) funded Phase II of this work for another two years. The research is being conducted with the USFWS and the United States Geological Survey, Conte Anadromous Fish Research Laboratory in Turners Falls, Massachusetts. To date, we have successfully tracked migrating wild brook trout in four streams in the Watershed, and plan to also analyze the data to quantitatively determine the habitat attributes that are most important to wild brook trout. This work will continue through December 2011. As part of this research project, the USFWS obligated $42,000 to replace two existing culverts on these brooks with stream crossings that are passable by fish. One of those culverts was replaced during September 22-26, 2008, and the other was replaced in late June 2009.

The Account was also used to support seasonal laborer help for the Eastern Brook Trout Joint Venture (EBTJV). The EBTJV is a recognized Fish Habitat Partnership operating under the National Fish Habitat Action Plan. The EBTJV coordinates efforts that build private and public partnerships to improve brook trout habitat. The long-term goals of the EBTJV are to implement a comprehensive conservation strategy to improve aquatic habitat, raise public awareness, and prioritize the use of federal, state and local funds for brook trout conservation. Seventeen states are working to prioritize policy changes and on-the-ground actions to improve water quality and restore brook trout habitat and populations in their individual state using locally-driven, incentive-based, and non-regulatory programs. All of this work will help the Department in its management and conservation decisions regarding wild brook trout in New Hampshire.
Nash Stream Restoration Project: Nash Stream was once renowned as a high quality native brook trout stream that provided exceptional angling opportunities. It is also former Atlantic salmon habitat. The river and its tributaries still contain native brook trout, but not in the numbers once seen due to historic log drives, impassable culverts and a catastrophic dam breach. The watershed has been a working forest since the mid 1800s. A railroad for logging was built in 1852. In 1870, the Nash Stream Improvement Company was incorporated for the purpose of clearing the stream of boulders and snags and building a series of dams for log drives. The largest of these, the Nash Bog Dam, was completed in 1900. The 236-acre impoundment created by the dam stored water for driving the logs. In the 1930s, haul roads were built to carry logs from the forest and the river drives ended. The dam at Nash Bog Pond was maintained to support seasonal camps that were built around the impoundment. In 1969 the dam failed, sending a torrent of water akin to the 500-year flood down Nash Stream, destroyed what fish habitat still persisted, and certainly killed every fish along nine miles of Nash Stream. As a result of the dam breach, much of the instream and riparian habitat was altered to the detriment of brook trout and other native fish species. This included the loss of over-story canopy which resulted in higher water temperatures. It also limited the suitability of mainstem habitat for all life stages of salmonids. Subsequent bulldozing further affected the river corridor and channel morphology by eliminating pools, widening the channel, and limiting Nash Stream’s access to its floodplain. The result was more homogenous water with limited habitat and spawning value. Poorly designed culverts along old logging roads compounded matters by blocking or impeding fish passage to critical tributary habitat. Such tributaries fulfill an essential need within a typical river system in terms of providing cold water and thermal refuge, and in this case critical spawning habitat, particularly for brook trout. Although many of these tributaries were relatively healthy, the inability of the fish to access them exacerbated the decline of the fishery. As a result, Nash Stream no longer supports a robust, wild brook trout fishery. Activities will continue to focus on restoring the instream and riparian habitat along Nash Stream and removing impassable barriers (culverts) to the spawning and rearing areas in the tributaries. In Fiscal Year 2011, we removed a failing, undersized culvert on Slide Brook and replaced it with a bridge (NH Fish and Game Department’s cost share was $3,843.42); conducted instream restoration in Nash Stream from the confluence with Emerson Brook downstream to the confluence with Pond Brook; and developed detailed plans for instream restoration from Pond Brook to Long Mountain Brook. This restoration project will continue for approximately four more years, at which time we intend to replace up to ten more crossings to make them passable by fish and conduct instream restoration for another five miles of Nash Stream and up to ten miles of its tributaries.

Lake Horace Marsh Restoration Project: The Piscataquog Land Conservancy, in partnership with the Weare Conservation Commission, NH Department of Environmental Services, the Russell Piscataquog River Watershed Foundation and NH Fish and Game, spearheaded an effort to restore and enhance fish and wildlife habitat in the 181 acre designated “Prime” wetland known as Lake Horace Marsh. This section of the River is in the Rivers Management and Protection Program (RSA 483) as a “Natural River” section of the North Branch Piscataquog River, one of the fourteen “Designated Rivers” in the State. For decades, water levels in the Marsh are controlled by the operation of the dam at the outlet of Lake Horace. The water is drawn down in October and refilled in mid to late May. The total drawdown is about five feet, which lowers the water elevation in the Marsh about three feet. This has severely degraded the fish and wildlife habitat in this large “Prime” wetland. The impacts include significant losses to spawning and rearing habitat for chain pickerel, black crappie, and yellow perch, foraging opportunities for smallmouth and largemouth bass, and habitat for forage fish species. The original approved expenditure from the Fisheries Habitat Account was up to $35,000, but the actual cost was only $23,500 after NH Fish and Game Department staff suggested specific design considerations, saving a total of approximately $50,000 for the project. In the fall of 2008, the Department of Environmental Services completed the construction of a water control structure that effectively eliminates the drawdown on the Marsh. In less than one year, we have already observed that aquatic plants are once
again becoming established in the Marsh. Fish surveys were conducted in the fall of 2010 and will be
done in future years to monitor the success of this project.

**Homestead Woolen Mills Dam:** The Fisheries Habitat Account has been used to help fund
several dam removals since 2001. In Fiscal Year 2011, the Account help fund the removal of the
Homestead Woolen Mills Dam. This eliminated a barrier to upstream passage for many diadromous fish,
including American shad, American eel, Atlantic salmon, alewife and blueback herring, and resident fish,
macroinvertebrate and aquatic furbearer species that use the Ashuelot River as a migratory corridor. The
New Hampshire Fish and Game Department has long supported American shad and Atlantic salmon
restoration in the Ashuelot River Watershed and elsewhere in New Hampshire. Additionally, there are
known populations of rare fish, mussel and turtle species in and near the Ashuelot River Watershed that
may benefit from the removal of this dam. The Ashuelot River is also important to the People of New
Hampshire as it is a Designated River under the Rivers Management and Protection Program, which is
administered by NHDES.

**Dam Registration Fees:** Some dams maintain water levels in many NH trout ponds and provide
important benefits to fish populations as well as providing angling opportunities. These dams require
annual inspections and the Fisheries Habitat Account was used to pay for these inspections (through an
annual registration fee), which are conducted by New Hampshire Department of Environmental Services.

**Spectacle Pond Dam Rebuild:** The dam on Spectacle Pond in Hebron/Groton was in disrepair
and the owners were oblige to repair it to dam safety specifications. Spectacle Pond is a popular trout
fishing pond, which the Department stocks with brook trout each year, and loons are well known to live
and breed at the pond each summer. Spectacle Pond is managed as a Trout Pond (fishing is allowed from
the 4th Saturday in April till October 15 each year) and no petroleum motors are allowed. There is a
public boat ramp there, in Groton, maintained by the Town of Groton as a Road to Public Waters.
Fishing there is primarily for brook trout, which grow to a relatively large size to due the rainbow smelt
population there. The private dam raises the natural water elevation of two ponds to create a single pond.
Several years ago, the NHDES Dam Bureau ordered the dam owner to either repair or remove the dam.
The dam owners decided to give the dam to the recently developed Spectacle Pond Association. The
Association is in the process of obtaining funding to repair the dam to keep the pond in its current state,
and has received commitments for some of the funding. If the dam were removed, the pond would revert
back to two smaller ponds, one that will become a shallow warmwater pond with no brook trout habitat
(this pond has the public access boat ramp), and one that will have some, brook trout habitat (no public
access boat ramp). The Department believes this would impact the fishery there for two reasons. First,
this would reduce the available habitat for the brook trout there. Second, this would preclude the public
access to the pond that would continue to have some brook trout habitat. Most of the land around the
pond has been conserved through conservation easements with several entities, including the Society for
the Protection of New Hampshire Forests.
In accordance with RSA 214:1-gVII, Annual Report: Fisheries Habitat Fund. The Department is submitting the following report for fiscal years 2006-2011:

