



Oyster River Nomination

**Submitted to the
Department of Environmental Services**

For designation to the

**New Hampshire
Rivers Management and Protection Program**

By the

Oyster River Watershed Association
with Strafford Regional Planning Commission

FUNDING SOURCE:



This project was funded by Section 604(b) of the Clean Water Act from the New Hampshire Department of Environmental Services.

Front Cover:

Photograph by Dick Weyrick during a Riverwalk on May 30th, 2004.

The location is at the southern edge of a huge bog and wetland that make up the headwaters of the Oyster River, in the Samuel A. Tamposi Water Supply Reserve (SATWaSR).

ACKNOWLEDGEMENTS

The Oyster River Watershed Association, a 501(c)(3) organization, prepared the Oyster River Nomination with assistance from the Strafford Regional Planning Commission and the NH Department of Environmental Services Rivers Management and Protection Program. The nomination was completed in June 2010.

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The Oyster River Watershed Association recognizes the professional contributions to this plan of Laura Weit-Marcum, Acting Rivers Coordinator (NHDES, Rivers Management and Protection Program), and the stakeholders and partners that provided technical and editorial assistance in development of this document.

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New Hampshire Rivers Management and Protection Program

River Nomination Form

Instructions: Before beginning any work on a river nomination, Sponsors should contact the State Rivers Coordinator at the NH Department of Environmental Services (NHDES). The Rivers Coordinator can provide initial guidance by identifying local and regional contacts and other sources of information and can give advice throughout the preparation of a river nomination. Refer to the publication, "A Guide to River Nominations," for a step-by-step explanation of the nomination process and a directory of federal, state, regional, and private sources of information and technical assistance. The River Coordinator's address and telephone number are: NHDES Rivers Coordinator, P.O. Box 95, 29 Hazen Drive, Concord, NH 03302-0095, (603) 271-8801.

SECTION I. NOMINATION INFORMATION

1. Name of River: Oyster River

2. River/River Segment Location (and start/end points) and Length (miles):

From the Oyster River headwaters at Hall Road in Barrington through to the Mill Pond Dam in Durham. The tidal portion of the river below the Mill Pond Dam is not included.
Total River Miles = 13.97

3. (a) Sponsoring Organization of Individual: Oyster River Watershed Association

(b) Contact Person: Eric Fiegenbaum

(c) Address: 6 Moharimet Drive, Madbury, NH 03823

(d) Daytime Telephone Number: 603-750-7519

(e) Email: eric@lefh.net

SECTION II. SUMMARY: RESOURCES OF STATEWIDE OR LOCAL SIGNIFICANCE

In order to be eligible for designation to the NH Rivers Management and Protection Program, a river must contain or represent either a significant statewide or local example of a natural, managed, cultural, or recreational resource.

1. By checking the appropriate boxes below, indicate the resource values that you believe are present in the nominated river and its corridor and whether you believe these values are present at a level of significance that is statewide or local. If the value is not present, leave the box blank.

Natural Resources	Value/Present Local Significance	Value/Present Statewide Significance
Geologic or Hydrologic Resources	X	X
Wildlife Resource	X	X
Vegetation/Natural Communities	X	X
Fish Resources	X	X
Water Quality	X	
Open Space	X	X
Natural Flow Characteristics	X	

Managed Resources

Impoundments	X	
Water Withdrawals/Discharges	X	
Hydroelectric Resources		

Cultural Resources

Historical/Archaeological Resources	X	X
Community River Resources	X	X

Recreational Resources

Fishery Resources	X	X
Boating Resources	X	
Other Recreational Resources	X	X
Public Access	X	

Other Resources

Scenic Resources	X	X
Land Use	X	X
Land Use Controls	X	
Water Quantity	X	X
Riparian/Flowage Rights		
Scientific Resources	X	X

2. Briefly describe the most important resource values, which are present in the nominated river and why you believe these values are significant from either a statewide or local perspective.

Several factors are motivating the Oyster River nomination for designation to the New Hampshire Rivers Management and Protection Program (RMPP).

- Increases in population and associated urban development in the New Hampshire seacoast area has been accompanied by an estimated 50-percent increase in the use of ground and surface water resources. [U.S. Geological Survey. *Methods for and estimates of 2003 and projected water use in the Seacoast Region, Southeastern New Hampshire*. Scientific Investigations Report 2007–5157.]
- The environmental quality of the region’s estuaries is declining. Eleven of twelve indicators show negative or cautionary trends. [Piscataqua Region Estuaries Partnership. *2009 State of the Estuaries*. 2009.]
- The Great Bay and the Oyster River are listed as impaired waters under the Clean Water Act for certain parameters and areas.
- While there are examples of cooperation among the towns of the region (protection of the 1,400-acre Tamposi Water Supply Reserve, and the Bellamy and Oyster River Protection Partnership), there is no formal cross-town body to address water issues within the Oyster River watershed.

Most Important Resource Values to Protect.

- **Primary Water Supply for NH’s State University, Flagship Campus and the Town of Durham** – The Oyster River is a significant source of water supply. The surface waters have been a primary source of potable water supply for the Town of Durham and the University of New Hampshire since 1935. Wells associated with the river’s water resources contribute to municipal requirements, as well as the needs of individual landowners. The water supply resource has been recognized and protected as evidenced by Town zoning regulations. The joint municipal protection of the 1,400-acre Tamposi Water Supply Reserve area in Barrington demonstrates the region’s acknowledgement of the importance of the resource for current and future needs.

The Oyster River’s relatively high water quality is an important influence on the health of the Great Bay Estuary system. For example, the tidal river supports a highly-resilient reef, which is one of the keys to the long term recovery of the oyster populations in the Bay.

- **Water Quality Risks** – There are significant risks to water quality that could have severe adverse effects on the water supply for the University of New Hampshire and the Town of Durham. The Oyster River crosses major highways three times within several hundred feet of the Lee traffic circle (U.S. Route 4 twice and Route 125 once), where there is substantial and growing commercial development. The volunteer water quality-sampling program of the Oyster River Watershed Association (ORWA) has identified intensifying and troubling pollution concerns in the stream that flows through the traffic circle area and directly into the river.

In addition, there are three gas stations in this commercial cluster. A major fuel spill at any one of them could reach the river in minutes (inclusive of construction and operational design and compliance). In addition, the traffic on the highways through the intersection includes dozens of trucks carrying solid wastes northward and dozens of tankers carrying fuel westward every day. It has been estimated that major spills into the river at this location would reach the water supply reservoir in Durham in a matter of hours.

Another water quality concern is the large number of highway and road crossings upstream of the water supply reservoir. There are seven numbered State highway crossings, and three Town road crossings, all within the nominated corridor. All of these crossings, as well as the impervious access road and parking areas at the Lee traffic circle receive salt and sand applications with almost every winter storm. A commonly emphasized understanding of water quality concerns in the Great Bay coastal basin is the runoff pollution from these dispersed sources.

Yet another water quality concern is relative to higher concentrations of chloride loads (salt). Recent studies have shown that increasing urbanization and the need to construct new roads suggests an upward trend in toxic levels in groundwater supplies. The use of salt is an effective de-icing agent, and as of 2005 deicing salt is the largest use of salt in the US. New Hampshire winters demand an effective and affordable means of de-icing roadways and keeping the roads safe for its citizens. Road salt satisfies these conditions. However, excess sodium in drinking water supplies can impact water quality and have adverse human health impacts. Road salt may also affect the wildlife, aquatic life, and vegetation in the Oyster River watershed. [Source: Siegel, Lori. *Hazard Identification for Human and Ecological Effects of Sodium Chloride Road Salt*. New Hampshire Department of Environmental Services. 2007]

- **Importance of Pristine Stretches of the River Corridor** – There are several portions of the river corridor that have pristine riparian floodplains – hundreds of acres in extent. It is crucial that these areas remain undeveloped and protected. Significant storm events have increased substantially over the past decade, resulting in costly infrastructure and property losses due to flooded and failed culverts. These floodplain areas are extremely important in providing flood storage, keeping losses lower than they would otherwise be. Keeping these areas intact should remain a high priority.

Floodplain forests support diverse natural communities, protect and enhance water quality by filtering and sequestering pollution, and control erosion and sediment. Many wildlife species use these forests at some point in their life cycle. Not only is a floodplain forest important but also the adjacent upland is also crucial for these species. Floodplain forests with their rich soils have been converted to open farmland for centuries; many floodplains are no longer forested wildlife habitat. [New Hampshire Department of Environmental Services. *Wildlife Action Plan: Floodplain Forests*. 2010.]

These pristine corridors also provide critical habitat for upland and aquatic plants and animals. Elsewhere in this nomination report there are lists of organisms of concern that

occur in the Oyster River corridor and tributaries. Protecting these undeveloped stretches remains a high priority, both locally and for New Hampshire.

- **Scientific/Education** – The nominated Oyster River corridor has important natural resource value for the purposes of education and scientific research. The core campus of the University of New Hampshire (Durham) lies adjacent to the Oyster River and the university owns over 200 acres of forested land along the river almost all of which lie within the corridor proposed for designation. These lands and waters, collectively known as the College Woods, are heavily used for teaching and research. College Woods is used by courses in the Department of Natural Resources and the Environment, Thompson School, Biology Program (General Ecology), and the Departments of Biological Sciences, English, and Art. College Woods also serves the educational goals of UNH programs such as ROTC (Reserve Officer Training Corps). Many of these courses are large and have multiple lab sections.

For example, the Introduction to Natural Resources course (NR 401) conducts exercises involving over 60 students on 10 days of the year. One exercise involves study of the Oyster River watershed from the perspective of drinking water supply and includes analysis of water quality data collected not only in College Woods but also throughout the Oyster River watershed. The General Ecology (BIOL 541) conducts a forestry exercise that involves over 90 students on eight days each year. Students in Field Dendrology (NR 425, several sections, up to 80 students) visit the College Woods almost weekly for an entire semester. While academic use of College Woods is dominated by courses from the College of Life Sciences and Agriculture, hydrology and environmental science courses from the College of Engineering and Physical Sciences as well English and Arts courses from the College of Liberal Arts are frequent users.

University lands along the Oyster River serve as a natural laboratory for research by faculty, graduate students, and undergraduates, primarily in the fields of basic and applied ecology, aquatic ecosystems, biology, earth sciences, ecosystem science, environmental science, forestry, hydrology, wildlife biology. While there is no formal or complete record of the number of funded research projects, theses, honors theses, Undergraduate Research Opportunities Program (UROP) sponsored projects, or scholarly publications that have used College Woods over the years, currently there are at least five funded research projects that make use of the Oyster River and adjacent lands.

- **Natural Resources** – The Oyster River and its corridor support numerous animal species, which are rare or vulnerable and have been listed as threatened, endangered, of special concern to the state. These include osprey and New England cottontail.

The Oyster River supports significant wildlife habitat. The Nature Conservancy's Coastal Plan and the NH Fish and Game's Wildlife Action Plan identify Core Focus Areas, Supporting Landscapes Areas, and highest quality habitat within the corridor. The Coastal Plan is unique in that it prioritizes coastal watershed areas and offers regional strategies for maintaining diverse wildlife habitat, abundant wetlands, clear water, productive forests, and outstanding recreational opportunities into the future. It was created with public input from a range of stakeholders including citizens, scientists,

conservation organizations, and natural resources agencies. The hope is that the plan will serve as a valuable guide, tool, and information resource for landowners, communities, land trusts, and public agencies that are interested in land conservation. [Source: The Nature Conservancy. *The Land Conservation Plan for New Hampshire's Coastal Watersheds*. July 2006.]

The Oyster River supports plant and exemplary natural ecological communities, such as herbaceous seepage marsh and red maple floodplain forest within its corridors as well as a number of valuable wetland complexes. A 4.5 million dollar wetland restoration project is being completed in Lee with the assistance of the USDA Natural Resource Conservation Service, and will include the creation of an Atlantic white cedar swamp.

The Oyster River is unique in its support of fish species. The state endangered American brook lamprey exists in New Hampshire only in the Oyster River. Seven fish species of concern are known to exist in the river; the highest number of species for any river in the state. The river is also important to migratory fish including the American eel and the blueback herring. The Denil fish ladder at the Durham Mill Pond dam is evidence of community support for this valuable resource.

- **The Collaborative Effort Between State Agencies and Municipalities**– The Samuel A. Tamposi property is located in the southeast corner of Barrington. The headwaters of the Oyster River and a headwater stream of the Bellamy River originate here. The Town of Barrington purchased 1,378 acres in 2001 to create a water supply protection reserve by means of a bargain sale by the Tamposi Corporation and a grant from NH Departmental Services Water Supply Protection Program. The land is now permanently protected by an easement held by the Society for the Protection of New Hampshire Forests.

The communities of Dover, Madbury, Durham, Lee, Portsmouth, and the University of New Hampshire obtain a portion of their drinking water from these rivers, and in an unprecedented move in New Hampshire, contributed funds or in-kind support to aid in the establishment of the reserve. [Source: Bellamy and Oyster River Watershed Protection Partnership (BORWPP) news release, May 2004.] While there are examples of cooperation among the towns of the region (protection of the 1,400 acre Tamposi Water Supply Reserve, and the Bellamy and Oyster River Watershed Protection Partnership), there is no formal cross-municipal body to address water issues within the Oyster River watershed.

While working on the Oyster River nomination, ORWA members met with Towns within the corridor and other watershed stakeholders to discuss the river's designation. At the time of submittal, there were over 20 letters of support received. The Lee Conservation Commission, Lee Planning Board, Lee Board of Selectman, Durham Conservation Commission, Madbury Conservation Commission, Madbury Water Board, Madbury Board of Selectmen, Barrington Conservation Commission, Barrington Planning Board, and Barrington Board of Selectmen all submitted letter of support. This speaks directly to the community support for establishing a local advisory committee to coordinate and collaborate across municipal boundaries to address the water quality risks that have been identified.

SECTION III. COMMUNITY AND PUBLIC SUPPORT

The level of community and other public support, which is demonstrated for a river nomination, will be an important factor in determining whether that river will be recommended for legislative designation. Such support may be shown by the adoption of a town resolution, a letter from selectmen, master plan excerpts, or documented from other groups, either public or private (if private, explain the group's purpose and who is represented).

Describe the type of community and other public support, which exists for the river nomination, and attach appropriate documentation. Include copies of any letters of support from local elected and appointed officials.

1. Notification of Corridor Communities: Notification letters and questionnaires were mailed on August 21, 2009 to the Towns of Barrington, Durham, Lee and Madbury (See copies of letters and questionnaires in Appendix A and B). Letters were also mailed to all Town selectmen, planning boards, and conservation commissions.

2. Outreach to Watershed Stakeholders: SRPC prepared email announcements and a Fact Sheet for the distribution to local land use boards and planning offices of the watershed communities and sent to the following watershed stakeholders: Strafford Rivers Conservancy, Strafford County Conservation District, Coastal Conservation Association of New Hampshire, Great Bay Trout Unlimited, NH Fish & Game, The Nature Conservancy, Piscataqua Region Estuaries Partnership, Lee Conservation Commission, Durham Conservation Commission, Madbury Conservation Commission, Barrington Conservation Commission, Madbury Water Board, Great Bay Protection Partnership, and the Gundalow Company. This was followed up by personal phone calls, meetings, and presentations.

3. Letters of Support: Along with municipal boards, the Strafford Rivers Conservancy, Strafford County Conservation District, Coastal Conservation Association of New Hampshire, Great Bay Trout Unlimited, NH Fish & Game, The Nature Conservancy, Piscataqua Region Estuaries Partnership, Great Bay Protection Partnership, and Gundalow Company all submitted letters of support. Refer to Appendix E.

4. When completed, SRPC will post on their website the complete Oyster River Nomination Package submitted to NHDES. SRPC will distribute a press release announcing the submission of the Oyster River Nomination for designation to the NH Rivers Management and Protection Program.

5. For the past 10 years, the Oyster River Watershed Association has been a 501(c)(3) nonprofit that seeks to protect, promote and enhance the ecological integrity and environmental quality of the Oyster River



watershed through community participation and involvement. The Association holds monthly meetings and river walks, conducts outreach and educational activities throughout communities in the watershed, and sponsors water quality monitoring through the NH Volunteer River Assessment Program. For a list of ORWA outreach strategies refer to Appendix D: Community Involvement.

6. While preparing the Oyster River Watershed Plan in 2001, the Oyster River Watershed Association wanted to create a platform for conversations regarding the long-term protection and management of the natural resources within the Oyster River watershed. The platform would rest upon the strong desire to use collective knowledge and wisdom to guide the decision making process as the Oyster River Watershed Association and the communities move into the future. It was seen as a neighbor-to-neighbor effort of collaboration.



The watershed management plan was perceived as an opportunity that occurred at a time when it was needed the most. The concept of the management plan foremost in the member's minds was to protect valuable resources rather than a management or restoration effort. The watershed management plan strives to attain an extremely delicate balance between individual and community efforts whereby community intentions and limitations are respected.

If the Oyster River is designated, the established local advisory committee could use this plan in order to re-visit their long-term protection and management strategies of the natural resources within the watershed.

7. Media Coverage – Refer to Appendix D: Community Involvement for article copies.

- *The New Hampshire* (October 23, 2009). “Groups hope to get State Protection for Oyster River.” An article published discussing the river’s nomination into the NH Rivers Management and Protection Program. *The New Hampshire* is a twice-weekly independent student newspaper of the University of New Hampshire in Durham, NH since 1911.
- *Foster’s Daily Democrat* (May 12, 2010). “Oyster River Nomination for the New Hampshire Rivers Management Program – Public Meeting.” *Foster’s Daily Democrat* is a six-day morning newspaper published in Dover, NH covering southeast New Hampshire and southwest Maine.
- *Durham Friday Updates* (May 14, 2010). “Oyster River Nomination for the New Hampshire Rivers Management and Protection Program- Public Meeting.” The *Durham Friday Updates* is a developed list server, which provides interested individuals with updates and announcements concerning the community.

8. ORWA Outreach List: Refer to Appendix D: Community Involvement for a report in 2007, summarizing findings from the Riverwalks that had been held up until that time.

Riverwalks

The Association has sponsored “Riverwalks” on roughly a monthly basis for a number of years. The general objective of these walks has been to learn about land uses and character of the vegetation along the streams, as well as potential water quality ramifications of situations that are observed. Most walks have consisted of walking a particular section of either the main stream or a tributary, but some have concentrated on particular issues of concern. Walks have been held in all months of the year; winter walks have facilitated examination of stream sections that are very marshy. The walks are open to anyone who is interested.

Main stream walks

- Samuel A. Tamposi Reserve (headwaters in Barrington) – two walks
- Sugar shack upstream to the headwaters – one walk
- Sugar Shack downstream to Route 125 (winter)
- Route 125 to Route 4 (west of Lee Circle) (winter)
- Route 4 (west) to Old Mill Road – one walk
- Old Mill Road to Snell Road – several walks
- Snell Road to Route 155 (north of Five Corners) – one walk
- Route 155 (north of Five Corners) to Route 155A at USGS Gauging Station. – one walk
- Oyster River Reserve (Town of Lee) Route 155A to Route 4 – one walk
- Route 4 to Route 155A (Mast Road) – two walks
- Route 155A (Mast Road) to reservoir dam at UNH – one walk
- Reservoir dam to Mill Pond – one walk
- Upper Mill Pond – one winter walk
- Mill Pond and dam – two walks
- Mill Pond dam downstream – one winter walk

Tributaries

- Caldwell Brook – two walks (one winter)
- Wheelwright Pond and brook – one walk
- Lee Circle brook – two walks
- Dube Brook – two walks, one winter
- Five Corners brook – one walk
- Chesley Brook – two walks
- Pettee (Reservoir) Brook – one walk
- Beard’s Creek – two walks
- College Brook – two walks
- Hamel Brook – one walk
- Johnson Creek – one walk
- Gerrish Brook – one walk
- Gerrish Brook tributary to Roselawn Farm – one walk
- Horsehide Creek – two walks
- Unnamed (“Chase Creek”) – one walk

Special Purpose Events

- Ecoquest and walk at Mill Pond Center
- Ecoquest and walk at Tuckaway Farm
- Road crossing inventory
- Farm pond inventory
- Old Mill inventory
- Clean up days
- UNH gas line route in watershed
- Old Mill Wetland Restoration project
- Oyster River Art Festival
- River Drive (stops at several points) – two events

Outreach

ORWA displays and volunteer water quality monitoring displays have been set up at many annual and special events in the watershed towns over the last decade:

- Durham Day
- Lee Country Fair
- Madbury Day
- Barrington Natural Heritage Day

Presentations:

- Durham Active Retirement Association
- UNH classes
- Durham - Great Bay Rotary

9. Other Events: The following meetings were attended by Oyster River Watershed Association, SRPC, and NHDES members to give a presentation on the pending nomination of the Oyster River into the NH Rivers Management and Protection Program and to discuss the implications of the designation.

- **Barrington Planning Board** (Thursday, February 4, 2010).
- **Durham Water/Wastewater/Stormwater Committee** (Thursday, April 29, 2010).
- **Lee Planning Board** (Wednesday, March 17, 2010).
- **Lee Board of Selectmen** (Monday, April 26, 2010).
- **Madbury Water Board** (Tuesday, October 27, 2009).
- **Madbury Board of Selectmen** (Monday, April 19, 2010).
- **Strafford Regional Planning Commission Annual Meeting** (May 27, 2010).

- **Noticed Public Meeting – Durham Council Chambers** (Thursday, May 20, 2010).

SECTION IV. OTHER SUPPORTING INFORMATION

1. Philip Trowbridge. *Sediment Loads from Great Bay Estuary Watershed: A Report to the Siltation Commission*. State of New Hampshire Department of Environmental Services; Watershed Management Bureau.

At the request of the Siltation Commission, the Department of Environmental Services compiled data on suspended sediment loads from watersheds to the Great Bay Estuary. DES used the suspended sediment concentrations measured at the tidal dams along with streamflow to estimate the loads during three periods: 1993-1996, 2002-2005, and 2006-2008.

The sediment yield from the Oyster River watershed is higher than the average for the Great Bay Watershed. In 2002-2005 and 2006-2008, the sediment yield from the Oyster River watershed was 15.1 and 17.1 tons/year/mi², respectively. The overall yield for the combined Great Bay watersheds during these periods was 7.1 and 9.1 tons/year/mi², respectively.

2. Underwood Engineering. *Feasibility Study for Re-establishing a Navigation Channel in the Oyster River, Durham NH: And Related Improvement of Wastewater Dilution*. Town of Durham. 2000.

The purpose of the study was twofold: to establish the optimal design of a channel necessary to restore navigation on the tidal Oyster River; and to assess the potential impacts of such a project. The overall goal was not to perform a formal engineering or environmental impact study, but to provide sufficient information to guide decision-makers interested in further pursuing channel restoration.

As the study progressed, another element came to light. Siltation of the river had caused a reduction of water flowing past the outfall pipe that discharges treated effluent from the nearby wastewater treatment plant into the Oyster River. The resulting loss of dilution of the effluent was expected to be a deterrent to the plant's ability to meet upcoming new federal regulations. Some possibilities were thus explored with the Town of Durham and Underwood Engineering on ways in which restoring the channel for recreation might also contribute to the solution of this wastewater treatment problem. Scientists from Dartmouth College were also retained to model the changes in tidal currents that would result from different channel design options. These two engineering efforts together provided information for making predictions on the possible impact that channel restoration would have on the dilution of treated wastewater.

3. Stephen Associates, Consulting Engineers. *Dam Evaluation Report: Oyster River Dam*. Town of Durham, Department of Public Works. March 17, 2009.

This Dam Evaluation Report provides the results of dam engineering evaluation performed by Stephens Associates Consulting Engineers, LLC for the Town of Durham, NH, Department of Public Works for Oyster River Dam #071.03 in Durham, New Hampshire.

The Town of Durham has retained Stephens Associates (SA) to inspect the dam, evaluate stability and evaluate options for addressing NHDES's concerns. Among the options for consideration are: rehabilitation, replacement and decommissioning. To assist the Town in its

considerations, SA preliminarily estimated relative costs for Durham rehabilitation and decommissioning at the request of Mike Lynch, Director of the Department of Public Works, and Dave Cedarholm, PE, Town Engineer. For comparison with decommissioning costs, SA assumed rehabilitation to include construction of repairs as well as dam operation and maintenance, and impoundment maintenance (dredging) over an assumed life of 30 years.

4. The Trust for Public Land. *Oyster River Forest, Durham: A Proposal Coordinated by the Trust for Public Land*. Durham Town Council. February 1, 2010.

The Trust for Public Land is asking the Town of Durham to be a partner to accomplish two separate but related goals: 1) conserve 171 acres abutting College Woods with significant frontage on the Oyster River; and 2) create incentives for downtown redevelopment. The 171 acres of unfragmented natural land that is the focus of the formal proposal is called The Oyster River Forest.

The property includes 4,640 feet of river frontage on the Oyster River and is situated between the Spruce Hole aquifer and the Oyster River, an area long recognized as an important source of drinking water for the Town and the University of New Hampshire, serving a population of approximately 16,000. For many Durham residents, this proposal may be the highest conservation priority.

5. Piscataqua Region Estuaries Partnership. UNH Stormwater Center. *The Oyster River Culvert Analysis Project: Final Technical Report*. March 7, 2010.

In 2008, the Piscataqua Regional Estuary Partnership (PREP) was awarded a \$50,000 grant from the U.S. Environmental Protection Agency's "Climate Ready Estuaries" initiative. This funded a detailed vulnerability assessment of how climate change is likely to impact the hydrology and drainage system within the watershed of the Oyster River, an important coastal river that empties into the Great Bay estuary in New Hampshire. New England is experiencing an unprecedented and ongoing increase in the frequency of extreme rainfall events.

Additionally, watersheds are being altered by development-associated increases in impervious surfaces such as roads, roofs, and parking lots. Both of these factors exacerbate water running off of the land. Many of the existing drainage systems in New England, including under-road culverts, were not designed to safely pass the amount of water that can be anticipated due to these changes. New systems are being designed still using standards that are fifty-years old. As a result, the trend in extreme storms and population growth increases the likelihood of failure of drainage components at road-stream crossings, damaging infrastructure and property, causing loss of life, and degrading both fluvial and down-stream estuarine aquatic ecosystems.

6. Vanasse Hangen Brustlin, Inc. *Mill Pond Bathymetric Survey and Sediment Sampling Study*. Town of Durham, Department of Public Works. 2010.

This report presents the findings of a bathymetric survey and sediment sampling study conducted on the Mill Pond located in Durham, New Hampshire. This study was funded through a Technical Assistance Grant provided by National Oceanographic and Atmospheric

Administration (NOAA) and administered by the New Hampshire Department of Environmental Services (NHDES) Coastal Program.

The general purpose of this study was to provide additional data to the Town officials and other interested stakeholders regarding the existing water depths and the physical and chemical nature of the bottom sediments within the pond. This information would then be used to assess how conditions in and around the pond may change if the dam was to be removed, especially with respect to vegetation and bottom sediments

SECTION V. RIVER CLASSIFICATIONS

Each river or river segment that is designated by the state legislature will be placed into a river classification system. This classification system consists of four categories: Natural, Rural, Rural-Community and Community Rivers. Refer to Appendices A and B in the Guide to River Nominations, for a complete description and explanation of the river classification system and the instream protection measures which have been adopted by the state legislature for each classification. In this part of the nomination form, DES and the State Rivers Management Advisory Committee are interested in learning which river classification(s) you believe is most appropriate for your river.

1. River Segment Criteria

For each classification criteria listed below (a-d), check the one box, which most accurately describes the nominated river or segment.

<u>(a) General Description</u>	
X	The river or segment is free flowing and characterized by high quality natural and scenic resources. The river shoreline is in primarily natural vegetation and the river corridor is generally undeveloped and development, if any, is limited to forest management and scattered housing. (Natural Rivers)
X	The river or segment is adjacent to lands, which are partially or predominantly used for agriculture, forest management and dispersed or clustered residential development. Some instream structures may exist, including low dams, diversion works and other minor modifications. (Rural Rivers)
X	The river or segment which flows through developed or populated areas of the state and which possesses existing or potential community resource values such as those defined in official municipal plans or land use controls. Such a river has mixed uses in the corridor reflecting some combination of open space, agriculture, residential, commercial and industrial land uses. It is readily accessible by road or railroad and may include impoundments or diversions. (Rural-Community Rivers)
X	The river or segment flows through populated areas of the state and possesses actual or potential resource values, with some residential or other building development near the shoreline. The river or river segment is readily accessible by road or railroad, and may include some impoundments or diversions. (Community Rivers)
<u>(b) Length</u>	
	The river or segment is at least 5 miles long. (Natural Rivers)
X	The river or segment is at least 3 miles long. (Rural and Rural-Community Rivers)
X	The river or segment is at least 1 mile long. (Community Rivers)
<u>(c) Water Quality</u>	
X	The actual water quality of the river or segment meet Class A standards under the state's water quality standards. (Natural Rivers)
	The actual water quality of the river or segment meets Class B standards under the state's water quality standards. (Rural, Rural-Community and Community Rivers)
<u>(d) Distance to Roads</u>	
	The minimum distance from the river shoreline to a paved road open to the public for motor vehicle use is at least 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. (Natural Rivers)
X	There is no minimum distance from the river shoreline to an existing road. Roads may parallel the river shoreline with regular bridge crossings and public access sites. (Rural, Rural-Community and Community Rivers)

2. River Segments

Rural Community River Segments

Segment 1 - Rural/Community (4.6 miles)

Immediately downstream of the Hall Road bridge in Barrington, 4.6 miles to the upstream of Old Mill Road. in Lee.

Segment 2 - Rural (3.07 miles)

Immediately downstream of Old Mill Road in Lee, 3.07 miles to the upstream Route 155 crossing in Lee.

Segment 3 - Rural/Community (4.5 miles)

Immediately downstream of the Route 155 crossing in Lee, 4.5 miles to the Oyster River Dam in Durham.

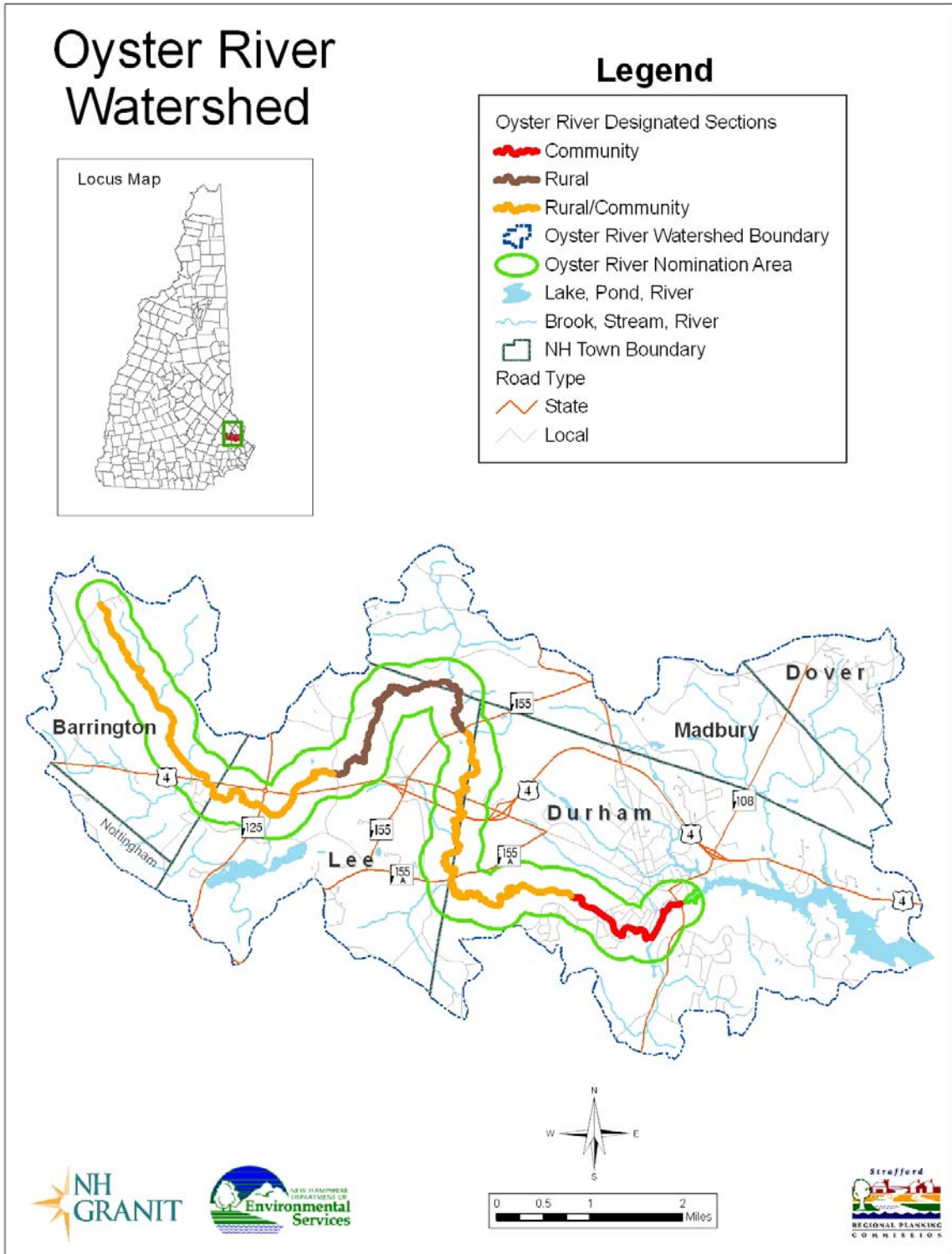
Community River Segments

Segment 4 - Community (1.8 miles)

Immediately downstream of the Oyster River Dam in Durham, 1.8 miles to the Mill Pond Dam in Durham.