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<th>2007</th>
<th>2008</th>
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<th>2010</th>
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Summary of public benefits derived from the disbursements from the fisheries habitat account (Fiscal Years 2006-2011):

2006

Fish habitat funds were used to hire seasonal personnel, purchase equipment, and to conduct fish and fish habitat surveys in the Nash Stream Watershed. The aquatic and riparian habitat of nearly 13 miles of Nash Stream was surveyed. This was an intense effort, conducted by three seasonal employees over a six week period, and required the employees to hike into remote areas of the watershed. Five seasonal employees, along with five permanent NH Fish and Game Department employees, two Department of Resources and Economic Development (DRED) employees, a permanent Trout Unlimited (TU) employee and a TU volunteer conducted fish surveys over a four day period in August. Eleven sites in Nash Stream, some of which were hundreds of feet long and 50-60 feet wide, and fifteen sites in twelve tributaries to Nash Stream were surveyed, to document the existing fish community and to determine the brook trout population size and status in the watershed. Water temperature loggers were deployed in each tributary and in Nash Stream to document the existing water temperature regime, and water quality (pH, conductivity, and alkalinity) and flow data were obtained throughout the watershed on a single day in September 2005. Using all these data collected in fiscal year 2006 (mostly collected in calendar year 2005), we were able to demonstrate that the tributaries have excellent water quality and habitat, and also relatively large and robust brook trout populations. Nash Stream and its brook trout population, however, remain highly impacted by the 1969 dam failure and flood and subsequent stream channelization and berming along the banks. All of this information is being used to guide the Nash Stream Restoration Project, which is a partnership between NH Fish and Game, Trout Unlimited and DRED, Division of Forests and Lands, the owner of the property. Fish Habitat Funds were also used to conduct fish surveys at an additional 211 sites throughout the state. This information is paramount in documenting the distribution of each fish species in the state, and ultimately to the management of each species.

Equipment for a specific project, that of restoring/enhancing fish habitat in Harrisville Lake, was purchased in fiscal year 2006. Total costs were $531.90. The objective of this project is to reintroduce wood structure that will be utilized by warmwater fish species.

Fish habitat funds were used to pay the Department of Environmental Services Wetlands Application Fee ($730.00) for the removal of sediment that is impeding the efficiency of the fish ladder on the Central Avenue (Cocheco Falls) Dam on the Cocheco River. To maintain the fish ladder and provide upstream fish passage into the Cocheco River, the sediment must be removed. Fish passage at this site, and in the Cocheco River as a whole, is part of the anadromous fish restoration programs being conducted by New Hampshire Fish and Game Department’s Inland and Marine Divisions in cooperation with other state and federal agencies.

Dams maintain water levels in many NH trout ponds and provide important benefits to fish populations as well as providing angling opportunities. These dams require annual inspections and fish habitat funds were used to pay for these inspections, which are conducted by New Hampshire Department of Environmental Services. The cost for this was $3,600 in fiscal year 2006. These funds were first used for this purpose in 2003, and have been $3,600 or $3,700 in each year.

2007

Fish habitat funds were used to hire seasonal personnel and to conduct fish and fish habitat surveys in the Nash Stream Watershed. Water temperature loggers were deployed in three tributaries and in Nash Stream to document the existing water temperature regime. All of this information is being used to guide the Nash Stream Restoration Project, which is a partnership between NH Fish and Game Department, Trout Unlimited and DRED, Division of Forests and Lands, the owner of the property, and
currently has committed funding of about $700,000. Fish Habitat Funds were also used to conduct fish surveys at an additional 75 sites throughout the state. This information is paramount in documenting the distribution of each fish species in the state, the implementation of the NH Wildlife Action Plan, and ultimately to the management of each species.

Additional equipment for a specific project, that of restoring/enhancing fish habitat in Harrisville Lake (and additional lakes and ponds in the future), was purchased in fiscal year 2007. Total costs were $304.69. The objective of this project is to reintroduce wood structure (in this case, trees) that will be utilized by warmwater fish species. Automated water temperature recorders were purchased with the specific intent to collect water temperature data in watersheds and at specific sites where fish habitat restoration projects will occur or are being considered. Water temperature data is essential for the development of restoration plans for these projects.

The Fish Habitat Account has been used to help fund several dam removals since 2001. One of those, the removal of the Winchester Dam, required that the project partners (NH Fish and Game Department, NH Department of Environmental Services, NH Division of Historical Resources, US Fish and Wildlife Service, USDA-Natural Resources Conservation Service, US Geological Service, US Army Corps of Engineers, Conservation Law Foundation, Trout Unlimited, NH Rivers Council, and the Connecticut River Watershed Council) prepare and construct publicly-accessible signs, to be placed at the former dam site, indicating the historic nature of the dam and its associated historic area, and the importance of the dam removal relative to the restoration of anadromous fish. Fish Habitat Account funds were used to purchase the signage material, which included protective laminate. The signs are specifically designed to last for many years.

During the large rain events in early October 2005, a culvert on Warren Brook in Alstead became blocked by wood and substrate (rocks and sand) creating an impoundment approximately 30 feet deep, ¼ mile long and several hundred feet wide. As the waters overtopped the road, the road fill and culvert failed catastrophically, sending a torrent of water equivalent to 170% of the 500-year flood event down Warren Brook, into the Cold River, and through the towns of Alstead, Langdon and Walpole. The result was that many houses were literally destroyed by the flood and several people died. Additionally, many sections of road were destroyed. The NHFGD, NHDES, NHDOT and USDA-Natural Resources Conservation Service funded the development of a restoration plan for about 18 miles of the Cold River and 3 miles of Warren Brook. This plan was written by a consulting firm with much advice and comment from the resource agencies, the Town of Alstead and most importantly, the public. To date, the area that was identified in the plan as being that in the greatest need of restoration has been restored to provide a natural stream channel, fish and wildlife habitat, and to reduce the massive amounts of erosion that was occurring there. The funding for this was from NRCS and NHDOT. Additional areas are currently being worked on to reduce erosion into Warren Brook and the Cold River.

A conservation easement was purchased for a total of $70,000 ($35,000 from the Fish Habitat Account) on a 197 acre property in Farmington with about 2,500 feet along the Mad River, which contains wild trout and excellent habitat and water quality for them. The purpose of the easement is to protect fish and wildlife habitat for the public. Fishing, hunting, hiking, and trapping by the public are allowed on the property. The Town of Farmington owns the property.

Dams maintain water levels in many NH trout ponds and provide important benefits to fish populations as well as providing angling opportunities. These dams require annual inspections and the Fish Habitat Account was used to pay for these inspections, which are conducted by New Hampshire Department of Environmental Services. The cost for this was $2,500 in fiscal year 2007.
2008

Fisheries Habitat Account funds were used to hire seasonal personnel and to purchase supplies ($380.00) to conduct research on wild brook trout in two tributaries (Johnson and Long Mountain Brooks) in the Nash Stream Watershed. The funds used to pay for seasonal personnel for this project will be 100% reimbursed through a cooperative agreement with the United States Fish and Wildlife Service (USFWS), which funded the research project. The research is being conducted with the USFWS and the United States Geological Survey, Conte Anadromous Fish Research Laboratory in Turners Falls, Massachusetts. To date, we have successfully tracked migrating wild brook trout in two streams in the Watershed, and plan to also analyze the data to quantitatively determine the habitat attributes that are most important to wild brook trout. This work will continue through December 2009. As part of this project, the USFWS has obligated $42,000 to replace two existing culverts on these brooks with stream crossings that are passable by fish. One of those culverts was replaced during September 22-26, 2008. The other will be replaced in 2009. The Fisheries Habitat Account was also used to hire seasonal personnel and equipment (radio transmitters, cost of $12,210.00) to track wild and hatchery brook trout throughout the entire Nash Stream Watershed. We tagged forty-five brook trout from May to August 2008, and tracked their migrations in the Watershed. This work will continue through January 2009. For both of these research projects, a total of $13,747.85 was used to pay for seasonal personnel, most of which will be reimbursed by the USFWS. All of this information is also being used to guide the Nash Stream Restoration Project, which is a partnership between NH Fish and Game Department, Trout Unlimited and DRED, Division of Forests and Lands, the owner of the property, and currently has committed funding of about $700,000 from various state and federal government and non-governmental organizations. The overall goal of the Restoration Project is to restore and protect healthy wild brook trout populations throughout the watershed for the benefit of anglers in New Hampshire. As part of the Nash Stream Restoration Project, a culvert that was not passable by migrating brook trout on one of Nash Stream’s tributaries (Farrer Brook) was removed in November 2007 at a total cost of $3,200.00. The Fisheries Habitat Account paid $1,900.00 ($200.00 for the standard dredge and fill application fee and $1,700.00 of the construction work) and DRED contributed $1,300 for the construction work.