The total river length nominated for protection is 13.97 miles, from the headwaters in Barrington and runs through to the Mill Pond Dam in Durham. The total acreage of land within the Oyster River Corridor is 3,910 acres.

SECTION VI. MAP SET



***The tidal portion of the Oyster River is not part of this designation.**

SECTION VII. RESOURCE ASSESSMENT

1. Natural Resources

Geographic and Physical Setting

The Oyster River watershed is approximately 31 square miles or 19,828 acres in size. It is one of the smallest watersheds located within the New Hampshire Coastal Basin. The drainage from the Oyster River and its watershed empties into the Great Bay, an estuarine system, which then empties into the Gulf of Maine. The Oyster River and all its tributaries in Barrington, Durham, Lee and Madbury are designated Class A streams and are used as a water supply for the University of New Hampshire and the Towns of Durham and Lee.

Table 1. Facts and Figures About the Oyster River Watershed
[Source:USGS]

Area of Oyster River Watershed	19,828 acres
Number of Subwatersheds	7
Elevation Change Along River	380 feet
Median Daily Discharge	30.8 cfps
Maximum Recorded Discharge	256 cfps (Mar. 9)
Minimum Recorded Discharge	0.88 cfps (Oct. 6)
Total Discharge to Estuary	11,267.07

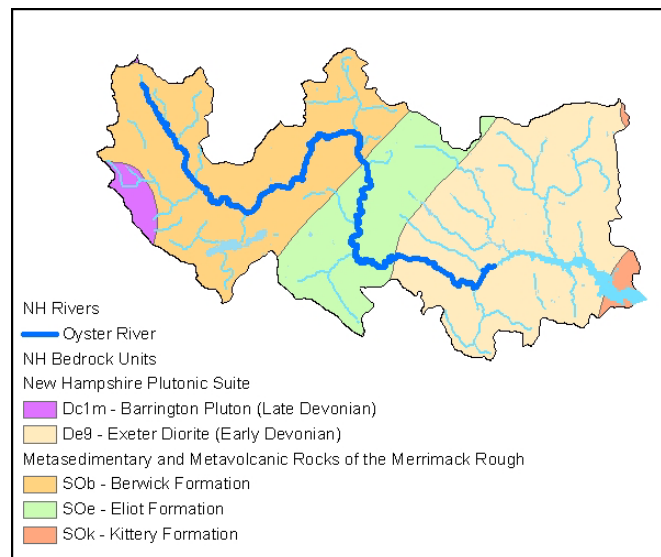
* Discharge data was collected from 2008 Oyster River stream gage records

(a) Geologic Resources

(1) Describe the important geologic resources found in the river and its corridor. Note their significance at the national, regional, statewide, or local level. Geologic resources to consider include those of natural history, visual, or economic interest. Natural history may include interesting bedrock, rapids, waterfalls, and surrounding topography such as evidence of glaciation. Scenic resources may include, in addition to the rapids and waterfalls listed above, gorges, cliffs, and bluffs. Economic geology may include the presence of ore minerals or materials such as sand and gravel. Significant aquifers in a river corridor are also a geologic resource.

Much of the Oyster River watershed is underlain by plutonic and metasedimentary rock formations. Plutonic, or igneous, formations include coarse-grained granitic and diorite rocks. Refer to Figure 1. for the distribution and description of these rock types within the watershed.

Figure 1. Geologic Formations of the Oyster River Watershed
[Source: NH GRANIT]



Similar to most of New Hampshire, the bedrock underlying the Oyster River corridor was covered by unconsolidated stratified drift deposits of till, unsorted glacial sediment, following the last glaciation. Stratified drift deposits consist of sand and gravel transported by Pleistocene glaciers and deposited in layers by meltwater streams. [Source: Thomas J. Mack, Sean M. Taylor. *Geohydrology and Water Quality of Stratified-Drift Aquifers in the Bellamy, Cocheco, and Salmon Falls River Basins, Southeastern New Hampshire*. NHDES. 1992.] These coarse-grained deposits are the basis for stratified-drift aquifers that are common and productive water sources in the watershed. These deposits also can provide significant sources of gravel and sand for construction purposes.

Stratified Drift Aquifers

Stratified drift aquifers are composed of layers of sand and gravel deposited by meltwater coming from glaciers, not the glaciers themselves. These layers are partially or fully saturated by groundwater below the land surface. Water yield from stratified drift aquifers is highly affected by groundwater recharge from precipitation, snowmelt and atmospheric conditions (drought). These sand and gravel deposits are widespread in large river valleys and form broad, moderate to steep sloping hills on the landscape.

Stratified drift aquifers comprise nearly 8.5 percent of the total land area of the Oyster River watershed. Refer to Figure 2. for the distribution of stratified drift aquifers throughout the entire watershed.

Table 2. Acreage of Stratified Drift Aquifers by Watershed Community
[Source: NH GRANIT]

Community	Corridor Acres	Watershed Acres	% Watershed
Barrington	87.8	324.3	1.6%
Lee	223.2	1069.1	5.4%
Durham	37	285.7	1.4%
Total	348	1679.1	8.4%

Spruce Hole Aquifer

The Spruce Hole formation is a sand deposit located in Lee and Durham, NH. In a recent study by the USGS, Spruce Hole was identified as a potential aquifer. This aquifer is well positioned between the Lamprey and Oyster Rivers. The sand deposit is being actively mined and there have been recent development pressures. In response, the Town of Durham has acquired 27 acres of the formation increasing public ownership to over 50 acres. [Source: Ballesterio, T.P., Birch, F.S., & Lee, T. *Hydrology of the Spruce Hole Aquifer*. UNH. 1994.]

Spruce Hole Peat Bog

The Spruce Hole Aquifer is also home to one of the few remaining undisturbed kettle-hole bogs in New England and the only one remaining in southeastern New Hampshire. The Spruce Hole Peat Bog is an exceptional and environmentally sensitive formation created by the melting of a glacier. It was classified as a unique ecological area by the US National Park Service and is a registered National Natural Landmark. Bogs are distinctive ecosystems whose species composition can be greatly influenced by water table characteristics and chemical composition of incoming water. With recent development pressures and possible use of the Spruce Hole Aquifer as a water source for Durham, a study on the biological characteristics of the bog was required.

Oyster River Nomination Form

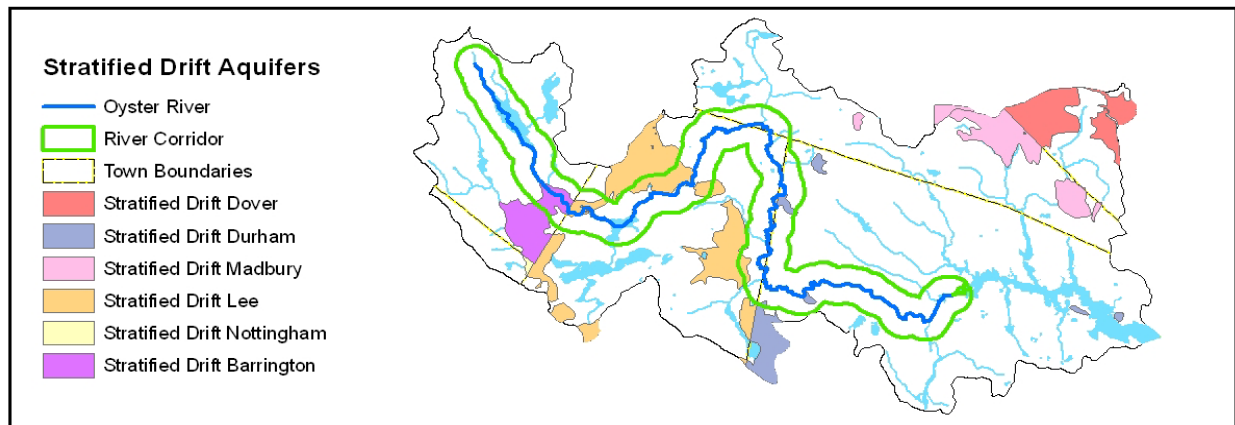
NH Rivers Management and Protection Program

Submitted June 1, 2010

Principle findings included that the bog is a perched system and responds rapidly to rainfall; however, the underlying aquifer does not. [Source: Thomas P. Ballestero, Frank S. Birch, and Thomas Lee. *Hydrology of the Spruce Hole Aquifer*. UNH.] Refer to Figure #7 - Water Resources: Aquifers and Wetlands.

On Tuesday, November 17, 2009 members of the public were invited to an unveiling ceremony of an official US Government bronze plaque given to the Town of Durham by the National Parks Service (NPS) recognizing the Spruce Hole Bog as a unique geologic occurrence.

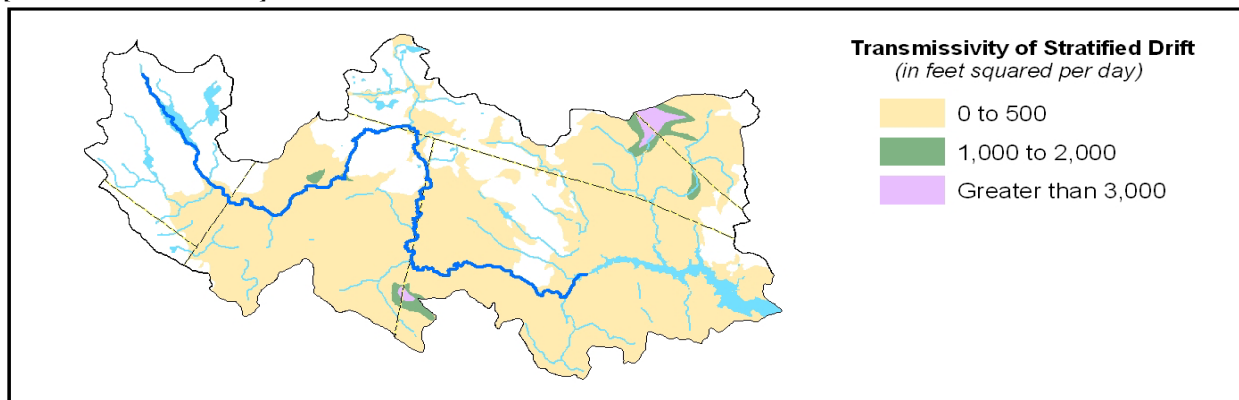
Figure 2. Distribution of Stratified Drift Aquifers in Oyster River Watershed
[Source: NH GRANIT]



Transmissivity

Transmissivity of an aquifer is a measure of the quantity of water that can be transmitted horizontally. The term is typically used to determine the water that an aquifer can deliver to a pumping well. It can be calculated directly from the aquifer’s average horizontal permeability and thickness. Transmissivity of stratified drift aquifers in the Oyster River watershed is estimated to be largely 0 to 500 feet squared per day, with isolated areas of 1,000 to 2,000 feet squared per day and a very small portion of greater than 3,000 feet squared per day. Refer to Figure 3. for the distribution and estimated transmissivity of stratified drift aquifers in the Oyster River watershed.

Figure 3. Estimated Transmissivity of the Stratified Drift Aquifers
[Source: NH GRANIT]



Local Protections of Groundwater Resources

The importance of groundwater movement in replenishing water within the aquifers cannot be neglected. Some of this water may move in from adjacent topographic watershed divides, but most has filtered downward through overlying materials and laterally through the bedrock from rainfall and snowmelt. [Source: Peter Thompson. University of New Hampshire. 2009.] Many areas within the watershed have been the focus of land conservation efforts focused on water resource protection. In 2001, the Town of Barrington completed one of the most considerable local and regional protection measures in managing water quality and quantity.

Samuel A. Tamposi Water Supply Reserve

Barrington is a source of drinking water for several downstream communities, including Portsmouth, Dover, Durham and the University of New Hampshire. Back in the early 1990s, Barrington was working to conserve the 1400-acre Samuel A. Tamposi Water Supply Reserve (SATWaSR). In 2001, the undeveloped land was permanently protected. The Reserve is home to the headwaters of the Oyster and Bellamy Rivers, which are both significantly important water supplies for the coastal communities. It includes a wide variety of habitats and populations of moose, bear, fox and fisher. Features also contain globally rare Atlantic white cedar swamp communities. The Town of Barrington owns the land and it is protected by an easement held by the Society for the Protection of NH Forests. This large tract of conserved land makes it important for maintaining high water quality and stable flow volumes downstream. [Source: Julia Peterson, Amanda Stone, and James Houle. *Protecting Water Resources and Managing Stormwater in New Hampshire*. UNH Cooperative Extension.]

Lee Well and Spruce Hole Aquifer

A way to actively manage potential threats to groundwater is through groundwater reclassification. This is a process that involves both the local entity – a water supplier or municipality – and DES. Through this process, a local entity would inventory and manage potential contamination sources through education and inspections. Reclassification provides the local entity with the authority to enforce Best Management Practices rule in the protected area. [Source: NH Department of Environmental Services, *The DES Guide to Groundwater Protection*, Revised October, 2008.]

In November, 2004 the NH Department of Environmental Services approved the Town of Durham's request for reclassification of groundwater in portions of Durham and Lee to GAA and GA1 from its current status of GA2. The area reclassified to GAA is the wellhead protection area for the UNH/Durham Water System's Lee Well. The area reclassified to GA1 is the area identified as "Spruce Hole Aquifer Reclassification Area". [Source: Michael Nolin, Commissioner NH DES, Letter to Town of Durham dated 11/15/05, Approval of Requests for Groundwater Reclassification.]

- **GAA** – Delineated Wellhead Protection Areas. Prohibits new and monitors existing risk uses (e.g. landfills). Authorizes active management on local level
- **GA1** – Groundwater of high value for present or future drinking water. No land use prohibitions. Authorizes active management on local level.
- **GA2** – Potentially valuable stratified drift aquifers defined by USGS. No land use prohibitions. No active management.

Oyster River Nomination Form

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(b) Wildlife Resources

(1) Species of mammals, macroinvertebrates, and birds observed in the river and river corridor.

Table 3. Mammals in the Oyster River and River Corridor

[Source: An Inventory of Natural, Agricultural and Cultural Resources on The Tuckaway and Sheltering Rock Farms, Lee, NH 2009, Observed on River Walks and Wildlife Screenings.]

Fisher	Beaver	Black Bear	Eastern Chipmunk
Mink	River Otter	Moose	Hairy-tailed Mole
Virginia Opossum	Red Fox	Grey Squirrel	Ermine
Raccoon	Coyote	Red Squirrel	Snowshoe Hare
Striped Skunk	Muskrat	Southern Flying Squirrel	Little Brown Bat
Deer Mouse	Short-tailed Weasel	White-footed Mouse	Pygmy Shrew
White-tailed Deer	Porcupine	Meadow Vole	Eastern Cottontail
Woodchuck	Grey Fox	New England Cottontail (E)	Star-nosed Mole
Potential Species			
Masked Shrew	Water Shrew	Smoky Shrew	N. Short-tailed Shrew
N. Long-eared Bat	E. Small-footed Myotis	Bog Brown Bat	Silver-haired Bat
Eastern Pipistrelle	Red Bat	Hoary Bat	Coney Rabbit
Woodland Vole	House Mouse	S. Red-backed Vole	S. Bog Lemming

(E) = Endangered species defined by the NH Department of Fish and Game.

Potential Species = Based on field evidence gathered from existing observations of habitat, weather, climate, and human and natural disturbances and combined with document evidence from the New Hampshire Wildlife Action Plan to predict with reasonable certainty what wildlife could and does likely inhabit the property. [Source: Degraff, Richard M. & Mariko Yamasaki. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England, Hanover. 2001.]

Table 4. Macroinvertebrates Observed in the Oyster River and River Corridor

[Source: David Neils, NH Department of Environmental Services. Stream Biomonitoring Report, 2007]

Latin Name	Common Name
Diptera - Chironomidae	Non-Biting Midges
Isopoda - Asellidae	Pillbug
Trichoptera – Hydropsychidae	Caddisfly
Trichoptera – Polycentropodidae	Tube-Maker Caddisflies
Haplotaxida - Naididae	Earthworms
Ephemeroptera – Leptophlebiidae, Heptageniidae	Mayfly
Megaloptera – Corydalidae	Dobsonflies
Odonata – Calopterygidae	Dragonflies/Damselflies
Amphipoda – Crangonyctidae, Gammaridae	Aquatic Amphipod
Plecoptera - Taeniopterygidae	Winter Stoneflies
Basommatophora – Ancyliidae	Snail
Diptera – Simuliidae	Black Fly
Plecoptera – Perlidae	Common Stoneflies
Heteroptera – Belostomatidae	Giant Water Bugs
Heteroptera – Veliidae	Broad-Shouldered Water Striders; Ripple Bug
Trichoptera – Psychomyiidae	Trumpet-net Caddisflies
Diptera – Empididae	Balloon Flies

Coleoptera – Psephenidae	Beetles
Odonata – Aeshnidae	Darner
Trichoptera – Hydropsychidae	Net-Spinning Caddisflies
Trichoptera – Philopotamidae	Fingernet Caddisflies
Trichoptera – Limnephilidae	Northern Caddisflies
Trichoptera – Rhyacophilidae	Primitive Caddisflies
Clitellata - Oligochaeta	Angleworms
Megaloptera – Sialidae	Alderflies
Diptera – Tipulidae	Crane Flies
Diptera – Ceratopogonidae	Biting Midges
Platyhelminthes – Tubellaria	Flatworms

Figure 4. NHDES Stream Biomonitoring Locations
 [Source: New Hampshire Department of Environmental Services Stream Biomonitoring Report, 2007]

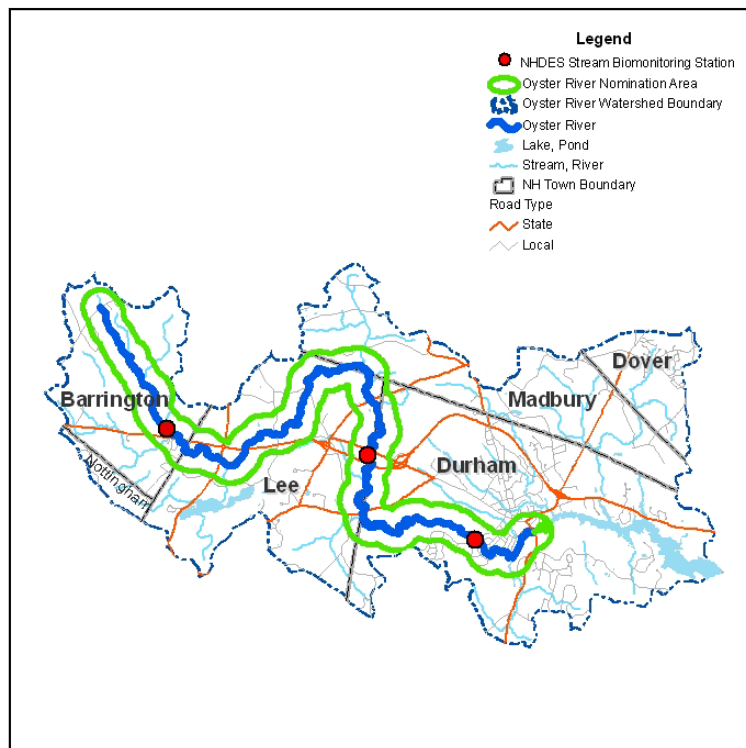


Table 5. Bird Species in the Oyster River and River Corridor
 [Source: An Inventory of Natural, Agricultural and Cultural Resources on The Tuckaway and Sheltering Rock Farms, Lee, NH 2009, Observed on River Walks and Wildlife Screenings.]

American Black Duck	Rufous Side Towhee	Cedar Waxwing
Mallard	Bluebird	Snowy Owl
Canada Goose	Gray Owl	Baltimore Oriole
Yellow-rumped Warbler	Banded Pigeon	Ruby-throated Hummingbird
Warbling Vireo	Turkey Vulture	Rose-breasted Grosbeak
Song Sparrow	Common Nighthawk (E)	Golden-winged Warbler (C)
Swamp Sparrow	Osprey	Blue Winged Warbler
Great Blue Heron	Cerulean Warbler (C)	Indigo Bunting
Double-crested Cormorant	Whip-poor-will (C)	Northern Cardinal

Cooper's Hawk (C)	Grasshopper Sparrow	Eastern Meadowlark
Pileated Woodpecker	Red-belly Woodpecker	Red-winged Blackbird
Red-tailed Hawk	Scarlet Tanager	American Woodcock (C)
Wild Turkey	American Goldfinch	Barn Owl
Screech Owl	Mourning Dove	American Crow
Barred Owl	European Starling	Great Horned Owl
Red-Shoulder Hawk (C)	Hairy Woodpecker	Downy Woodpecker
Belted Kingfisher	Ruffed Grouse	Northern Harrier
Horned Lark	Pied-Billed Grebe	Barn Swallow
Blue Jay	Broad-winged Hawk	Brown Creeper
Gray Catbird	Black-capped Chickadee	Chipping Sparrow
Brown-headed Cowbird	Evening Grosbeak	Field Sparrow
Northern Flicker	House Sparrow	House Wren
Dark-eyed Junco	American Kestrel	Killdeer
Mockingbird	Ovenbird	Partridge
Pewee	Pheasant	Eastern Phoebe
Pileated Woodpecker	Timberdoodle	Tufted Titmouse
E. Towhee	Tree Sparrow	Turkey
White-breasted Nuthatch	White-throated Sparrow	Winter Wren
Wood Duck	Wood Thrush (C)	Common Yellowthroat
Yellow-bellied Sapsucker	Pine Warbler	Common Raven
Red-breasted Nuthatch	American Robin	Rose-breasted Grosbeak
Potential Species		
Northern Goshawk (C)	Veery (C)	American Black Duck (C)
Sedge Wren (E)	Canada Warbler (C)	Mud Hen
Green Heron	Hooded Merganser	Bald Eagle (T)
Sharp-shinned Hawk	Broad-winged Hawk	Rough-legged Hawk
Peregrine Falcon (T)	Virginia Rail	Sora
Common Moorhen	Spotted Sandpiper	Upland Sandpiper (E)
Snipe	Rock Pigeon	Black-billed Cuckoo
Yellow-billed Cuckoo	Screech Owl	Long-eared Owl
Saw-whet Owl	Chimney Swift	Red-headed Woodpecker
Alder Flycatcher	Willow Flycatcher	Least Flycatcher
Great Crested Flycatcher	Eastern Kingbird	Northern Shrike
Yellow-throated Vireo	Red-eyed Vireo	Horned Lark
Tree Swallow	Rough-winged Swallow	Marsh Wren
Blue-gray Gnatcatcher	Hermit Thrush	Brown Thrasher
Nashville Warbler	Yellow Warbler	Chestnut-sided Warbler
Magnolia Warbler	Blackburnian Warbler	Prairie Warbler
Black-and-white Warbler	Redstart	

(T) = Threatened species defined by the NH Department of Fish and Game.

(E) = Endangered species defined by the NH Department of Fish and Game.

(C) = Species of Concern identified by the NH Department of Fish and Game.

Potential Species = Based on field evidence gathered from existing observations of habitat, weather, climate, and human and natural disturbances and combined with document evidence from the New Hampshire Wildlife Action Plan to predict with reasonable certainty what wildlife could and does likely inhabit the property. [Source: Degraff and Yamasaki, 2001.]

(2) List any endangered or threatened animals, which are supported by the river and river corridor environment. Include location, if known. Check whether these animals are endangered [E] or threatened [T] species and if they are significant at a national [N] or state [S] level.

Table 6. Endangered or Threatened Animals within the Oyster River and River Corridor
 [Source: NH Natural Heritage Bureau, 2009]

Species	Location	Listing Status	Rankings	Precision	Last Observed
Least Bittern (<i>Ixobrychus exilis</i>)	Durham	SC	S1/G5	S	1995
Blanding's Turtle (<i>Emydoidea blandingii</i>)	Durham	E	S3/G4	S	1966
Spotted Turtle (<i>Clemmys guttata</i>)	Lee	T	S3/G5	S	2000
Wood Turtle (<i>Glyptemys insculpta</i>)	Lee	SC	S3/G4	S	1997
Osprey (<i>Pandion haliaetus</i>)	Durham	SC	S2B/G5	S	2006
Great Blue Heron Rookery (<i>Ardea herodias</i>)	Durham	-	S4B/G5	S	1986
Ringed Bog Haunter (<i>Williamsonia lintneri</i>)	Durham	E	S1/G3	S	2008
New England Cottonail (<i>Sylvilagus transitionalis</i>)	Durham	E	S3/G3	S	2008
Gold-Winged Warbler (<i>Vermivora chrysoptera</i>)	Durham	SC	S2B/G4	S	1984
Vesper Sparrow (<i>Pooecetes gramineus</i>)	Durham	SC	S2S3/G5	S	1984
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	Lee	T	S1B/G5	S	2002
Upland Sandpiper (<i>Bartramia longicauda</i>)	Durham	E	S1/G5	S	2001
Species State - SRANK	Global Rank- GRANK		Precision		Listing Status
S1 = critically imperiled because of rarity, especially vulnerable to extirpation from state. Typically 5 or fewer occurrences.	G1 = critically imperiled globally. Typically 5 or fewer occurrences.		S = location known to within ca. 300 feet.		T = Threatened
S2 = imperiled because of rarity, vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining.	G2 = imperiled globally. Typically 6-20 occurrences.				E = Endangered
S3 = vulnerable because rare or uncommon, found in restricted range. Typically 21 to 100 occurrences.	G3 = vulnerable, rare. Typically 21-100 occurrences.				M = Monitored
S4 = apparently secure, uncommon not rare usually widespread. Usually more than 100 occurrences.	G4 = apparently secure, uncommon not rare. Some cause for long-term concern. Usually more than 100 occurrences.				SC = Special Concern
S5 = secure, demonstrably widespread, abundant	G5 = secure, common; widespread and abundant.				

(3) List significant wildlife habitat, which is supported by the river or to which the river is integral, for game and non-game wildlife populations. Identify if the habitat has been determined to be exceptionally diverse, very diverse, or moderately diverse by the NH Fish and Game Department or the U.S. Fish and Wildlife Service.

Table 7. Significant Wildlife Habitat Supported by the Oyster River
 [Source: The Land Conservation Plan for New Hampshire’s Coastal Watersheds (2007), New Hampshire Wildlife Action Plan (2010)]

Significant Habitat	Source
Oyster River Corridor	
<i>Core Focus Areas and Supporting Landscape</i>	
Oyster River (Lee, Madbury, Durham)	Land Conservation Plan
Creek Pond Marsh (Barrington)	Land Conservation Plan
LaRoche and Woodman Brooks (Durham)	Land Conservation Plan
Highest Quality Habitat in NH	Wildlife Action Plan
Highest Quality Habitat in Biological Region	Wildlife Action Plan
Supporting Landscapes	Wildlife Action Plan
Oyster River Watershed	
Johnson and Bunker Creeks (Durham, Dover)	Land Conservation Plan
Crommet and Lubberland Creeks (Durham)	Land Conservation Plan
<i>NH Fish & Game Conservation Focus Areas</i>	
Highest Quality Habitat in NH	Wildlife Action Plan
Highest Quality Habitat in Biological Region	Wildlife Action Plan

Land Conservation Plan for New Hampshire’s Coastal Watersheds

The Land Conservation Plan for New Hampshire’s Coastal Watersheds (2007) by The Nature Conservancy and its state, local and non-profit partners, recognizes five Core Focus Areas and their Supporting Landscapes located wholly or partially within the Oyster River corridor and watershed. Refer to Figure 8 for a map of the Core Focus Areas and Supporting Landscape Areas.

Wildlife Action Plan (2010), NH Fish & Game

As reported by the New Hampshire Wildlife Action Plan (U.S. Fish & Wildlife Service, 2010, available at http://www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/using_maps.htm) the Oyster River contains several Core Focus Areas and highest quality habitat in NH and is within a biological region (as defined in the plan). Refer to Figure 9 for a map of the Core Focus Areas and Highest Quality Habitat Areas.

(4) Determine if the river corridor is important for the movement of wildlife between large habitat areas. If it is, explain why.

The Oyster River corridor is critical for the movement of wildlife species. The Oyster River and associated riparian habitats provide the most extensive contiguous habitat in the watershed. Between the Mill Pond dam in Durham and Route 125 in Lee, there are only nine river crossings and over 80% of the river has no development within 0.1 mile. Various wildlife species have been observed during all seasons and tracked during periods of snow cover between the UNH

College Woods and the conservation lands north of Mast Road on the Durham-Lee boundary. Field evidence suggests that animals in the table below use the Oyster River and adjacent riparian habitats to move between these large habitat areas (Thomas D. Lee. Associate Professor of Forest Ecology. UNH. Personal communication).

Table 8. Various Wildlife Species Movement Between Large Habitat Areas
[Source: Thomas D. Lee. Associate Professor of Forest Ecology. UNH.]

Beaver	Muskrat	Porcupine	Coyote	Red Fox
Gray Fox	Black Bear	Mink	River Otter	White-tailed Deer
Moose	Belted Kingfisher	Great Blue Heron	Wild Turkey	

(c) Vegetation and Natural Ecological Communities

Vegetation and Natural Ecological Communities of the Oyster River

The river corridor for most of its length is either forest, open and shrub wetlands, or agricultural land; the latter dominated by hay fields. The exceptions are road/highway crossings, the commercial zone in the vicinity of the Lee traffic circle (Intersection of Routes 4 and 125), cultivated fields in the Mast Road (Route 155A) vicinity of Durham, and the residential development in the Mill Pond/ lower river vicinity in Durham. The forested portions are largely second growth woodlands that have grown following the decline of the earlier agricultural communities of the 1800's.

The undeveloped parts of the corridor are remarkably undisturbed and exhibit a pristine character that belies the nearby human influence. There is a large portion of the river where humans rarely visit and where natural processes take place with little human interference. To the extent possible the natural ecological communities will be described in terms of the habitat types that are identified in the New Hampshire Wildlife Action Plan and the Natural Communities of New Hampshire.

Peatlands

The Oyster River origins are in Atlantic white-cedar swamps and peat bogs located in the Town of Barrington. The Barrington Atlantic white-cedar swamps fall into two types: 'seasonally flooded Atlantic white-cedar swamp' and 'Atlantic white-cedar -- yellow birch -- pepperbush swamp'. Both types are considered rare and imperiled (ranked S2 by NH Heritage Bureau) in New Hampshire. [Source: Sperduto, D.D and N. Ritter. *Atlantic White Cedar Wetlands of New Hampshire*. NH Heritage Inventory, Department of Resources & Economic Development. 1994.] These peatlands are located mostly in the Samuel A. Tamposi Water Supply Reserve, which was acquired using funds raised by the Towns of Barrington, Lee, Madbury, Dover, Durham and UNH, as well as the New Hampshire Department of Environmental Services Water Supply Protection Program. In addition, there are peatland areas in the upper portion of Caldwell Brook, a major tributary of the Oyster River, also protected via conservation easement. Some of the Caldwell Brook peatlands formerly supported Atlantic white-cedar, but cedar was eliminated by beaver impoundments. Some of the Tamposi cedar swamps have also been impacted by beaver flooding. [Source: Sperduto, D.D. and W.E. Nichols. *Natural Communities of New Hampshire*. NH Natural Heritage Bureau and the Nature Conservancy. Department of Resource & Economic Development. 2004.]

Marsh and Shrub Wetlands

Much of the river edges, banks, and floodplains between the Tamposi Reserve and the Mill Pond in Durham are fringed with marsh and shrub wetlands. Marsh community types are represented by: 'tall graminoid emergent marsh', 'medium depth emergent marsh (with pickerel weed and bur-reed dominant)', 'cattail marsh', and 'aquatic bed' (mainly yellow water lilies), while shrub communities include 'speckled alder – silky dogwood – arrowwood alluvial thicket', 'meadowsweet alluvial thicket', and 'alluvial mixed shrub thicket'. [Source: Sperduto, D.D. and W.E. Nichols. *Natural Communities of New Hampshire*. NH Natural Heritage Bureau and the Nature Conservancy. Department of Resource & Economic Development. 2004.] All of these wetlands are fairly common communities in NH (ranked S4-S5). Of special interest is the very

large marsh, shrub, and forested wetland through which the river flows in the vicinity of the Lee traffic circle. This area encompasses more than 240 acres and includes examples of most of the communities cited above as well as some red maple floodplain forest. [Source: Allan, David M. *Wetlands of Lee*. Lee Conservation Commission. Lee, NH. 1976]

Floodplain and Other Wetland Forest

There are several forested areas in the corridor that serve flood plain functions, temporarily storing storm water and relieving flooding pressure downstream. These forests are generally dominated by red maple, and likely include the following community types: ‘red maple – lake sedge swamp’, ‘red maple – sensitive fern swamp’, and ‘seasonally flooded red maple swamp’. Good examples of the rare (S2) ‘red-maple – black ash – swamp saxifrage swamp’ and ‘red maple – elm – ladyfern silt forest’ occur in College Woods within the Oyster River corridor [Source: Sperduto, D.D. and W.E. Nichols. *Natural Communities of New Hampshire*. NH Natural Heritage Bureau and the Nature Conservancy. Department of Resource & Economic Development. 2004.]