The Fisheries Habitat Account has been used to help fund several dam removals since 2001. One of those, the removal of the Bellamy River V Dam in Dover, required that the project partners (NH Fish and Game Department, NH Department of Environmental Services, NH Division of Historical Resources, US Fish and Wildlife Service, National Marine Fisheries Service, and the Coastal Conservation Association) prepare and construct publicly-accessible signs, to be placed at the former dam site, indicating the historic nature of the dam and its associated historic area, and the importance of the dam removal relative to the restoration of diadromous fish. Fisheries Habitat Account funds were used to purchase the signage material, which included protective laminate. The signs are specifically designed to last for many years, and cost a total of $1,946.06.

A conservation easement was purchased on a ~2,500 acre property in Pittsburg with about five miles of frontage on the Connecticut River, which contains wild trout and excellent habitat and water quality for them. The Fisheries Habitat Account contributed $70,000, with other New Hampshire Fish and Game accounts contributing $180,000, for a total project cost of $2.55 million. The Society for the Protection of New Hampshire Forests owns the property, and NHFGD and SPNHF have a management agreement that provides for collaborative management and management planning on the property. The purpose of the easement is to protect fish and wildlife habitat for the public. Fishing, hunting, hiking, and trapping by the public are allowed on the property.

Dams maintain water levels in many NH trout ponds and provide important benefits to fish populations as well as providing angling opportunities. These dams require annual inspections and the Fisheries Habitat Account was used to pay for these inspections, which are conducted by New Hampshire
Department of Environmental Services. The cost for this was $9,425 in fiscal year 2008, representing a significant increase in the registration fees for dams in New Hampshire.

2009

Fisheries Habitat Account funds were used to hire seasonal personnel and to purchase supplies to conduct research on wild brook trout in two tributaries (Johnson and Long Mountain Brooks) in the Nash Stream Watershed. The funds used to pay for seasonal personnel for this project will be 100% reimbursed through a cooperative agreement with the United States Fish and Wildlife Service (USFWS), which funded the research project, and recently (September 2009) funded Phase II of this work, which will continue for another two years. The research is being conducted with the USFWS and the United States Geological Survey, Conte Anadromous Fish Research Laboratory in Turners Falls, Massachusetts. To date, we have successfully tracked migrating wild brook trout in two streams in the Watershed, and plan to also analyze the data to quantitatively determine the habitat attributes that are most important to wild brook trout. This work will continue through December 2011. As part of this project, the USFWS has obligated $42,000 to replace two existing culverts on these brooks with stream crossings that are passable by fish. One of those culverts was replaced during September 22-26, 2008, and the other was replaced in late June 2009. The Fisheries Habitat Account was also used to hire seasonal personnel and equipment (radio transmitters, cost of $12,210.00) to track wild and hatchery brook trout throughout the entire Nash Stream Watershed. We tagged forty-five brook trout from May to August 2008, and tracked their migrations in the Watershed. This work will continue through January 2009. All of this information is also being used to guide the Nash Stream Restoration Project, which is a partnership between NH Fish and Game Department, Trout Unlimited and DRED, Division of Forests and Lands, the owner of the property, and currently has committed funding of about $700,000 from various state and federal government and non-governmental organizations. The overall goal of the Restoration Project is to restore and protect healthy wild brook trout populations throughout the watershed for the benefit of anglers in New Hampshire. This research information will also help the Department in its management and conservation decisions regarding wild brook trout in New Hampshire.

The Fisheries Habitat Account has been used to help fund several dam removals since 2001. The Merrimack Village Dam, in Merrimack, NH, was removed in August and September 2008. This eliminated a barrier to upstream passage of many diadromous (in particular, American shad, American eel, alewife, Atlantic salmon and blueback herring) and resident fish species and macroinvertebrate and aquatic furbearer species that use the Souhegan River as a migratory corridor. Fourteen miles of the Souhegan River is now accessible to these fish. The Department has been involved with Atlantic salmon restoration in the Merrimack River Watershed for more than 30 years. Approximately 100,000 salmon fry are stocked in the Souhegan River Watershed annually as part of the Merrimack River Anadromous Fish Restoration Program and the Souhegan River is one of the most productive Atlantic salmon watersheds in the Merrimack River Watershed. Additionally, there are known populations of rare fish, mussel and turtle species in and near the Souhegan River Watershed that will likely benefit from the removal of the dam. The removal of the dam is also likely to improve aquatic habitat and water quality conditions upstream and downstream of the dam. Fisheries Habitat Account funds were used for the on-the-ground construction (dam removal) work. Partners on this project were the NH Department of Environmental Services, the National Oceanographic and Atmospheric Administration (National Marine Fisheries Service), Pennichuck Water Works (the dam’s owner), the U.S. Fish and Wildlife Service, the Souhegan River Local Advisory Committee and Trout Unlimited.

The Eastern Brook Trout Joint Venture (EBTJV) is a geographically focused, locally driven, and scientifically based effort to protect, restore and enhance aquatic habitat throughout the brook trout’s historic eastern range. The EBTJV partners, which includes State Agencies from Georgia to Maine, federal fish and wildlife and water quality agencies, and several non-profit organizations, are taking actions to consolidate existing data on the status of brook trout, range wide; to identify gaps in the current
knowledge of brook trout distribution and trends, range wide; and to identify threats and potential solutions, as part of a range wide conservation strategy. It is also working towards providing all partners with the ability to share data, successful management tools, and program concepts. Ultimately, the EBTJV will protect and increase fishable populations of brook trout, aid in the restoration of watershed integrity, protect water quality, and enhance human connections to and stewardship of our natural environment.

Dams maintain water levels in many NH trout ponds and provide important benefits to fish populations as well as providing angling opportunities. These dams require annual inspections and the Fisheries Habitat Account was used to pay for these inspections, which are conducted by New Hampshire Department of Environmental Services. The cost for this was $9,775.00 in fiscal year 2009.

**2010**

Fisheries Habitat Account funds were used to hire seasonal personnel and to purchase supplies to conduct research on wild brook trout in three tributaries (Emerson, Johnson and Slide Brooks) in the Nash Stream Watershed. The funds used to pay for seasonal personnel and supplies for this project will be 100% reimbursed through a cooperative agreement with the United States Fish and Wildlife Service (USFWS), which funded the research project, and recently (September 2009) funded Phase II of this work for another two years. The research is being conducted with the USFWS and the United States Geological Survey, Conte Anadromous Fish Research Laboratory in Turners Falls, Massachusetts. To date, we have successfully tracked migrating wild brook trout in four streams in the Watershed, and plan to also analyze the data to quantitatively determine the habitat attributes that are most important to wild brook trout. This work will continue through December 2011. As part of this project, the USFWS has obligated $42,000 to replace two existing culverts on these brooks with stream crossings that are passable by fish. One of those culverts was replaced during September 22-26, 2008, and the other was replaced in late June 2009.