Upland Forest

The ¼ mile wide corridor that is the focus of the Oyster River nomination contains extensive upland forests. The majority of these are dominated by eastern white pine and a mixture of hardwoods. They occur on former agricultural lands (pastures and croplands) that were abandoned 30-140 years ago. Some of these forests are mature enough to be classified by the New Hampshire Heritage Bureau system, and they include: ‘hemlock – beech – oak – pine forest’, probably the most common type in the watershed, as well as dry red oak – white pine forest’, ‘mesic Appalachian oak – hickory forest’, ‘semi-rich Appalachian oak – sugar maple forest’, among others. The University of New Hampshire College Woods includes some of the most unique forests in the seacoast region. Most of this forest is either ‘hemlock – beech – oak – pine forest’ or ‘hemlock forest’ both of which are not uncommon types, but contain unusually old and large eastern white pines and eastern hemlocks. [Source: Sperduto, D.D. and W.E. Nichols. *Natural Communities of New Hampshire*. NH Natural Heritage Bureau and the Nature Conservancy. Department of Resource & Economic Development. 2004.] There are over 10 eastern white pine individuals that exceed 1 meter (3.3 feet) in diameter, and some that exceed 35 meters (120 feet) in height. Some of the pines likely exceed 300 years in age and several hemlocks exceed 200 yrs. The unusual properties of the matrix forest in the College Woods Natural Area are cited in Lyon’s and Reiners’ *Natural Areas of New Hampshire Suitable for Ecological Research* (1971) and Jorgensen’s *A Guide to New England’s Landscape* (1977).

(1) List the plant species commonly found in the river and river corridor

Table 9. Common Plant Species in the River and River Corridor
 [Source: Observed on River Walks and Wildlife Screenings, UNH faculty and students]

COMMON NAME	SCIENTIFIC NAME
TREES	
Striped Maple	<i>Acer pensylvanicum</i>
Norway Maple	<i>Acer platanoides</i>
Red Maple	<i>Acer rubrum</i>
Sugar Maple	<i>Acer saccharum</i>
Yellow Birch	<i>Betula alleghaniensis</i>

Sweet Birch	<i>Betula lenta</i>
Paper (white) Birch	<i>Betula papyrifera</i>
Gray Birch	<i>Betula populifolia</i>
Musclewood	<i>Carpinus caroliniana</i>
Shagbark Hickory	<i>Carya ovata</i>
American Chestnut	<i>Castanea dentata</i>
Atlantic White-Cedar	<i>Chamaecyparis thyoides</i>
American Beech	<i>Fagus grandifolia</i>
White Ash	<i>Fraxinus americana</i>
Black Ash	<i>Fraxinus nigra</i>
Eastern Hophornbeam	<i>Ostrya virginiana</i>
Red Pine	<i>Pinus resinosa</i>
Pitch Pine	<i>Pinus rigida</i>
White Pine	<i>Pinus strobus</i>
Big-toothed Aspen	<i>Populus grandidentata</i>
Quaking Aspen	<i>Populus tremuloides</i>
Black Cherry	<i>Prunus serotina</i>
White Oak	<i>Quercus alba</i>
Red Oak	<i>Quercus rubra</i>
Black Oak	<i>Quercus velutina</i>
American Basswood	<i>Tilia americana</i>
Eastern Hemlock	<i>Tsuga canadensis</i>
American Elm	<i>Ulmus americana</i>
SHRUBS	
Speckled Alder	<i>Alnus incana var. rugosa</i>
Shadbush	<i>Amelanchier sp.</i>
Japanese Barberry	<i>Berberis thunbergii</i>
European Barberry	<i>Berberis vulgaris</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
Sweetfern	<i>Comptonia peregrina</i>
Silky Dogwood	<i>Cornus amomum</i>
Beaked Hazelnut	<i>Corylus cornuta</i>
Bush Honeysuckle	<i>Diervilla lonicera</i>
Glossy Buckthorn	<i>Frangula alnus</i>
Black Huckleberry	<i>Gaylussacia baccata</i>
Witch Hazel	<i>Hamamelis virginiana</i>
Winterberry Holly	<i>Ilex verticellata</i>
Common Juniper	<i>Juniperus communis</i>
Sheep Laurel	<i>Kalmia angustifolium</i>
Spicebush	<i>Lindera benzoin</i>
Northern Fly Honeysuckle	<i>Lonicera canadensis</i>
Maleberry	<i>Lyonia ligustrina</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>
Pin Cherry	<i>Prunus pensylvanica</i>
Choke Cherry	<i>Prunus virginiana</i>

Common Buckthorn	<i>Rhamnus cathartica</i>
Multiflora Rose	<i>Rosa multiflora</i>
Swamp Rose	<i>Rosa palustris</i>
Common Elderberry	<i>Sambucus canadensis</i>
Meadowsweet	<i>Spiraea alba var. latifolium</i>
Poison Ivy	<i>Toxicodendron radicans</i>
Lowbush Blueberry	<i>Vaccinium angustifolium</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>
Pale Blueberry	<i>Vaccinium pallidum</i>
Mapleleaf Viburnum	<i>Viburnum acerifolium</i>
Northern Arrowwood	<i>Viburnum dentatum var. recognitum</i>
Nannyberry	<i>Viburnum lentago</i>
Wild raisin	<i>Viburnum nudum var. cassinoides</i>
DWARF SHRUBS	
Bunchberry	<i>Cornus canadensis</i>
Wintergreen	<i>Gaultheria procumbens</i>
Dewberry	<i>Rubus hispidus</i>
HERBS	
Hog Peanut	<i>Amphicarpaea bracteata</i>
Wood Anemone	<i>Anemone quiquefolia</i>
Wild Sarsaparilla	<i>Aralia nudicaulis</i>
Grove Sandwort	<i>Arenaria lateriflora</i>
Jack-in-the-Pulpit	<i>Arisaema atrorubens</i>
Flat-topped Aster	<i>Aster latifolius</i>
Calico Aster	<i>Aster sp.</i>
Canada Bluejoint	<i>Calamagrostis canadensis</i>
Marsh Marigold	<i>Caltha palustris</i>
Gracillema Sedge	<i>Carex gracillema</i>
Gynandra Sedge	<i>Carex gynandra</i>
Inflated Sedge	<i>Carex intumescens</i>
Lurid Sedge	<i>Carex lurida</i>
Tussock Sedge	<i>Carex stricta</i>
Turtlehead	<i>Chelone glabra</i>
Pipsissewa	<i>Chimaphila umbellata</i>
Chrysosplenium	<i>Chrysosplenium americanum</i>
Enchanter's Nightshade	<i>Circaea lutetiana</i>
Goldthread	<i>Coptis trifolia</i>
Pink Lady's Slipper	<i>Cypripedium acaule</i>
Boneset	<i>Eupatorium perfoliatum</i>
Common Strawberry	<i>Fragaria virginiana</i>
Yellow Avens	<i>Geum aleppicum</i>
Rough Avens	<i>Geum laciniatum</i>
Round-leaved Hepatica	<i>Hepatica acutiloba</i>
Spotted Jewelweed	<i>Impatiens capensis</i>
Blue Flag	<i>Iris versicolor</i>

Canada Mayflower	<i>Maianthemum canadensis</i>
Indian Cucumber	<i>Medeola virginiana</i>
Cow-Wheat	<i>Melampyrum lineare</i>
Partridgeberry	<i>Mitchella repens</i>
Indian Pipe	<i>Monotropa uniflora</i>
Pinesap	<i>Monotrpa hypopites</i>
Dwarf Ginseng	<i>Panax quiquefolius</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Halberd-leaved Tearthumb	<i>Polygonum</i>
Rattlesnake Root	<i>Prenanthes altissima</i>
Shinleaf	<i>Pyrola eliptica</i>
Round-leaved Wintergreen	<i>Pyrola rotundifolia</i>
Small-flowered Crowfoot	<i>Ranunculs abortivus</i>
Common Blackberry	<i>Rubus alleghaniensis</i>
Red Raspberry	<i>Rubus ideaus</i>
Dwarf Raspberry	<i>Rubus pubescens</i>
Arrowhead	<i>Sagittaria latifolia</i>
Marsh Skullcap	<i>Scutellaria galericulata</i>
Golden Ragwort	<i>Senecio</i>
Carrion Flower	<i>Smilax herbacea</i>
Deadly Nightshade	<i>Solanum dulcamara</i>
Rough Goldenrod	<i>Solidago rugosa</i>
Bur-reed	<i>Sparganium sp.</i>
Foamflower	<i>Tiarella cordifolia</i>
Starflower	<i>Trientalis borealis</i>
Broad-leaved Cattail	<i>Typha latifolia</i>
Wild Oats	<i>Uvularia sessilifolia</i>
FERNS AND CLUBMOSSES	
Lady Fern	<i>Athyrium felix-femina</i>
Tree Club Moss	<i>Dendrolycopodium hickeyii</i>
Hayscented Fern	<i>Dennstaedtia punctilobula</i>
Groundcedar	<i>Diphasiastrum digitatum</i>
Crested Fern	<i>Dryopteris cristata</i>
Intermediate Wood Fern	<i>Dryopteris intermedia</i>
Marginal Wood Fern	<i>Dryopteris marginalis</i>
New York Fern	<i>Dryopteris novaboracensis</i>
Marsh Fern	<i>Dryopteris palustris</i>
Common Horsetail	<i>Equisetum arvense</i>
Woodland Horsetail	<i>Equisetum sylvaticum</i>
Sensitive Fern	<i>Onoclea sensibilis</i>
Cinnamon Fern	<i>Osmunda cinamomea</i>
Interrupted Fern	<i>Osmunda claytoniana</i>
Royal Fern	<i>Osmunda regalis</i>
Bracken Fern	<i>Pteridium latiusculum var.</i>

As part of the New Hampshire Wildlife Action Plan, NHFG predicted the type of vegetation that would grow at particular locations. Additionally, NH Natural Heritage Bureau supplied natural communities data. The NH Land Cover data, which shows locations of various categories of developed and undeveloped land, was also used as well as the National Wetlands Inventory data for wetlands.

Sixteen types of habitat could be modeled in this way. There are five matrix forest types: Hemlock Hardwood Pine, Appalachian Oak Pine, Lowland Spruce Fir, Northern Hardwood Conifer and High Elevation Spruce Fir. There are three freshwater wetlands types: Marsh and Shrub Wetlands, Peatlands and Floodplain Forests. There are three coastal habitats: Saltmarsh, Dunes and Coastal Islands. There are three steep slope habitats: Alpine, Cliff and Rocky Ridge/Talus Slope. And two other small-scale habitats: Pine Barrens and Grasslands.

Since the habitats are defined by vegetation type and structure, but based on the needs of wildlife, most forested wetlands are included as part of the forest habitats. Grasslands include croplands as they could easily be converted to grasslands. [Source: New Hampshire Fish and Game Department. *2010 Statewide Habitat Map*. New Hampshire Wildlife Action Plan. 2006.]

(2) List any endangered or threatened plant species that are supported by the river and river corridor environment. Include location, if known. Check whether these plants are endangered [E] or threatened [T] species and if they are significant at a national [N] or state [S] level.

Table 10. Known Occurrences of Endangered or Threatened Plant Species.
[Source: New Hampshire Natural Heritage Bureau, 2009]

Species	Location	Listing Status		Last Observed
		Federal	State	
Marsh Horsetail (<i>Equisetum palustre</i>)	Durham	-	E	1973
Missouri Rock Cress (<i>Arabis missouriensis</i>)	Lee/Durham	-	T	1943
Small-crested Sedge (<i>Carex cristatella</i>)	Durham	-	T	1943
*Star Duckweed (<i>Lemna trisulca</i>)	Durham	-	E	1995
*Downy False Foxglove (<i>Aureolaria virginica</i>)	Durham	-	E	1946

* Not located within the 0.25-mile river corridor, but is included within the watershed.

(3) List any vegetative communities supported by the river and the river corridor environment, which have been identified as "exemplary natural ecological communities" by the New Hampshire Natural Heritage Inventory. Include location, if known.

Table 11. Exemplary Natural Ecological Communities
[Source: NH Natural Heritage Bureau, 2009]

Exemplary Natural Ecological Community	Location
Herbaceous Seepage Marsh	Oyster River/College River, Durham
Hemlock – Beech – Oak – Pine Forest	College Woods, Durham
Red Maple Floodplain Forest	Oyster River/College River, Durham
*High Salt Marsh	Bunker Creek, Durham

* Not located within the 0.25-mile river corridor, but is included within the watershed.

(d) Fish Resources

(1) List the fish species commonly found in the river.

Table 12. Common Freshwater Species in the River
 [Source: New Hampshire Fish and Game Department. (2009)]

Black Crappie	<i>Pomoxis nigromaculatus</i>	Creek Chubsucker	<i>Erimyzon oblongus</i>
Blacknose Dace	<i>Rhinichthys atratulus</i>	Fallfish	<i>Semotilus corporalis</i>
Bluegill	<i>Lepomis macrochirus</i>	Golden Shiner	<i>Notemigonus crysoleucas</i>
Brown Bullhead	<i>Ameiurus nebulosus</i>	Largemouth Bass	<i>Micropterus salmoides</i>
Chain Pickerel	<i>Esox niger</i>	Longnose Dace	<i>Rhinichthys cataractae</i>
Common Shiner	<i>Luxilus cornutus</i>	Pumpkinseed	<i>Lepomis gibbosus</i>
Common White Sucker	<i>Catostomus commersoni</i>	Yellow Perch	<i>Perca flavescens</i>
Brook Trout	<i>Salvelinus fontinalis</i>	Horn Pout	<i>Ameiurus nebulosus</i>

(2) List any endangered or threatened fish species, which inhabit the river. Check whether these fish are a state endangered [E] or threatened [T] species.

The Oyster River contains the only known population of American brook lampreys in New Hampshire. The NHDES surveyed most of the watershed above the Durham water supply dam and produced a map of occupied brook lamprey habitat, which includes brook trout habitat. Refer to Figure 5. A detailed study of bridle shiners in the Oyster River was conducted by Robert W. Harrison in the late 1940's. He published a number of papers describing the life history of bridle shiners based on observations of an abundant population in the Mill Pond impoundment. Surveys suggest that bridle shiners are no longer present in the Oyster River. The cause of extirpation is not clear, but sudden changes in water level behind the dam, pollution, siltation, nutrient loading, and introduced predators may have all been contributing factors.

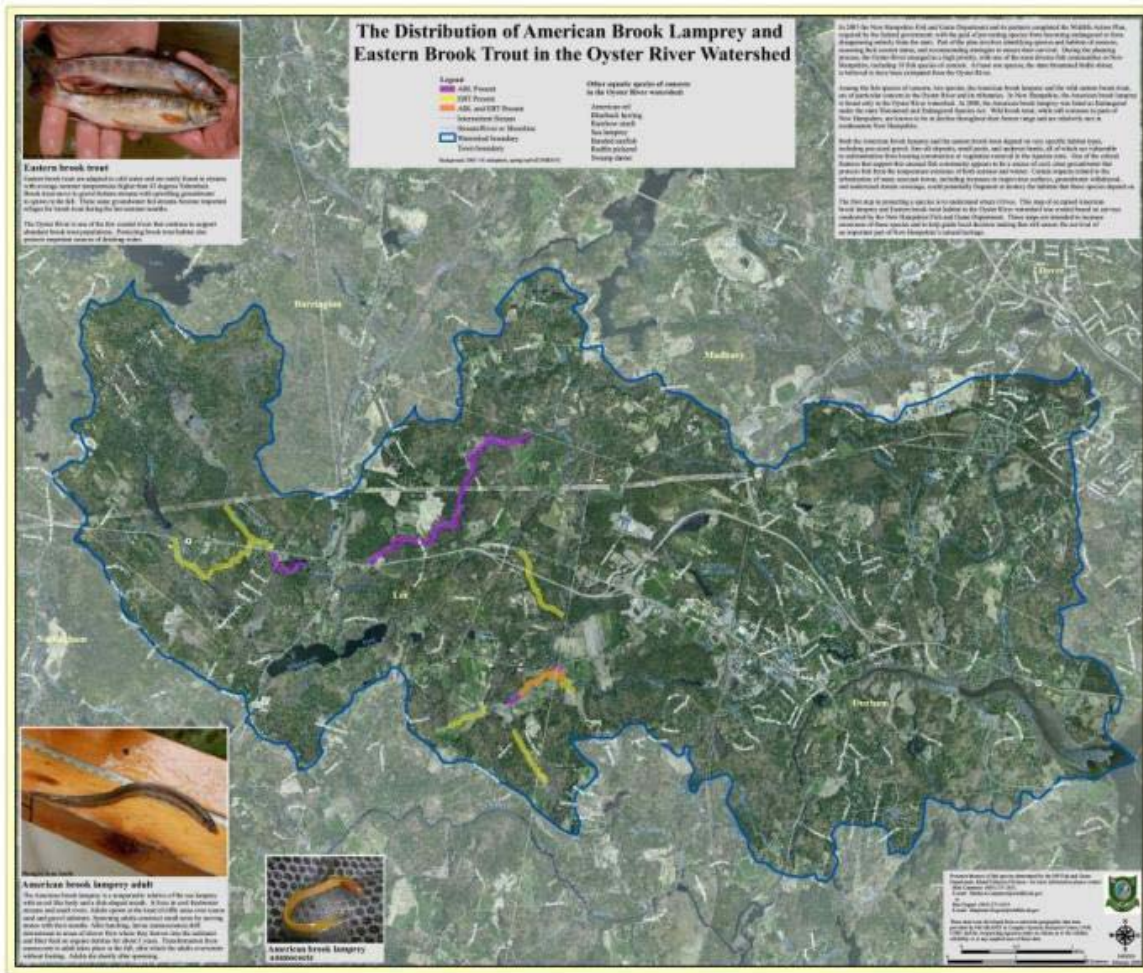
Table 13. Known Occurrences of Rare Fish Species and Exemplary Natural Communities
 [Source: New Hampshire Fish and Game Department. (2009)]

Species	Listing Status		Rank	
	Federal	State	State	Global
*American Brook Lamprey (<i>Lampetra appendix</i>)	-	E	S2	G4
**Bridled Shiner (<i>Notropis bifrentus</i>)	-	T	S3	G3
State Rank	Global Rank			
S2 = critically imperiled because of extreme rarity, especially vulnerable to extirpation from state. Typically 5 or fewer occurrences.	G3 = vulnerable, rare. Typically 21-100 occurrences.			
S3 = vulnerable because rare or uncommon found in restricted range. Typically 6 to 20 occurrences.	G4 = apparently secure, uncommon not rare. Some cause for long-term concern. Usually more than 100 occurrences.			

* The Oyster River contains the only documented population in New Hampshire.

** Appears to have been extirpated from the Oyster River Watershed.

Figure 5. Distribution of American Brook Lamprey and Eastern Brook Trout in Oyster River [NH Fish and Game]



(3) List freshwater species of concern.

Freshwater species of concern include the state endangered American brook lamprey and the state threatened bridge shiner, banded sunfish, redbin pickerel, and swamp darter. During the survey process, NHDES discovered the importance of spring fed streams for maintaining naturally reproducing brook trout populations. An abundance of stratified drift aquifers in the Oyster River watershed makes it an important resource for wild brook trout, which are relatively rare and isolated in southeastern New Hampshire. The Oyster River is also home to healthy populations of banded sunfish and swamp darters. Although the NHDES surveys have shown that these species are more abundant than previously thought, their distribution is limited to southern New Hampshire, where aquatic habitats are the most vulnerable to development.

Table 14. Freshwater Species of Conservation Concern [Source: New Hampshire Fish and Game Department. (2009)]

Banded Sunfish	<i>Enneacanthus obesus</i>
Brook Trout	<i>Salvelinus fontinalis</i>
Redfin Pickerel	<i>Esox americanus americanus</i>
Swamp Darter	<i>Etheostoma fusiforme</i>

(4) Indicate whether the significant fisheries found in the river rely on natural reproduction or a stocking program.

A small number of brook trout are stocked in the Oyster River each spring. The fish ladder at the Mill Pond Dam in Durham is monitored by the marine division of New Hampshire Fish and Game Department (NHFGD). Sea lamprey adults have also been sporadically stocked above the water supply dam by researchers at UNH.

The river herring returns to the Oyster River have historically been one of the highest yearly returns of all six rivers (Cocheco, Exeter, Oyster, Lamprey, Taylor, Winnicut) monitored by NHDES. During the 1999-2003 project period, more fish passed through the Oyster River fishway than any other river with more than 335,000 river herring negotiating the fishway. During the current project period the Oyster River passed the third highest number of river herring (approximately 110,000 fish) of all six rivers monitored. Refer to Table 15.

Table 15. Numbers of Blueback Herring Returning to Oyster River Fishway from 1990-2008
[Source: New Hampshire Fish and Game Department. *Anadromous Fish Investigations*. 2009]

Year	Number of Blueback Herring	Year	Number of Blueback Herring
1990	154,588	2000	70,873
1991	151,975	2001	66,989
1992	157,024	2002	58,179
1993	73,788	2003	51,536
1994	91,974	2004	52,934
1995	82,895	2005	12,882
1996	82,362	2006	6,035
1997	57,920	2007	17,421
1998	85,116	2008	20,780
1999	88,063	2009	N/a

The numbers of returning river herring have generally been declining since 1990 to a low of 6,035 in 2006. Flooding conditions in May 2006 likely contributed to the low return numbers in 2006. In subsequent years, returns to this fish ladder have increased to more than 20,000 fish in 2008. However, the numbers are still decreasing and are now roughly only 10% of those seen at the peak from 1990-1992. There is evidence from water quality sampling that dissolved oxygen levels may be affecting survival of juvenile river herring in the impoundment. [Source: Cheri Patterson, Mike Dionne, Kevin Sullivan, Rebecca Heuss, Renee Zobel, Jessica Fischer, Kim Trull, Robert Eckert, and Chris Warner. NHFGD. *Anadromous Fish Investigations*: Final Report. March 31, 2009]

(5) Is the river a viable diadromous fish resource? If yes, identify any on-going or planned restoration programs.

The Oyster River has one of the most diverse fish species assemblages in the state, including nine fish species of concern listed in New Hampshire's Wildlife Action Plan. Three of these species of concern (the blueback herring, the sea lamprey, and the American eel) are diadromous (fish that migrate between fresh and salt waters). Spawning habitat for the blueback herring and sea lamprey is accessible via a fish ladder on the Mill Pond dam in Durham. The next upstream

barrier to migration is the water supply dam at UNH. Blueback herring populations have declined significantly in the Oyster River and would benefit greatly from dam removals. Sea lamprey populations are also low due to limited access to spawning habitat. The entire Oyster River watershed is accessible to American eels (though passage could be improved at low flows), making the river an important resource for the species.

Table 16. Diadromous Species of Concern
[Source: New Hampshire Fish and Game Department. (2009)]

American Eel	<i>Anguilla rostrata</i>
Blueback Herring	<i>Alosa aestivalis</i>
Rainbow Smelt	<i>Osmerus mordax</i>
Sea Lamprey	<i>Petromyzon marinus</i>

In 2008, the Piscataqua Region Estuaries Project (PREP), along with staff members from the Durham Public Works Department, the Strafford Regional Planning Commission and the NHFGD, conducted culvert evaluations on over 100 stream crossings to gather information for a study of the Oyster River watershed. One of the project's main goals was to develop a practical adaptation strategy to proactively reduce negative climate change impacts on stream habitat. The data collected will be used to prioritize stream crossing replacement projects that will help reduce flood damage and improve fish passage. [Source: Derek Sowers. Piscataqua Region Estuaries Partnership. University of New Hampshire. 2009]

(e) Water Quality

(1) Check the state's water quality classification which applies to this river or segment under state law.

The Oyster River and all its tributaries in Barrington, Durham, Lee and Madbury from their sources to the crest of the Oyster River Reservoir dam are designated as Class A waters. All other portions of the Oyster River downstream of the Water Supply dam are designated as Class B. [Source: T. Walsh, J. Drociak, D. Mucciarone, C. Foley, *New Hampshire Volunteer River Assessment Program 2008 Oyster River Watershed Water Quality Report*, 2009.]

(2) According to readily available information, what is the actual water quality of this river under the state's water quality standards?

All assessment units (AUs) of the Oyster River meet water quality standards after treatment. All AUs are impaired for safe fish consumption due to mercury contamination, although the impairment is relatively slight or marginal. Four of the six AUs are impaired for Dissolved Oxygen (DO) and pH for aquatic life. These impairments are more severe and cause poor water quality. The other two segments have some but insufficient data to assess the parameter. All AUs, except the Oyster River Reservoir, are impaired for E. coli and the impairment is more severe and causes poor water quality. Refer to Figure 6.

(3) If the river is not currently supporting its water quality classification, identify the existing major causes of deficient water quality (e.g., industrial or sewage pollutants, agricultural fertilizer run-off) and possible corrective measures (e.g., regulations, enforcement, local and use controls).

The Oyster River Watershed Association, UNH, and state agencies are working to better understand the components of the river system in order to protect and enhance water quality. A comprehensive program to monitor the Oyster River was initiated in 2001 and continues at present. The program is a cooperative effort of UNH, NH DES VRAP, NH DES VBAP, ORWA, SRPC, and UNH WRRC. The program has monitored water quality at 14 stations on the Oyster River and tributaries, with some measurements taken eight or more times per year. Water quality measures have included dissolved oxygen, temperature, turbidity, specific conductance, pH, E. coli, nitrogen, phosphorous, and macro invertebrates. [Source: Tracey Lesser, *The Oyster River Monitoring Project: Watershed Context, Findings, and Recommendations*, 2005.]

2008 Section 305(b) Report and 303(d) List developed using the 2008 Consolidated Assessment and Listing Methodology (CALM) Water Quality Data.

This report describes the quality of New Hampshire's surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water.

Each waterbody is divided into smaller segments called Assessment Units (AUs). In general, AUs are the basic unit of record for conducting and reporting the results of all water quality assessments. AUs are intended to be representative of homogenous segments: consequently,

sampling stations within an AU can be assumed to be representative of that segment. [Source: 2008 Watershed Report. NH DES Water Quality Assessment Program.]

The following is a description of results of the CALM data for all 6-assessment units (AUs) on the mainstem of the fresh water portion Oyster River by Use Category.

Description of Oyster River AUs (map labels):

R*02 = Headwaters in Barrington;

R*03 = Beginning along Rt. 4 just west of the Lee circle and ending at the confluence with Dube Brook near the Madbury town line;

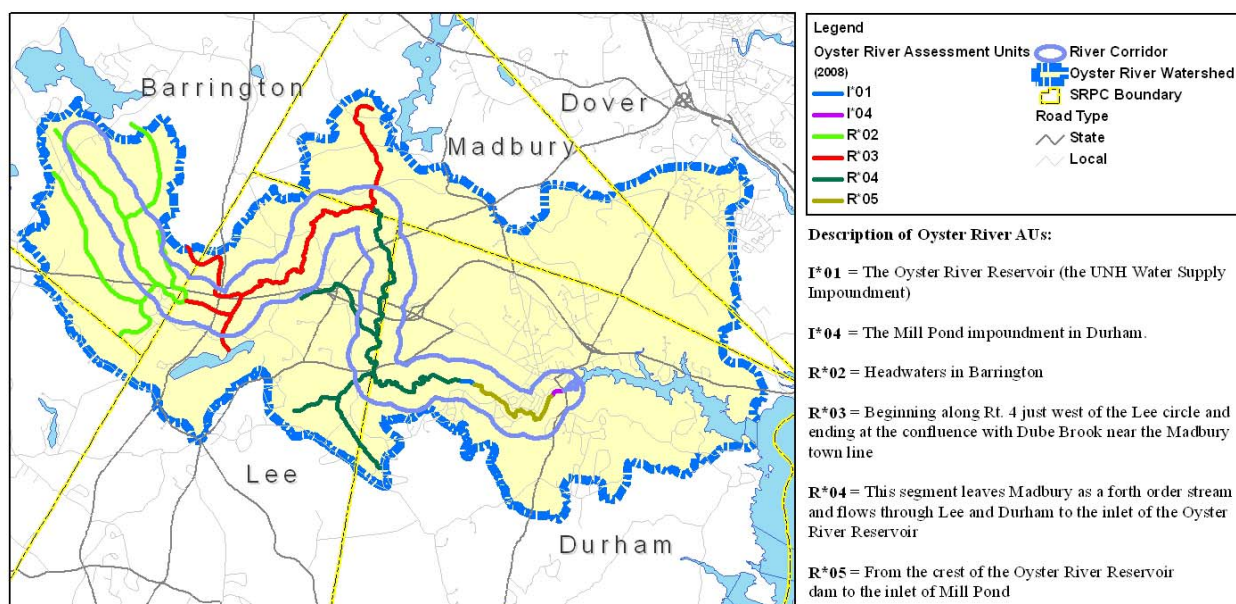
R*04 = This segment leaves Madbury as a forth order stream and flows through Lee and Durham to the inlet of the Oyster River Reservoir;

I*01 = The Oyster River Reservoir (the UNH Water Supply Impoundment);

R*05 = From the crest of the Oyster River Reservoir dam to the inlet of Mill Pond;

I*04 = The Mill Pond impoundment in Durham.

Figure 6. NHDES Assessment Units on Oyster River
 [Source: New Hampshire Department of Environmental Services Surface Water Quality Assessment Program]



Summary of Data by Use Category

(see Table 18 for definitions of subcategories for parameters.)

The following is a description of results of the CALM data for all 6-assessment units (AUs) on the mainstem of the Oyster River by Use Category.

Aquatic Life

Four of the six AUs [Mill Pond (I*04) and the three river segments upstream of the Water Supply Reservoir (R*02, R*03, R*04)] are impaired for Dissolved Oxygen (DO) and pH. They are reported as category 5-P.

Two of the six AUs [The Oyster River Reservoir (I*01) and the segment downstream of the reservoir (R*05)] are reported as category 3-PAS. There's insufficient data to assess per the

Oyster River Nomination Form

NH Rivers Management and Protection Program

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CALM, however, the data that is available suggests that the parameter is potentially attaining standards.

Drinking Water After Treatment

All six AUs reported as category 2-G, as meeting water quality standards by a relatively wide margin.

Fish Consumption

All six AUs (category 4A-M) are impaired per the CALM for mercury (from atmospheric deposition), which is a pollutant and an EPA-approved Total Maximum Daily Load (TMDL) has been completed. However, the impairment is relatively slight or marginal.

Primary Contact Recreation

Five of six AUs are impaired per the CALM for E. coli. The exception is the Oyster River Reservoir (I*01) where there is insufficient data for this parameter.

The five impaired AUs are category 5-P. The impairment is more severe and causes poor water quality.

Secondary Contact Recreation

Three (R*02, R*03, R*04) of the six AUs are reported as 5-P; impaired per the CALM for E.coli. Two AUs (I*04 & R*05) are reported as 2-M; meets water quality but only marginally. One AU (I*01) is reported as 3-ND; there is no data or the data is unusable.

Wildlife

Six of the Six AUs are reported as 3-ND. There is no data or the data is unusable.

[Source: NHDES Water Quality Assessment Program, 2008 Watershed Report Card.]

Table 17. The 2008 Section 305(b) Report and 303(d) List for the Oyster River

[Source: NHDES. 2008 Watershed Report Card.]

DES USE Category	Aquatic Life	Drinking Water After Treatment	Fish Consumption	Primary Contact Recreation	Secondary Contact Recreation	Wildlife
Assessment Unit						
NHRIV600030902-02	5-P	2-G	4A-M	5-P	5-P	3-ND
Pollutant Flag	DO, pH		Mercury	E. coli	E. coli	
NHRIV600030902-03	5-P	2-G	4A-M	5-P	5-P	3-ND
Pollutant Flag	DO, pH		Mercury	E. coli	E. coli	
NHRIV600030902-04	5-P	2-G	4A-M	5-P	5-P	3-ND
Pollutant Flag	DO, pH		Mercury	E. coli	E. coli	
NHIMP600030902-01	3-PAS	2-G	4A-M	5-P	3-ND	3-ND
Pollutant Flag			Mercury			
NHRIV600030902-05	3-PAS	2-G	4A-M	5-P	2-M	3-ND
Pollutant Flag			Mercury	E. coli		
NHIMP600030902-04	5-P	2-G	4A-M	5-P	2-M	3-ND
Pollutant Flag	DO, pH		Mercury	Chlor a, E. coli		

(6 Assessment Units on the river's main stem listed in order from headwaters to the head of tide in Durham)

Table 18. Definition of DES Subcategories for Parameters, Uses and Assessment Units
[Source: NHDES. 2008 Watershed Report Card.]