The Account was also used to support seasonal laborer help for the Eastern Brook Trout Joint Venture (EBTJV). The EBTJV is a recognized Fish Habitat Partnership operating under the National Fish Habitat Action Plan. The EBTJV coordinates efforts that build private and public partnerships to improve brook trout habitat. The long-term goals of the EBTJV are to implement a comprehensive conservation strategy to improve aquatic habitat, raise public awareness, and prioritize the use of federal, state and local funds for brook trout conservation. Seventeen states are working to prioritize policy changes and on-the-ground actions to improve water quality and restore brook trout habitat and populations in their individual state using locally-driven, incentive-based, and non-regulatory programs. All of this work will help the Department in its management and conservation decisions regarding wild brook trout in New Hampshire.

**Nash Stream Restoration Project:** Nash Stream was once renowned as a high quality native brook trout stream that provided exceptional angling opportunities. It is also former Atlantic salmon habitat. The river and its tributaries still contain native brook trout, but not in the numbers once seen due to historic log drives, impassable culverts and a catastrophic dam breach. The watershed has been a working forest since the mid 1800s. A railroad for logging was built in 1852. In 1870, the Nash Stream Improvement Company was incorporated for the purpose of clearing the stream of boulders and snags and building a series of dams for log drives. The largest of these, the Nash Bog Dam, was completed in 1900. The 236-acre impoundment created by the dam stored water for driving the logs. In the 1930s, haul roads were built to carry logs from the forest and the river drives ended. The dam at Nash Bog Pond was maintained to support seasonal camps that were built around the impoundment. In 1969 the dam failed, sending a torrent of water akin to the 500-year flood down Nash Stream, destroyed what fish habitat still persisted, and certainly killed every fish along nine miles of Nash Stream. As a result of the dam breach, much of the instream and riparian habitat was altered to the detriment of brook trout and other native fish species.
This included the loss of over-story canopy which resulted in higher water temperatures. It also limited the suitability of mainstem habitat for all life stages of salmonids. Subsequent bulldozing further affected the river corridor and channel morphology by eliminating pools, widening the channel, and limiting Nash Stream’s access to its floodplain. The result was more homogenous water with limited habitat and spawning value. Poorly designed culverts along old logging roads compounded matters by blocking or impeding fish passage to critical tributary habitat. Such tributaries fulfill an essential need within a typical river system in terms of providing cold water and thermal refuge, and in this case critical spawning habitat, particularly for brook trout. Although many of these tributaries were relatively healthy, the inability of the fish to access them exacerbated the decline of the fishery. As a result, Nash Stream no longer supports a robust, wild brook trout fishery. Activities will continue to focus on restoring the instream and riparian habitat along Nash Stream and removing impassable barriers (culverts) to the spawning and rearing areas in the tributaries.

Lake Horace Marsh Restoration Project: The Piscataquog Land Conservancy, in partnership with the Weare Conservation Commission, NH Department of Environmental Services, the Russell Piscataquog River Watershed Foundation and NH Fish and Game, spearheaded an effort to restore and enhance fish and wildlife habitat in the 181 acre designated “Prime” wetland known as Lake Horace Marsh. This section of the River is in the Rivers Management and Protection Program (RSA 483) as a “Natural River” section of the North Branch Piscataquog River, one of the fourteen “Designated Rivers” in the State. For decades, water levels in the Marsh are controlled by the operation of the dam at the outlet of Lake Horace. The water is drawn down in October and refilled in mid to late May. The total drawdown is about five feet, which lowers the water elevation in the Marsh about three feet. This has severely degraded the fish and wildlife habitat in this large “Prime” wetland. The impacts include significant losses to spawning and rearing habitat for chain pickerel, black crappie, and yellow perch, foraging opportunities for smallmouth and largemouth bass, and habitat for forage fish species. In the fall of 2008, the Department of Environmental Services completed the construction of a water control structure that effectively eliminates the drawdown on the Marsh. In less than one year, we have already observed that aquatic plants are once again becoming established in the Marsh. Fish surveys are planned for the fall of 2010 and spring of 2011 to monitor the success of this project.

Pemigewasset River Restoration Project: The purpose of this project is to restore impaired habitat and enhance existing habitat for aquatic species in a 2,900 foot section of the Pemigewasset River and to improve existing recreational use. The project was completed in the fall of 2009. The enhancements created a more stable and biologically healthy fishery in this section of the river. The site is located on the mainstem of the Pemigewasset River near Exit 31 of Route 93 in the town of Woodstock, Grafton County, New Hampshire. Several factors contributed to the conclusion that the Pemigewasset River site is a good candidate for a habitat restoration and fisheries enhancement pilot project. First, the site is suffering from a lack of adult fish holding water which is likely caused, in part, to physical impacts incurred to the riverbed and banks by a former adjacent gravel mining operation that was used in the 1980s to obtain fill for the construction of Route 93. Examples of these physical impacts include excessive sedimentation and widening of the river and large areas of bank erosion. These types of features typically dictate the presence or absence of healthy fish populations. Additionally, the existing overwidened channel is exacerbating the problems that are causing a decrease in the quality of fish habitat. This project has many funding partners including Trout Unlimited, NH Department of Environmental Services, New Hampshire State Conservation Committee (Moose Plate), the Davis Conservation Foundation, an abutting landowner, and NH Fish and Game Department. Total project costs were approximately $668,000.00 consisting of a combination of cash and in-kind donations from the aforementioned organizations.

Stonehouse Pond: This approximately 230-acre property is located within a 4,200-acre block of unfragmented forest and features a mix of woodlands, wetlands, and open waters that have been
recognized as a top conservation priority at the state and local level. It encompasses appropriate habitat for more than 30 species rated as either state threatened, state endangered, or as a New Hampshire species of special concern. Moreover, the State’s Wildlife Action Plan rates 61.6 acres of the property as Tier 1 – highest quality habitat in the State. Another 3 acres are rated Tier 2, the highest quality habitat in the biological region, and 149 acres as Tier 3, important supporting landscape. Similarly, the State’s Coastal Management Plan identifies 165.8 acres of the property as a “Core Conservation Focus Area” and 66.5 acres as “Supporting Natural Landscape.” Stonehouse Pond is a highly valuable fly fishing only trout pond, and is often called a “jewel of southeast New Hampshire” because of its pristine condition and close proximity to many highly populated areas.

Mohawk River: The Mohawk River was channelized in the 1950s near where it enters the Connecticut River in an attempt to reduce flooding in the area. Channelization of rivers to reduce flooding was done in many places in New Hampshire, and those efforts ultimately fail and even created worse flooding conditions over time. In the case of the Mohawk River, sediment that would otherwise naturally deposit at the mouth of the Mohawk River now flows directly into the Connecticut River and the influx of sediment to this reach of the Connecticut River has resulted in the formation of enlarged channel bars, which are creating bank erosion problems. In order to reduce these erosive stresses, it is essential to decrease the sediment load. The lower Mohawk River restoration has reduced the Connecticut River’s sediment load by retaining more sediment in the Mohawk River. Additionally, the fish and wildlife habitat at the mouth of the Mohawk River has been much improved. This is the first phase of this work; the second phase is to install an engineered log jam at the Colebrook Industrial Park along the Connecticut River to stop the bank erosion there and to provide valuable fish habitat.

The Fisheries Habitat Account has been used to help fund several dam removals since 2001. The dam, which was removed in the fall of 2009, was situated at the head-of-tide on the Winnicut River in Greenland, and represented the only anthropogenic barrier to upstream fish movement along the main stem of the river. The dam restricted fish movement within the Winnicut River, which in turn affects other ecological systems that are dependent upon the fish populations for dispersal within the ecosystem. The removal of the dam improved upstream and downstream migration for diadromous fish including: river herring (alewives and blueback herring), American eel, and rainbow smelt.

Dams maintain water levels in many NH trout ponds and provide important benefits to fish populations as well as providing angling opportunities. These dams require annual inspections and the Fisheries Habitat Account was used to pay for these inspections, which are conducted by New Hampshire Department of Environmental Services.
Included on the following pages are the Fish Habitat Program activities from the New Hampshire Fish and Game Department, Inland Fisheries Division 2011 Master Operational Plan.
Fisheries Habitat Program

Program Need:

Fish abundance, as well as species composition, is affected by the quality of their aquatic habitat (Hubert and Bergersen 1998). Riparian and aquatic ecosystems are currently being altered, impacted or destroyed at a greater rate than any time in history (National Research Council 1992). Two primary anthropogenic causes of aquatic ecosystem dysfunction are land and water use practices (Kauffman et al. 1997). Land use practices that can have a detrimental affect on watersheds include sand and gravel mining, logging, road construction, landscape fragmentation, and agriculture. Water use practices that can degrade aquatic habitat include physical alteration of watercourses, flood control structures and practices, water flow diversion and consumption, and destruction or modification of wetlands.

Degradation of riparian zones and streams diminishes their capacity to provide critical ecosystem functions, including the cycling and chemical transformation of nutrients, purification of water, attenuation of floods, maintenance of stream flows and stream temperatures, recharging of groundwater, and establishment and maintenance of fish habitat (Kauffman et al. 1997). Recent scientific reviews of aquatic biological diversity and riverine health have urged a watershed approach as the most appropriate methodology to resolve fisheries declines (Naiman 1992; Doppelt et al. 1993; Williams et al. 1997). The watershed approach seeks to correct the underlying causes of habitat degradation rather than treat site-specific symptoms (Frissell 1997). Inherent in the watershed approach is the active involvement of those responsible for and concerned about managing land and water throughout the watershed, including various government agencies, private landowners, civic groups, industry, anglers, and conservation interests (Dombeck et al. 1997).

Program Goal:

To preserve, enhance, and restore New Hampshire’s fisheries habitats at a watershed-scale so that viable fish communities can be supported for their intrinsic value and long-term benefits to the state.

Approach:

Fisheries habitat preservation, enhancement, and/or restoration will entail an initial resource analysis to evaluate the status of existing riparian and aquatic habitat within a watershed. Preserving intact and functional riparian and aquatic habitat will be the first priority in any watershed reclamation plan. To facilitate planning for the restoration of riparian and/or aquatic habitat within a watershed, habitats will be partitioned into one of three categories, those capable of rapid recovery, those with a slow rate of natural recovery, and those with little or no resilience capacity (Kauffman et al. 1997). Only after those riparian and aquatic habitats with high resilience capacity are improving or restored, will restoration efforts shift its focus to the other types.
A passive or natural approach will be undertaken first whenever riparian and aquatic habitat restoration activities are deemed feasible. This will be accomplished primarily by implementing strategies that will halt land and water use practices that are degrading the habitat or preventing its recovery. This natural recovery process will be monitored or assessed for a sufficient length of time in order to ascertain whether active restoration is necessary. Active restoration may include constructing instream structures, road removal or modification, stabilization of sediment sources, riparian planting, culvert replacements, etc. (Doppelt et al. 1993; William et al., 1997).

The objective of active restoration will be to move the watershed toward the structure, function, or composition of the historic ecosystem based on an examination of local disturbance regimes and at several spatial scales (Roper et al. 1997). Monitoring of passive or active restoration activities recommended by Kershner (1998) will be conducted, at a minimum, using methods described by Bain and Stevenson (1999).

Expected Results And Benefits:

A watershed-scale approach to preserving, enhancing, and restoring New Hampshire’s fisheries habitats will result in functional ecosystems that exhibit self-sustaining natural processes and linkages among its terrestrial, riparian, and aquatic components. This in turn will lead to long-term maintenance of instream fish habitat, fish community structure and fish population abundance.
Fisheries Habitat Program Action Plans

Project Title: Aquatic Habitat Restoration Support

Project Objective: To provide technical support to aquatic habitat restoration and protection activities in New Hampshire.

For 2011, the specific objectives are to provide technical expertise on:

1. dam removal projects,
2. aquatic habitat restoration projects (including the Nash Stream Restoration Project and lake habitat enhancement projects),
3. NHDES wetland and water quality rules through coordination with NHDES (specifically, serving as a technical expert on stream crossing design relative to fish passage and fluvial geomorphology, which will include making presentations on this subject to interested groups), and
4. reviews of environmental impacts relative to NHDES wetlands applications and NPDES permitting process.
5. Serve on various interagency committees including the Rivers Management Advisory Committee and the Technical Review Committees for the Souhegan and Lamprey Rivers Pilot Instream Flow Studies

Project Work Description: Stakeholder groups involved in river restoration and protection activities will be provided technical support and field activities will be conducted as needed. River restoration activities may include dam removals, restoration of instream and/or riparian habitat, restoration of geomorphology, or other restoration activities. Assessments of habitat and the use of habitat by fish prior to and after restoration activities will also be conducted in order to evaluate the effectiveness of each restoration activity. Technical reviews of environmental impacts, specifically during the wetland permitting process, which is done through the U.S. Army Corps of Engineers and NHDES, will include reviewing overall plans, engineering designs and site visits. Technical advice and the agency’s position on issues affecting fish and wildlife will be communicated while on various interagency committees, including the Rivers Management Advisory Committee and the Technical Review Committees for the Souhegan and Lamprey Rivers Pilot Instream Flow Studies.

Project Justification: Many aquatic habitats in New Hampshire have been severely degraded leading to the subsequent negative impacts on fisheries resources they support.

Aquatic Habitat Restoration Support is a strategy that directly assists the Department in achieving objectives 1.1, 1.2, 2.1, and 3.1 within its Strategic Plan (1998-2010), and Strategies 3.2.3, 3.2.6, , and Objective 3.2 in the Action Plan, Adapting to Changing Times.

Project Costs: $53,550.00

Salary: (1) Biologist II 1000 hours x $53.55/hr = $53,550.00
Project Priority Score: 28 points

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Project Title: Warmwater Habitat Improvement

Project Objective: To improve warmwater fish habitat and opportunities to fish for these species in selected lakes. Structures will be added to Harrisville Pond in 2011.

Project Work Description: A water body’s need for installation of habitat structures will be based on a number of criteria, which may include a lack of existing structure, low abundance of sport or prey species, and/or poor growth or recruitment of sport or prey species. Initial assessments of existing structure will be made using visual observations, underwater cameras, and GPS/mapping software (completed in 2006). Assessments of fish populations will primarily be made via boat electrofishing, although NH design fyke nets may also be used (completed in 2006). Biological data collected will include relative abundance, relative weight, total length, weight, age, and growth (Gries and Racine 2005).

Small conifer trees (Christmas trees) were chosen for this project because they are a natural material and readily available. The trees were collected in winter 2006 from the Keene Transfer Station, but due to concerns raised by NHDES and the time needed to develop a fact sheet on the topic, we discarded the trees. Trees were again collected in winter 2009-2010 from the Keene Transfer Station. It is intended that several trees will be combined into one structure and for trees to sit vertically in the water column by anchoring the base to cement filled buckets or cinder blocks. Further specifics of what type of structure(s) to use, depth of placement and number of structures were determined on a water body specific basis taking into account particular project objectives (i.e. increase habitat for spawning, adult fish, species of interest, etc.) and reviewing available relevant literature.

Type, number, and depth of structures cannot be determined prior to assessments of each specific water body for a number of reasons. Use of structures by fish is variable and can depend on proximity and density of existing natural structure (Wilbur 1978; Rogers and Bergersen 1999; Hunt and Annett 2002; Hunt et al. 2002; Wills et al. 2004), depth of structure placement (Walters et al. 1991; Johnson and Lynch 1992), presence of other fish species (Johnson et al. 1988), water clarity (Johnson et al. 1988), season (Johnson and Lynch 1992; Moring and Nicholson 1994; Rogers and Bergersen 1999; Barwick et al. 2004), fish life stage or size (Johnson and Lynch 1992; Moring and Nicholson 1994), fish species (Johnson et al. 1988; Walters et al. 1991; Moring and Nicholson 1994; Richards 1997; Barwick et al. 2004; Wills et al. 2004), and type of structure used (Johnson and Lynch 1992; Moring and Nicholson 1994; Richards 1997; Rogers and Bergersen 1999; Wills et al. 2004). Additionally, density of natural littoral structure can depend on level of residential lakeshore development (Christensen et al. 1996).