ADB Category	DES Subcategory	Definition of DES Subcategory for PARAMETERS
2	2-G	All samples for a given parameter meet water quality standards by a relatively large margin.
2	2-M	All samples for a given parameter meet water quality standards but only marginally.
2	2-OBS	Parameter exceeds water quality criteria due to naturally occurring conditions (Section 3.1.7) and but for the naturally occurring conditions the parameter would be marked as Category 4 or 5.
3	3-PAS	There is some but insufficient data to assess the parameter per the CALM, however, the data that is available suggests that the parameter is Potentially Attaining Standards (PAS).
3	3-PNS	There is some but insufficient data to assess the parameter per the CALM, however, the data that is available suggests that the parameter is Potentially Not Supporting (PNS) water quality standards (e.g., there is one exceedance).
3	3-ND	There is no data available for the parameter.
4A	4A-M	The parameter is a pollutant, which is assessed as an impairment per the CALM, and an EPA approved TMDL has been completed. However, the impairment is relatively slight or marginal.
4A	4A-P	The parameter is a pollutant which is assessed as an impairment per the CALM, and an EPA approved TMDL has been completed. However, the impairment is more severe and causes poor water quality conditions.
4B	4B-M	Parameter is a pollutant that is causing impairment as per the CALM but a TMDL is not necessary since other controls are expected to attain water quality standards within a reasonable time. The impairment is marginal as defined in DES subcategory 4AM.
4B	4B-P	Parameter is a pollutant that is causing impairment as per the CALM but a TMDL is not necessary since other controls are expected to attain water quality standards within a reasonable time. The impairment is more severe and causes poor water quality as defined in DES subcategory 4AP.
4C	4C-M	Parameter is not a pollutant but is causing impairment per the CALM. The impairment is marginal as defined in DES subcategory 4AM.
4C	4C-P	Parameter is not a pollutant but is causing impairment per the CALM. The impairment is more severe and causes poor water quality as defined in DES subcategory 4AP.
5	5-M	Parameter is a pollutant that requires a TMDL. The impairment is marginal as defined in DES subcategory 4AM.
5	5-P	Parameter is a pollutant that requires a TMDL. The impairment is more severe and causes poor water quality as defined in DES subcategory 4AP.

Notes: G = Good, M = Marginal, P = Poor, PAS = Potentially Attaining Standards, PNS = Potentially Not Supporting.

(f) Natural Flow Characteristics

Briefly describe the natural flow characteristics of the river, including natural periodic variation in flow (e.g., spring run-off and summer flow amounts) and frequency and duration of flood events.

(1) Indicate which segments of the river are free-flowing.

The Oyster River is partially free-flowing (not considered natural classification because of roads within the 250 ft. buffer) from its headwaters west of Hall Road in Barrington to the dam at the University of New Hampshire water treatment plant in Durham, a distance of approximately 10 miles. Below this point, the river is free-flowing for 1.5 miles, to the dam at the Durham Mill Pond, immediately west of Route 108.

Natural Flow Characteristics

Between the Oyster River headwaters just west of Hall Road in Barrington to the Route 4 crossing in Barrington the river drops over 150 feet in just 3.3 miles. Over this reach, the river alternates between shallow fast-flowing water with rock or gravel streambeds and deeper but slow-moving water in large, beaver-impounded swamps and marshes. A major tributary, Caldwell Brook, joins the Oyster River just north of the Route 4 crossing.

South of Route 4 the river meanders slowly over muck and sand bottoms through extensive scrub-shrub palustrine wetlands and red maple swamps for 1.3 miles until it re-crosses Route 4 just east of Lee traffic circle. In this section the river is joined by the unnamed stream that drains Wheelwright Pond, the largest natural water body in the Oyster River watershed. The river drops only 15 feet in this reach.

North of Route 4, the river drops just over 50 feet over 4.1 miles to the USGS gaging station on Old Concord Road. Throughout this section the river is bordered by undeveloped forestland and some farmland and exhibits the classic pool and riffle structure that characterizes free-flowing second and third order streams. For most of this stretch, river width is 5-15 feet. The stream bottom is either rock (boulders or bedrock) or sand, but streambanks are frequently composed of marine sediment (silt and clay). Dube Brook, the main tributary in this reach, joins the river from the north about 1.4 miles upstream of the gaging station.

Below the gaging station but upstream of the dam at the UNH water treatment facility, soft-sediments and sand dominate the river bottom, and the river flows either slowly or rapidly, depending on grade, as it meanders between banks composed of outwash, till, or marine sediment (silt and clay). Fast flowing sections tend to be narrow (<15 feet) shallow, with depths less than two feet, but slow flowing sections may be over 5 feet deep at the cut banks and can reach widths of 20 feet. Two significant tributaries, an unnamed brook draining the Lee Five Corners area and Chesley Brook (incorrectly marked Chelsea Brook on the USGS topographic map of the area) join the river in this section. Between the gaging station and the dam the river travels approximately 3 miles and drops 33 feet. Roughly 1/3 mile of this distance is occupied by the still waters of the Oyster River Reservoir, which provides drinking water for UNH and Durham.

Below the dam at UNH, the river flows freely for approximately 1 mile until it enters the still waters of the Mill Pond impoundment. In this section the river drops 20 feet and exhibits pool and riffle structure with a primarily rocky or sandy bottom. In its last 0.5 mile, the river is ponded by the Mill Pond dam and is over 5 feet deep in places. Hamel Brook joins the Oyster River in this section. At the Mill Pond dam the river drops 18 feet to join the saline waters of the Oyster River estuary.

Stream Flow Statistics

Based on USGS monitoring (1934-2008), the average daily discharge measured at the gage near Durham is 20.0 cubic feet per second (cfs). Since averages tend to be skewed by large flood events, a more accurate statistical indicator of “normal” discharge conditions would be the median value (50% of the measurements are greater and 50% are lower). The median daily discharge for the Oyster River during this period as measured near Durham was 10 cfs.

Generally, the seasonal low flows occur during September each year. The lowest daily mean flow was 0.01 cfs that occurred on September 6, 1999.

The highest peak discharges for the period 1935 to 2008 occurred in the spring months of March and April. This is likely due to the combination of snowmelt, frozen ground conditions, and large precipitation events. The highest peak flow was on April 16, 2007 with a discharge of 1320 cfs. [Source: USGS National Water Information System Web Interface.]

Table 19. Summary Statistics Discharge in Cubic Feet per Second (cfs).
[Source: USGS National Water Information System Web Interface]

	Water Year 1935 - 2008	Date
Annual mean	20.0	
Highest annual mean	37.5	2006
Lowest annual mean	8.89	2002
Highest daily mean	942	April 16, 2007
Lowest daily mean	0.01	September 06, 1999
Annual seven-day minimum	0.04	September 02, 1999
Maximum peak flow	1320	April 16, 2007
10 percent exceeds	49	
50 percent exceeds (median)	10	
90 percent exceeds	1.2	

Table 20. Statistics of Monthly Mean Data for Water Years 1935-2008.
[Source: USGS National Water Information System Web Interface]

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	8.35	18.4	22.3	19.4	21.8	47.3	49.5	26.1	13.5	5.35	3.87	4.64
Max	65.2	62.7	55.6	58.1	84.5	122	104	111	71.1	33.7	35.7	52.6
WY	1997	1952	1997	1958	1981	1936	2007	2006	1998	1938	2008	1954
Min	0.55	0.93	2.73	2.25	3.47	13.5	13.7	6.51	2.07	0.65	0.52	0.40
WY	2002	2002	1996	1981	1980	1967	1999	2001	1936	1949	1999	2002

*Discharge in cfs.

USGS Gage Station

The U.S. Geological Survey maintains a gage station on the Oyster River near Durham. The USGS estimates that there are 12.1 square miles of drainage basin upstream from this discharge monitoring station. The Durham gage has been collecting discharge measurements since October 1934. Discharge data is available at the USGS National Water Information System Web interface at <http://waterdata.usgs.gov/nwis/inventory>.

Old Gage –Concrete broad-crested weir 1934 - 2008.



Photo by: Dick Weyrick

USGS Gage Station #01073000 Oyster River near Durham, NH.

Hydrologic Unit Code: 01060003

Latitude 43° 08' 55", Longitude 70° 57' 56" NAD27

Drainage Area 12.1 square miles Gage – water-stage recorder, crest stage gage, and V-notch sharp crest weir. The weir is located on the upstream wingwalls of the Route 155A Bridge. Datum of gage is 65.29 feet above National Geodetic Vertical Datum of 1929. Previously, a concrete broad-crested weir, 150 feet upstream of the Rt. 155A Bridge, was used as a control since construction of the gage. However, this weir has deteriorated over the years and was finally undermined during winter 2007. [Source: Brian Mrazik, USGS NH-VT District Chief, Email to David Paulson, NHDOT. 07/12/2004]

New Gage – Water-stage recorder, crest gage, V-notch sharp crest weir. August 2008 – Present.



Photo by: Dick Weyrick

(2) If applicable, describe purpose of and flow variations caused by impoundments, significant diversions, or channel alterations, including interbasin transfers.

Direct Withdrawal

The Oyster River has been the primary source of potable water for the University of New Hampshire and the Town of Durham since 1935. It is from the Oyster River reservoir that the UNH Arthur Rollins Water Treatment Plant (ARWTP) removes approximately 220 million gallons of water per year for treatment. After treatment, water enters the combined UNH/Durham distribution system and is returned to the tidal portion of the river at the sewage treatment facility, 2.6 miles downstream. [Source: Tracey Lesser, *The Oyster River Monitoring Project Watershed Context, Findings, and Recommendations*. 2005.]

The Town and the University have three existing water supply sources and one potential source, as listed below:

- Oyster River – Primary source treated at ARWTP.
- Lamprey River – Supplemental source to Oyster River treated at ARWTP
- Lee Well – Secondary, independent source
- Spruce Hole Aquifer – Potential future groundwater source

The greatest water resource management challenge is meeting demand in the critical period from August to October during typical low river flows with high demand due to fall UNH session. [Source: Dufresne-Henry, *Durham New Hampshire Water Resources Management Plan*. 2000.]

In October 2007 the University and the Town of Durham drafted an update to their Water Resources Management Plan to better manage the available water resources so that a reliable, year-round supply is provided to users while not over stressing any one resource and complying with all regulations.

2007 Annual Average Day

- UNH - 602,000 gpd (73%) – surface water
- Town - 216,000 gpd (27%) – groundwater
- Total - 818,000 gpd

2007 Demand for Combined UNH/Durham System:

- Avg Day Demand 818,000 gpd
- Sept Avg Day Demand 1,045,000 gpd
- Max Day Demand 1,450,000 gpd

[Source: Underwood Engineers, *Draft Update Durham New Hampshire Water Resources Management Plan*. 2007.]

Watershed Transfer

Oyster River water is not exported to another watershed. However, the UNH/Durham Water System does remove water from the Lamprey River for treatment at the ARWTP. The Lamprey River Transmission main is connected directly into the UNH Treatment Plant. There is also a branch line with a manual valve to direct Lamprey River water into the Oyster River Impoundment. [Source: Dufresne-Henry, *Preliminary Design Lamprey River Transmission Main*. 2000.]



Photo by: Brian Gallagher

Interbasin transfers as defined in RSA 483, are prohibited. [Any transfer of water from one river drainage basin to another. River drainage basin means the Androscoggin, Coastal, Connecticut, Merrimack, Piscataqua, and Saco River basins.] Transfer of water from the Oyster River to the Lamprey River or vice versa does not qualify as an interbasin transfer.

(g) Open Space

Briefly describe, give the location and identify the type (e.g., floodplain, forested, etc.) and type of ownership (i.e., public or private) of significant areas of open space in the river corridor. Describe and include the location of any protected land parcels within the river corridor (e.g., state parks and forests, national forest lands, municipal parks and conservation easements).

Table 21. Land Uses By Type in the Oyster River Corridor
[Source: NH GRANIT]

Land Use Type	Acres
Agriculture	343.8
Forested	2324.1
Commercial, Services and Institutional	67.6
Residential	489.5
Transportation, Communications and Utilities	171.1
Transitional Land	36.2
Outdoor and Other Urban and Built-Up Land	12
Disturbed Land	26
Industrial	31.6
Open and Shrub Wetlands	408.2
Total	3910.1

Unprotected Lands Currently Open Space and/or Undeveloped

From the headwaters in Barrington beginning at Hall Road all the way to Old Mill Road in Lee, the predominant land use type is forested and open wetlands with areas of residential development near Meadowbrook Drive in Barrington. This segment has been classified as rural-community by the committee and also includes a large portion of the Samuel A. Tamposi Water Supply Reserve, Rivers Edge Easement and the Shultz-Friedlander parcel (the only one protected under the NHDES Water Supply Land Grant Program).

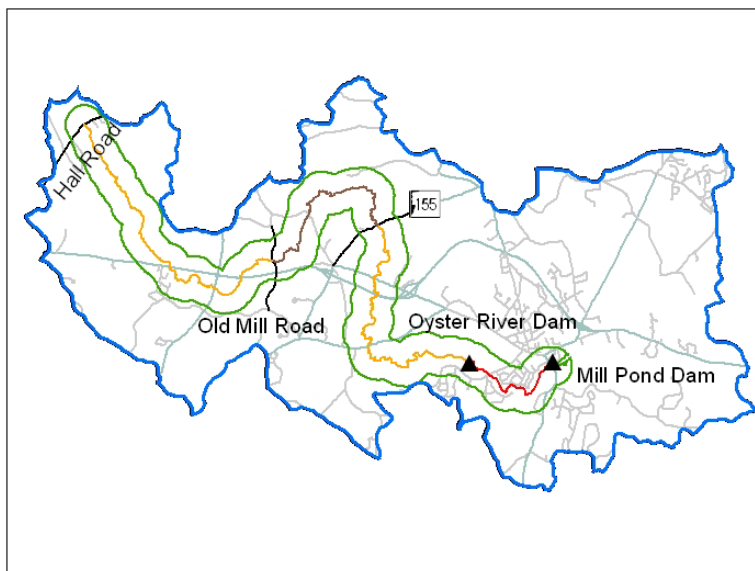


Figure 7. Proposed Designated River Segments
[Source: NH GRANIT, 2005]

As the river continues from Old Mill Road northeast through Lee to Route 155, there is limited residential or commercial development. The committee classified this segment of river rural and the major land use types are forested, open wetlands and small areas of agriculture. This segment contains the Tuckaway and Sheltering Rock Farms. While

both easements are protected under the NHDES Water Supply Land Grant Program, Sheltering Rock includes the protection of certain historical resources (buildings).

From Route 155 the river flows south along the Lee and Durham town border before heading east into Durham. The committee classified this segment of river rural-community and the primary land use types in this segment are forested and agriculture, including a nearly 100-acre parcel of agriculture land near Mast Road. As the river runs from Mast Road towards Durham, there is virtually no residential development. The river continues through UNH-College Woods, a 240-acre State protected easement, to the Oyster River Dam in Durham.

From the Oyster River Dam the river continues east through the urbanized town center of Durham, where the dominant land use types are residential, commercial and institutional (UNH) services. The committee classified this segment of river community as it is densely developed with small sections of forested land. The largest tract of forested land can be found in the UNH-MacDonald Lot, a 36-acre State protected easement, located behind Mill Pond Road. This river segment ends at the Mill Pond Dam in Durham. Refer to Figure 10 – Existing Land Use for the complete watershed land use types.

Protected Lands

There are 1,287.4 acres of protected land in the river corridor (nearly 33%) and 6,377.4 acres of protected land in the watershed, a combination of federal, state, municipal and private owned properties with some easements held by non-profit organizations.

Ovenbird stops for a drink.



Photo taken by Charlie Tatham, Barrington NH.

Samuel A. Tamposi Water Supply Reserve.