Post-habitat assessments will be conducted after structures have been added and may include sampling of fish populations (see above; conducted at least one year after structure deployment), video observations during summer and winter to document fish use, and angling surveys (conducted at least one month after structure deployment). Angling data may be compared between control and treatment areas (Richards 1997). Comparisons may be made for biological data collected before and after habitat structures have been placed, although fish population responses to habitat enhancement can be difficult to detect (Tugend et al. 2002; Allen et al. 2003), especially at a large scale such as an entire water body (Barwick et al. 2004).
Additionally, replication of habitat structure studies through use of multiple lakes is often needed to increase statistical power enough to detect significant differences (Carpenter et al. 1995).

**Project Justification:** Improving fish habitat by installing habitat structures is a common and successful strategy used by State management agencies across the United States. Frequent objectives of habitat improvement projects include increasing angler catch rates, creating nursery habitat for juvenile fish, and creating adult fish and spawning habitat (Tugend et al. 2002).

Habitat structures can improve warmwater fish habitat and opportunities to fish for these species through a number of mechanisms. Structures have been suggested to increase recruitment by providing spawning cover (Vogele and Rainwater 1975; Hunt et al. 2002) and can also act to increase nest success (Hunt and Annett 2002; Wills et al. 2004), quality of spawning habitat (Hunt and Annett 2002), spawning nest density (Wills et al. 2004), and juvenile habitat (Jackson et al. 2000; Allen et al. 2003; Barwick et al. 2004). Studies have also shown that fish abundance often increases or becomes concentrated in areas modified with structures (Johnson et al. 1988; Johnson and Lynch 1992; Moring and Nicholson 1994; Richards 1997; Rogers and Bergersen 1999; Barwick et al. 2004) and that angler catch rates are often higher in modified areas (Wickham et al. 1973; Wilbur 1978; Richards 1997; Johnson and Lynch 1992; Rogers and Bergersen 1999). Additionally, habitat improvements provide additional structure for aquatic invertebrates to colonize (Angermeier and Karr 1984; Moring and Nicholson 1994).

New Hampshire’s black bass fish populations are highly utilized by anglers, with smallmouth (Micropterus dolomieui) and largemouth bass (M. salmoides) ranking among the top four species fished for by anglers (Responsive Management 1996 and 2004). Although sought by fewer anglers, yellow perch (Perca flavescens), pickerel (Esox niger) and white perch (Morone saxatilis) rank in the top ten among species fished for (Responsive Management 1996 and 2004). Because warmwater fisheries are sustained through natural reproduction and are popular with the state’s anglers, the addition of habitat structures to improve warmwater fish habitat and angling opportunities is warranted.

According to the 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation, 168,000 anglers fished 1.87 million days for warmwater species in New Hampshire (panfish: 30,000 anglers fished 339,000 days; black bass: 105,000 anglers fished 1.264 million days; northern pike and chain pickerel: 33,000 anglers fished 268,000 days) (U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau 2008). The level of angler participation in black bass fishing represented 53% of New Hampshire’s freshwater anglers and 46% of the total days of fishing. Since the average trip expenditure for anglers fishing in New Hampshire is $30 per day, the total expenditures by anglers fishing for warmwater species equals approximately $56.13 million.

Installation of habitat structures will allow the Department to improve fish habitat for warmwater fish in New Hampshire. Additionally, involving anglers and bass tournament organizations in this process presents an excellent opportunity for the Department and anglers to work together towards the common goal of improving and sustaining New Hampshire’s fisheries resources for current and future generations.
The Warmwater Habitat Improvement Project is a strategy that assists the Department in achieving objectives 2.1, 3.1, 6.1 and 16.1 within its Strategic Plan (1998-2010), and Strategy 3.2.3 and Objective 3.2 in the Action Plan, Adapting to Changing Times.

**Project Costs: $6,596.00**

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**Project Priority Score: 29 points**

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Project Title: Fishing For the Future GIS Data Entry

Project Objective: To enter all Fishing for the Future fish data collected in the 1980s into a GIS database, and determine the ability for Inland Fisheries Division staff to enter all subsequent data into the same database. This database will be part of a larger fish database that is currently in development in cooperation with NHDES and other state and federal agencies and NGOs. Work in 2011 will include the construction of a working, holistic database of fish survey data that is linked to GIS.

Project Work Description: Fishing for the Future fish data from the hard copy field datasheets will be entered into an Excel spreadsheet (completed in 2006). The spatial locations of all stream sampling locations will be determined and entered into the existing Excel spreadsheets (mostly completed in 2006). The incorporation of the fish data into GIS will entail creating new shapefiles from the existing Excel spreadsheets and occur under the supervision of the GIS Manager for NHFGD. Ultimately, the data will likely reside in a single shapefile or other GIS format file. The GIS Manager will approve all data entry and file formats. During the data entry process and again after all data have been entered, an evaluation of the ability of NHFGD-IFD to enter all subsequent data will be made by the Fish Habitat Biologist and the GIS Manager.

Project Justification: A significant amount of fisheries resources data was collected in the 1980’s during the Fishing for the Future stream classification project. Additional data was collected in the 1990’s. However, only some of the data have been entered into electronic format, and none are geospatially referenced. Completion of the fisheries resources GIS database will aid in implementing New Hampshire’s Wildlife Action Plan by providing the locations in which fish species at risk occurred both historically and currently. Additionally, the information contained in the GIS database will be an essential requirement in determining the species of interest for future aquatic habitat restoration projects. These data sets, along with water quality and habitat data, will strengthen water quality standards being developed by NHDES in cooperation with NHFGD.

Fishing For the Future GIS Data Entry is a strategy that directly assists the Department in achieving objectives 1.1, 2.1, and 16.1 within its Strategic Plan (1998-2010), and Strategy 3.2.3, and Objective 3.2 in the Action Plan, Adapting to Changing Times.

Project Costs: $2,365.00

Salary: (1) Biologist II 22.5 hours x $53.55/hr = $1,205.00
(1) Biologist I 30.0 hours x $35.39/hr = $1,062.00
In-State Travel Cost: $ 98.00
$2,365.00

Project Priority Score: 25 points

Ecological Importance: High 5 points
Public Interest: Low-High 4 points
Economic Importance: Low-High 4 points
Adequacy of Existing Data: Low-Moderate 2 points
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**Project Title: Lake Horace Marsh Restoration**

Project Objective: To restore a natural water level regime to Lake Horace Marsh to improve and protect the ecological integrity of the marsh for fish and wildlife habitat. Construction for the project was completed in late December 2008.

For 2011, the specific objectives are to:

2. Conduct at least two site visits, one in April and one in September or early October, and photodocument the conditions during those visits.

Project Work Description: Work on this project will consist primarily of providing technical expertise in the conceptual, design and construction phases of a water level control structure, and if needed, a fish passage structure. Technical considerations of the project include the habitat requirements, life history, behavior, and fish passage requirements of fish species of concern (chain pickerel, largemouth bass, yellow perch, white sucker, golden shiner, and common shiner).

An assessment of the fish using the marsh both before and after the water level structure is constructed will be needed. It is anticipated that the structure will be built in fall 2008. Fish were sampled using fyke nets and seines in the marsh in May and October 2005. These data provide a baseline of the use of the marsh by fish prior to the water level control structure being constructed. To assess the effectiveness of the project, fish sampling will also occur one, three, and five years after the structure is built.

The Fish and Game Commission approved the use of up to $35,000 from the Fisheries Habitat Fund to secure matching funds through a watershed grant from New Hampshire Department of Environmental Services (NHDES). The Piscataquog Watershed Association (now Piscataquog Land Conservancy) is the sponsor of the watershed grant. The total project cost is $187,267.

Project Justification: Lake Horace Marsh is at the upstream end of Lake Horace in the Town of Weare. The marsh is designated by NHDES as a “Prime” wetland. The marsh and lake are part of the North Branch Piscataquog River, one of the fourteen “Designated Rivers”. The marsh is in a section of the river classified as a “Natural River”. RSA 483:7-a defines natural rivers as the following:

“...(a) Natural rivers are free-flowing rivers or segments characterized by the high quality of natural and scenic resources. River shorelines are in primarily natural vegetation and river corridors are generally undeveloped. Development, if any, is limited to forest management and scattered housing. For natural rivers, the following criteria and management objectives shall apply:

(1) The minimum length of any segment shall be 5 miles.
(2) Existing water quality shall be not lower than Class B level pursuant to the water quality standards established under RSA 485-A:8.
(3) The minimum distance from the river shoreline to a paved road open to the public for motor vehicle use shall be 250 feet, except where a vegetative or other natural barrier exists which effectively screens the sight and sound of motor vehicles for a majority of the length of the river or segment.
(4) Management of natural rivers and segments shall perpetuate their natural condition as defined in this chapter and shall consider, protect, and ensure the rights of riparian owners to use the river for forest management, agricultural, public water supply, and other purposes which are compatible with instream public uses of the river and the management and protection of the resources for which the river or segment is designated.”

The dam at the outlet of Lake Horace controlled the water elevation of both Lake Horace and Lake Horace Marsh. The dam is owned and operated by NHDES. The water elevation of Lake Horace is lowered approximately five feet, starting in mid-October, and raised approximately five feet starting in early to mid-May. Consequently, prior to the project’s completion, much of the marsh is dewatered during the winter, and much of the substrate becomes frozen. The aquatic habitat in the marsh was impacted such that the emergent vegetation is primarily monotypic, and submerged aquatic vegetation is spatially limited to a relatively narrow area occupied by the river channel. Little or no submerged vegetation occurred in the dewatered areas.

The recreational fishery in Lake Horace is primarily for yellow perch (Perca flavescens), chain pickerel (Esox niger), largemouth bass (Micropterus salmoides), panfish (including the recently introduced black crappie, Pomoxis nigromaculatus), brown trout (Salmo trutta) and rainbow trout (Oncorhynchus mykiss). Brown trout and rainbow trout are stocked by NHFGD. Yellow perch and chain pickerel spawn in shallow water very soon after ice-out, which typically occurs in mid-April. Yellow perch spawn at water temperatures of ~6°C to 13°C over submerged aquatic vegetation and brush at water depths of ~1.5 to 3 feet (Scott and Crossman 1973, Kreiger et al. 1983); chain pickerel spawn over submerged and emergent aquatic vegetation at water depths of 3 to 10 feet (Scott and Crossman 1973). Submerged aquatic vegetation is limited to a relatively narrow area of the river channel in water generally <3 feet deep, and emergent aquatic vegetation is generally above the water level in mid-April. Therefore, the spawning habitat for these two species was very limited in Lake Horace Marsh because of the winter drawdown. Additionally, largemouth bass typically move into shallow water areas to feed heavily (prior to spawning) and to locate spawning sites in the early spring, often before ice-out (Mayhew 1987, J. Magee personal observation). Because the water elevation in the marsh was not increased until early to mid-May, the operation of the dam at Lake Horace likely negatively impacted the ability of largemouth bass to feed and to locate spawning sites in the early spring.

Additionally, the water elevation of Lake Horace Marsh was decreased approximately five feet every fall at a time after which many reptiles and amphibians have prepared for winter by burrowing into the substrates in shallow water areas. Much of these shallow water areas were dewatered when the water level is decreased at the dam. These reptiles and amphibians cannot survive freezing temperatures. Strandings of amphibian larvae have been documented in 2004 immediately after the drawdown. Strandings of young-of-the-year brown bullhead (Ameiurus nebulosus) have been documented during the October drawdown prior to project completion. Providing a natural water level regime in Lake Horace Marsh (by eliminating the winter drawdown) will protect submerged and emergent aquatic vegetation, reptiles and amphibians. The submerged and emergent aquatic vegetation provide habitat and reptiles and amphibian provide a food source for fish species in the marsh and lake.

Lake Horace Marsh Restoration is a strategy that directly assists the Department in achieving objectives 1.1 and 2.1within its Strategic Plan (1998-2010), and Strategies 3.2.3 and 3.2.6, and Objective 3.2 in the Action Plan, Adapting to Changing Times.
Project Costs: $2,152.00

Salary: (1) Biologist II 30 hours x $53.55/hr = $1,607.00
       (1) Biologist I 15 hours x $32.57/hr =  $ 489.00
In-State Travel Cost:  $  56.00

$2,152.00

Project Priority Score:  28 points

Ecological Importance:  High  5 points
Public Interest:         Moderate-High  4 points
Economic Importance:    High  5 points
Adequacy of Existing Data: Moderate-High  4 points
Project Feasibility:    High  5 points
Cost-Benefit Ratio:     High  5 points
**Project Title: Nash Stream Restoration**

**Project Objectives:** 1) Assess the aquatic and riparian habitat, fish community, and water quality of Nash Stream, its tributaries, and lakes/ponds; 2) Identify potential stream restoration projects that would improve the physical habitat and ecological integrity of Nash Stream, its tributaries, and lakes/ponds; 3) Evaluate the feasibility of implementing each stream restoration project; and, 4) Conduct stream restoration projects with the greatest opportunity and likelihood of success.

**Project Work Description:** Work on this project will consist primarily of providing technical expertise and fieldwork in the assessment and restoration of aquatic and riparian habitat of Nash Stream, its tributaries, and lakes/ponds relative to fish. This will include, at a minimum, the following (#1-6 were completed in 2005-2007, and will be done again after restoration activities, and #7 will occur in 2006-2012):

1. Collecting and summarizing background data on the habitat and fish in Nash Stream, its tributaries and lakes/ponds.
2. Collecting additional data on the physical instream and riparian habitat including:
   a. Rosgen Level I, II, and III assessments in several sites in Nash Stream. These sites will likely be sites at which restoration activities are conducted and Rosgen assessments are made before and after restoration.
   b. Water temperature monitoring of at least three sites in Nash Stream and one site in each of the eight tributaries.
   c. Air temperature monitoring in the watershed at an intermediate elevation.
   d. Flow measurements at the same sites water temperature is monitored.
3. Identification, description, and assessment of stream crossings relative to fish passage and geomorphology.
4. Collecting data on the fish populations and macroinvertebrates.
5. Identify areas and causes of degradation and possible restorative actions to improve or correct the ecological conditions.
6. Identify potential negative impacts of restorative actions.

**Project Justification:** The Nash Stream watershed is nearly wholly contained within the Nash Stream Forest, which is owned by the State of New Hampshire; therefore it offers a unique opportunity to restore the ecological integrity of a significant watershed. Based on recent (1990 – present) fish surveys, the wild brook trout population in Nash Stream is low in comparison to other New Hampshire streams and the survival of Atlantic salmon stocked as fry in Nash Stream is minimal (generally about 1% from fry to age 1 parr; the survival of most Atlantic salmon stocked as fry in northern New Hampshire is >1% - 9%). It is possible, however that age 0 and/or age 1 Atlantic salmon move downstream into the Ammonoosuc River in search of more preferred habitat (i.e., more cobble and small boulder and deeper water) because the habitat in Nash Stream is limited, as it consists almost entirely of shallow riffles (less suitable habitat).

Habitat surveys conducted in the early 1990s, indicates there is very little pool habitat in Nash Stream, a condition that has been attributed to a dam break and subsequent flood that occurred in 1969. The flood scoured most of the streambed of its medium-sized substrate and filled the pools that once existed in the stream. The lack of pool habitat may be limiting the growth and
survival and ultimately the population of brook trout in Nash Stream and its tributaries, though anecdotal evidence suggests the physical habitat has changed since the 1990 surveys.

The United States Forest Service (USFS) owns the conservation easement on Nash Stream Forest. The USFS has conducted several stream restorations in northern New Hampshire and western Maine, and is interested in conducting similar restorations in the Nash Stream Forest. Additionally, Trout Unlimited (TU) has already received some funding for assessment activities in 2005 through the New Hampshire Charitable Foundation, and is interested in collaborating with, at a minimum, the USFS and New Hampshire Fish and Game Department.

Nash Stream Restoration is a strategy that directly assists the Department in achieving objectives 1.1, 1.3, and 2.1 within its Strategic Plan (1998-2010); and, objectives 1, 2, 4, and 5 for Fisheries Resources in the Nash Stream Forest Management Plan (NHDRED 2002), and Strategies 3.2.3 and 3.2.6, and Objective 3.2 in the Action Plan, Adapting to Changing Times.

**Project Costs:** $29,360.00

Salary: (1) Biologist II 500.0 hours x $53.55/hr = $26,775.00
(1) Biologist I 37.5 hours x $53.43/hr = $2,004.00
In-State Travel Cost: $581.00
$29,360.00

**Project Priority Score:** 30 points

- Ecological Importance: High 5 points
- Public Interest: High 5 points
- Economic Importance: High 5 points
- Adequacy of Existing Data: High 5 points
- Project Feasibility: High 5 points
- Cost-Benefit Ratio: High 5 points
**Project Title: Water Temperature Metrics Analysis**

**Project Objective:** To determine the water temperature metrics most useful to the management of individual fish species and entire fish communities within lotic systems.

For 2011-2012, the specific objectives are to (#1 was completed on a subset of data in 2006, #2-#4 will be completed in 2011-2012):

1. Determine the relationship between two temperature metrics (mean July water temperature and mean daily water temperature fluctuation) and young-of-year (YOY) brook trout (*Salvelinus fontinalis*) density and biomass,
2. Determine the relationship between two temperature metrics (mean July water temperature and mean daily water temperature fluctuation) and yearling and older (YAO) brook trout density and biomass,
3. Determine the values for the above temperature metrics at which brook trout are and are not present using presence/absence data, and
4. Determine the values for #3 at which all other species of fish are and are not present using presence/absence data.
5. Collaborate with other entities (specifically UNH, USEPA, Massachusetts Fish and Wildlife and NHDES, who are working on independent analyses of similar data)

**Project Work Description:** The work will be conducted in two phases, and the primary species of interest is brook trout. All aspects of the work will be coordinated with NHDES, specifically the Biomonitoring Program. For Phase I, the work on this project was conducted in 2005 and consisted of determining the type of data needed and planning required to analyze water temperature and fish data to meet the project objectives. Phase II work was nearly completed in 2006 and entailed the actual calculations of water temperature metrics and the relationship of those metrics to fish species presence and/or abundance. Objectives #1, 2, and 4 have been completed on the dataset that was available as of December 2006. Because data at approximately 5000 additional sites was collected in 2007-2010, the work in 2011-2012 will focus on analyzing this larger dataset.

**Project Justification:** Although much work has been conducted to determine the temperature tolerances of many fish species, most has been done in the laboratory. Additionally, most of those studies have used constant temperatures or changing temperatures that are not environmentally relevant (i.e., change at a rate faster than occurs in the natural environment). Thus, although the general temperature tolerances of fish species that inhabit New Hampshire waters are known, little empirical data collected in New Hampshire is available to justify management decisions based on water temperature and fish data collected at a given site. Currently, NHFGD biologists use specific metrics (e.g., the number of days in which the mean water temperature exceeded 70°F) and but also rely on professional judgment to identify cold water streams suitable for several management options. It is important to strengthen the quantitative metrics while retaining some ability to use professional judgment in making management decisions.
NHDES is responsible for regulating water quality standards in the state. Recently, NHDES has become interested in strengthening its ability to protect the water quality of first order streams, specifically as it relates to water temperature. Much of the brook trout habitat (based on water temperature) is in the first order streams of New Hampshire, but NHDES does not currently have empirical data to understand the link between water quality (i.e., water temperature) and biology (specifically, brook trout presence, abundance, and biomass per area) in first order streams. If NHDES had this type of quantitative information, NHDES would be able to more fully protect small lotic systems, and in turn, the fish communities that depend on them (specifically brook trout). It is essential that these small streams be protected as the water quality in them affects the water quality of all the streams into which they flow. For example, increasing the summer water temperature of a small stream that happens to offer the only summer refugia (from high water temperatures) for brook trout that seasonally inhabit areas downstream could effectively destroy the brook trout population in the system. In 2009, UNH received a grant from the USEPA to conduct similar analyses on water temperature metric relationships to wild brook trout in both New Hampshire and Massachusetts. NHFGD will work collaboratively with UNH, USEPA, Massachusetts Fish and Wildlife and NHDES on this work.

Additionally, NHFGD will be responsible for the implementation of New Hampshire’s Wildlife Action Plan. Because many fish species are included in the plan, it is a requirement that NHFGD fully understand the habitat (in this case, water temperature) requirements of each of the species. Information on water temperature requirements may be available from the literature for some species, but it may no be applicable to fish in New Hampshire. Therefore, it is essential to determine the water temperature requirements for fish populations occurring in New Hampshire.

Water Temperature Metrics Analysis is a strategy that directly assists the Department in achieving objectives 1.1, 1.2, 1.3, 2.1, and 4.1 within its Strategic Plan (1998-2010), and Strategy 3.2.3 and Objective 3.2 in the Action Plan, Adapting to Changing Times.

**Project Costs:** $3,070.00

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**Project Priority Score:** 26 points

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**Project Title: Instream Flow**

**Project Objective:** To provide technical expertise on instream flow policies for the State of New Hampshire and to assist in developing policies for instream flow.

For 2011, the specific objectives are to:

1. Provide technical expertise to the Pilot Instream Flow Study and resultant legislation for the Lamprey River, and
2. Contribute to the development of New Hampshire Instream Flow Rules by participating in meetings on this subject.

**Project Work Description:** Work on this project will consist primarily of providing technical expertise on habitat requirements of fish and the amount of habitat needed relative to instream flow rules. This will be accomplished by coordinating the development of instream flows policies in New Hampshire with NHDES, the USFWS, other state and federal agencies, and other stakeholders to the instream flow rules.

**Project Justification:** Aquatic habitat is affected by many factors. Water withdrawals for agriculture, water supply, municipal and commercial purposes, and operations of dams at hydroelectric projects and for flood management directly affect the amount of water, and thus the amount and type of aquatic habitat in a given body of water. Additionally, development can have indirect effects on aquatic habitat by causing alterations in the hydrology of a watershed and by serving as a source and conduit for pollutants that enter a waterbody. Protecting instream flows is essential because of the direct role it plays in determining the amount and quality of aquatic habitat in streams, especially given the rapid rate of development that is occurring in New Hampshire.

Instream flow is one of the key protection measures provided for under the Rivers Management and Protection Act (RSA 483). The Act gives the NHDES the authority and responsibility to maintain flow to support instream public uses in rivers that have been designated by the Legislature for special protection under RSA 483.

In 2002, a broad coalition of New Hampshire business and conservation interests joined together to enact compromise legislation which became Chapter 278, Laws of 2002 (from House Bill 1449-A) that calls for a pilot program for instream flow protection on two of the fourteen designated rivers - the Lamprey River in the coastal watershed and the Souhegan River in the Merrimack watershed. With the advice and input of the statewide Rivers Management Advisory Committee (RMAC), NHDES adopted Instream Flow Rules (Env-Ws 1900) effective May 29, 2003 that apply to the Souhegan and Lamprey Rivers. The rules describe the process for conducting a Protected Instream Flow study and developing a Water Management Plan to implement the study results. If the pilot program were successful, the rules would be amended before they could be applied to other Designated Rivers.
Instream Flow is a strategy that directly assists the Department in achieving objectives 1.1, 1.2, 1.3, 2.1, and 4.1 within its Strategic Plan (1998-2010), and Strategy 3.2.3 and Objective 3.2 in the Action Plan, Adapting to Changing Times.

Project Costs: $2,008.00

Salary: (1) Biologist II  
37.5 hours x $53.55/hr = $2,008.00

Project Priority Score: 27 points

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