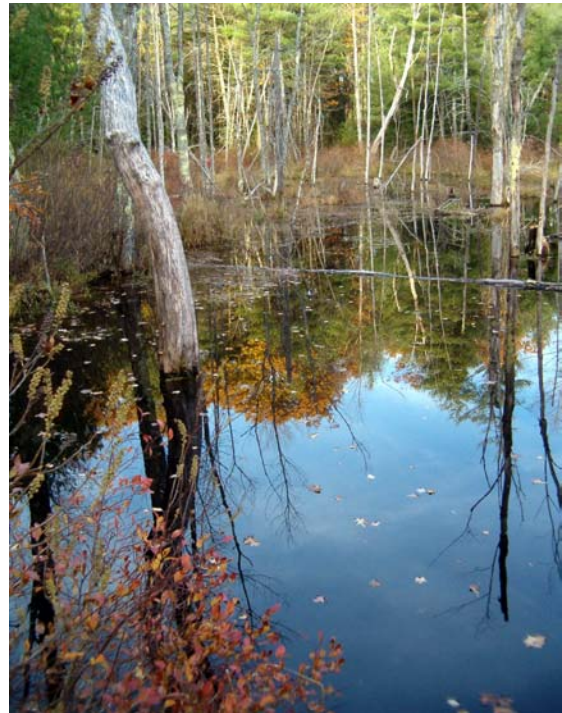


Photo taken by John Wallace, Barrington, NH.

Table 22. Conservation Lands In the Oyster River Corridor
[Source: NH GRANIT]

Property Name	Location/Agency	Protection Level	Protection Type	Primary Agency	Agency Type	Access Permitted	Acres
Cheney, Old Mill Reserve	Lee	1	Conservation Easement	US Department of Agriculture, NRCS	Federal	Allowed	42.6
Kelley 1, Old Mill Reserve	Lee	1	Conservation Easement	US Department of Agriculture, NRCS	Federal	Allowed	44.7
Henry	Lee	1	Conservation Easement	US Department of Agriculture, NRCS	Federal	Unknown	37.1
Kelley 2, Old Mill Reserve	Lee	1	Conservation Easement	US Department of Agriculture, NRCS	Federal	Allowed	10
Ford	Lee	1	Conservation Easement	Lee	Municipal/County	Unknown	54.4
Samuel A. Tamposi Water Supply Reserve	Barrington	1	Fee Ownership	Barrington	Municipal/County	Unknown	336.9
Tuckaway Farm	Lee	2A	Protective Easement	Lee	Municipal/County	Restricted to Certain Areas	55.8
Randall Farm	Lee	2A	Protective Easement	Lee	Municipal/County	Restricted to Certain Areas	70.8
DeMerritt Hill Farm	Lee	1	Conservation Easement	Lee	Municipal/County	Unknown	49.6
UNH Property	UNH	2	Fee Ownership	UNH	State	Unknown	54.6
UNH College Woods	UNH	2	Fee Ownership	UNH	State	Unknown	238.9
Swan Drive Open Space	Lee	2	Set Aside	Lee	Municipal/County	Unknown	44.9
UNH - Foss Farm East	UNH	2	Fee Ownership	UNH	State	Unknown	11.1
UNH - MacDonald Lot	UNH	2	Fee Ownership	UNH	State	Unknown	36
Ellis Easement	Lee	2A	Deed Restriction	Lee	Municipal/County	Restricted to Certain Areas	14.1
Shultz-Friedlander	Lee	2A	Protective Easement	Lee	Municipal/County	Restricted to Certain Areas	50
Lee Five Corners	Lee	1	Conservation Easement	Strafford Rivers Conservancy	Private	Allowed	21.7
Rivers Edge	Barrington	1	Conservation Easement	Barrington	Municipal/County	Not Allowed	75.2

Protection Level

- 1 Permanent Conservation Land
- 2 Unofficial Conservation Land
- 2A Water Supply Land

Oyster River Nomination Form

NH Rivers Management and Protection Program
 Submitted June 1, 2010

2. Managed Resources

(a) Impoundments

List all of the dams, which are present in the river, including any dams, which are breached or in ruins. Identify their location, ownership, and purpose (i.e., flood control, low flow augmentation, or storage). Also indicate whether minimum flow requirements exist at any of the impoundments, if known. Include any proposals for new or reconstructed dams; indicate that this is a proposed dam by placing an asterisk (*) next to the name of the dam. Do not include existing or proposed dams, which are used for hydroelectric energy production. These will be listed separately in the managed resources category.

Table 23. Impoundments on the Oyster River
[Source: NH Dam Listing Provided by NHDES, 2007]

Code	Name of Dam	Location	Ownership	Status	Purpose	Material	Impoundment	Height (ft.)	Drainage Area (acres)
135.06	Oyster River II Dam	Lee	Mr. Drew Goss	Ruins	Recreation	-	0	0	11.28
135.05	Oyster River I Dam	Lee	Mr. Joseph De Angelo	Ruins	Recreation	Stone/Earth	0	10	8.14
071.07	Oyster River Reservoir Dam	Durham	UNH	Active	Water Supply	Concrete	8	21	16.58
071.03	Mill Pond Dam	Durham	Town of Durham	Active	Recreation	Concrete	24	10	20
071.06	Oyster River Double Wall Dam	Durham	Mr. Fred S Daniels	Ruins	Recreation	-	0	8	16.5

(b) Water Withdrawals and Discharges

(1) List any significant water withdrawals from the river, including withdrawals for public drinking water, industry, and agriculture. Identify the purpose (e.g., irrigation) and location of the withdrawal. Indicate if the river has been identified in a state, regional, or local study as a potential source of water supply and, if so, identify the study.

The Oyster River has been identified in the *New Hampshire River Protection and Energy Development Project Final Report* (New England Rivers Center, 1983) as a source for water supply. In the Resource Assessment: Recreational and Natural Resource Category Findings, the Oyster River was identified as being of the highest significance value in the water supply category. The Oyster River has been utilized as a community-drinking supplier and has been given a state “class A” water quality designation. [Source: New Hampshire River Protection and Energy Development Project Final Report. New England Rivers Center. February 22, 1983.]

Table 24. Withdrawals from the Oyster River

[Source: Wayne Ives, New Hampshire Department of Environmental Services, P.G. Hydrogeologist]

SD ID	Withdrawal	Purpose	Location
Durham			
20066-S01	University of New Hampshire	Water Supply	Oyster River
From Major Tributaries to Oyster River			
20066-S03	University of New Hampshire	Water Works	Lee 5 Corners Well
20830-S01	University of New Hampshire	Ritzman Lab	Ritzman Lab Well
20694-S01	University of New Hampshire	Well	Cogeneration Electric Plant
20694-S01	University of New Hampshire	Well	Field House
20694-D01	University of New Hampshire	Irrigation	Field House
20694-S02	University of New Hampshire	Well	Field House

(2) List all known surface water and potential discharges to the river and identify the source, type (e.g., industrial wastewater) and location of the discharge. Indicate whether the discharge has been permitted by the state (yes or no).

There are no registered surface water discharges to the river in the Oyster River watershed. [Source: Ives, Wayne. New Hampshire Department of Environmental Services, P.G. Hydrogeologist. Personal Email.]

(c) Hydroelectric Resources

List all known existing or potential (as cited in the NH River Protection and Energy Development Project -- Final Report; New England Rivers Center, 1983) sites of hydroelectric power production. Record the owner, location and whether the site is regulated or exempt from regulation by the Federal Energy Regulatory Commission (FERC).

There are no existing hydroelectric power production facilities on the Oyster River. Although a potential hydroelectric power site has been identified on the river, at the Mill Pond Dam. It has not yet been pursued.

3. Cultural Resources

(a) Historical and Archaeological Resources

Describe any significant historical or archaeological resources or sites with significant potential for such resources (as determined by the state historic preservation officer) found in the river or river corridor. Identify whether the resource is listed or is eligible to be listed as a National Historic Landmark (NHL) or on the National Register of Historic Places (NRHP) or is a recognized Historic District (HD) or Multiple Use Area (MUA). If known, indicate whether these resources are significant at a national, regional (New England), state, or local level. Below this listing, note any local town histories, oral histories, or general historical knowledge about the use of the river and its corridor.

Human occupation of the Piscataqua region by Native Americans began some 11,000 years ago. The first hunter-gatherers had a keen understanding of the natural resources, and for long periods the local plants, mammals and fish sustained stable economies. One needs only to look at the 1670 map, “Piscatway River in New England” by John Scott, to realize the importance of the tributaries of the Great Bay to the European settlement period of the New Hampshire seacoast. The first clusters of settlements occurred at the mouths of the region’s rivers. Searching not only for rich fishing grounds and fertile farmland, the Europeans wanted falling waters that could power machinery. The added transportation function of the local rivers made it all the easier to seek land and export product. Called the Shankhassick by Native Americans, the Oyster River, renamed by the Europeans for its shellfish beds, fulfilled the requirements of a desirable river location and settlement began in the 1630’s. [Source: Bolster, Jeffrey W. & Randall, Peter E. *Cross-Grained and Wily Waters: A Guide to the Piscataqua Maritime Region*. 2002]



Portion of “Piscatway River in New England” by John Scott,
© The British Library Board. Maps K.Top.120.27

Whereas settlement began at the Great Bay and worked its way inland, the Oyster River originates in Barrington, some 13 miles from its head of tide at the Mill Pond dam in Durham. Small streams feeding the wetland at Creek Pond form the headwaters of the river. In this area the river runs through the 1,400-acre Samuel A. Tamposi Water Supply Reserve. This parcel was protected in 2001 for its valuable water resource by Barrington and the Society for the Protection of New Hampshire Forests, with the cooperation of five other towns and the University of New Hampshire. The river runs for only 2.5 miles in Barrington and never reaches a size where there could have been any sustained use for power. [Source: Wiggin, Morton H. *A History of Barrington, NH*. © Joan Wiggin, 1966.]

The Oyster enters Lee in the area of the Lee traffic circle at State Route 125 and State Route 4, and shortly thereafter expands into a large wetland area where it is joined by outflow from Wheelwright Pond. Just downstream of Mill Road in Lee is the site of a mill. Erected before 1712 and referred to as the New Town mill and later Layne's mill, it was first a sawmill and later perhaps a gristmill. Substantial stone work at the falls can be seen at this site today. Sand and gravel extraction has occurred on abutting land, but a restoration of wetlands and the construction of an Atlantic white cedar swamp is being undertaken by the Town of Lee and the USDA Natural Resource Conservation Service. Approximately three quarters of a mile further downstream toward Madbury are the remains of a small sawmill in the vicinity of the Snell Road crossing. [Source: Personal communication with Dick Wellington of Lee.]



Remains of Layne's Mill at Mill Road in Lee.
Photos by Eric Fiegenbaum

As the river crosses into Madbury it is joined by Dube Brook, where just downstream enough flow at certain times of the year sustained a mill. First referred to as the Emerson's mill and later as the Demerit dishwater mill, the mill at this location was used for sawing. There are records indicating the mill's existence in 1779. It was remodeled in 1801, and in 1910 it was removed to provide material to build a barn. [Source: Thompson, Mary P. *Landmarks in Ancient Dover, New Hampshire*. Durham Historical Association. 1892, re-published 1965.]

The river goes on to straddle the boundary between Lee and Durham before it finally crosses into Durham at State Route 155A. Here, a USGS gauging station has been collecting flow data since 1934.

It is said that the best falls or rapids on the Oyster River existed near Blacksnake Hill. This hill is in Durham, on the north side of “Oyster River freshet,” between Mast Road and the B. & M. railroad. It is part of the farm of the late Benjamin Thompson. While the site was not suitable for a mill, the surrounding area would come to play a key role in the continued growth of the region. Before the relocation of the New Hampshire College of Agriculture and Mechanical Arts to Durham in 1893, the village of Durham was almost completely dependent on individual shallow dug wells or privately-owned water distribution systems. To address the need for an adequate supply of water, a dam was built on Pettee Brook, an Oyster River tributary, creating a reservoir that was used for boilers, irrigation and fire fighting. The reservoir’s poor water quality for drinking required that water be piped from local springs until wells were drilled in 1910.

[Source: Durham Historical Society. *Durham, New Hampshire, A History, 1900-1985*. Published for the Durham Historical Association, 1985.]

By the early 1930’s an additional source of water was needed to meet the demand of an increasing population in Durham and higher enrollment at the University. In 1934, it was decided to build an impoundment on the Oyster River, north of the Boston and Maine Railroad and within College Woods. A water treatment facility was built adjacent to the new reservoir. The reservoir was created by a dam 100 feet long and 21 feet high (including wood flashboards). It holds back some nine million gallons of water.



Oyster River Reservoir at the University of New Hampshire. Photo by Dick Weyrick.

During its first full year (1936) the water treatment plant produced over 55 million gallons of drinking water. Today the water treatment plant (with increased capacity) is still the primary source of drinking water for the University and the Town of Durham. The plant processed over 218 million gallons of water from the Oyster River in 2006. An additional 89 million gallons was supplied to the distribution system by a well owned by the Town of Durham, making a total of over 300 million gallons removed from the small, urbanizing Oyster River watershed. [Source: Loveren, H.W. *History of the Public Water Supply in Durham*. UNH Superintendent of Properties.]

Below the reservoir, the first railroad bridge was built across the river in 1841 when the rail line was extended through Durham north to Dover from Exeter. The current (third) railroad bridge was built in 1911 at which time the course of the river was changed to accommodate the need for a solid foundation for the bridge footings. Beneath the banks of the natural river was quicksand, and the second bridge built there had collapsed. [Source: Personal communication with Janet Mackie, Vice President Durham Historical Association.]

Downstream of the railroad bridge and just west of Mill Road in Durham are the remains of a dam for the Chesley's mill. This mill privilege was granted in 1699 and the original Mill Road to this site was laid out in 1703. The mill was first a saw mill and later converted to a grist mill. There was also a fulling (process for cleansing wool) mill at this site. Below Chesley's mill one can see the pool from another mill where the river turns behind the corner of Mill Pond Rd and Oyster River Rd. [Source: Thompson, Mary P. *Landmarks in Ancient Dover, New Hampshire*. Durham Historical Association. 1892, re-published 1965.]

Few if any of the other mills on the river actually impounded water like the mill at the Mill Pond, also called Durham Falls. It was the last mill before the tidal portion of the river and likely the major milling operation on the Oyster. It was privileged in 1649 and was used for a saw mill, grist mill, cider mill and finally a machine shop over the almost 300 year existence of the Mill Pond dam. The Mill Pond and dam are highly valued by the citizens of Durham as a scenic focal point of the community. The dam is New Hampshire's earliest known example of an Ambursen dam, a type of dam that relies on a series of evenly-spaced concrete buttresses, anchored in the bed of the river. Recent discussions regarding the possible need for repairs to the dam were very well attended. [Source: Town of Durham. *History of the Oyster River Dam*. Presentation. Town of Durham website.]

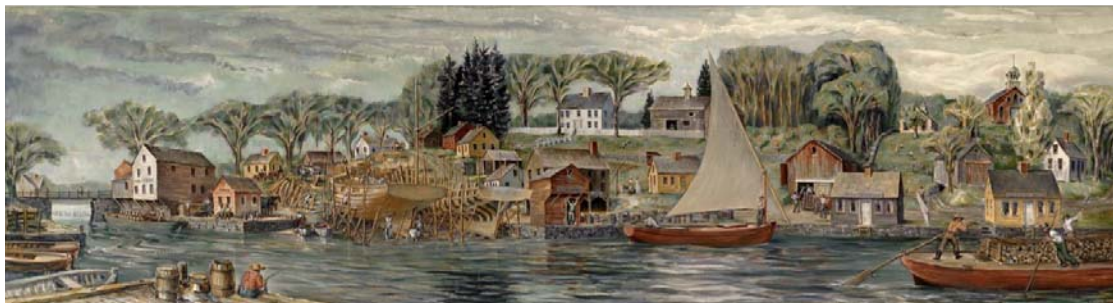


Jenkins Mill and Mill Pond Dam, from 1908 postcard.



Setting rebar, from an album of the estate of Edith Onderdonk estate, © Durham Historical Association.

The large tidal area of the Oyster River below the Mill Pond Dam was where the river had its earliest historical use. Originally used by the Native Americans as a seasonal camping ground and for shell fishing, the lower reach of the river supported the first settlers in the early 1600s. By 1639 the “Oyster River Plantation”, the beginnings of a scattered English Village, was discernible along the lower banks. The banks of the Oyster River yielded good quality blue clay, supporting dozens of brick yards. There were at least two locations for shipbuilding, at the mouth of the river and just below Mill Pond, where schooners, privateers and scores of gundalows were constructed. [Source: Stackpole, Everett S. & Thompson, Lucien. *History of the town of Durham, New Hampshire*. Published in 1913 by vote of the Town.]



“The Falls” depiction of 1822, mural by John Hatch, currently at the Community Church of Durham.

The Oyster River is not the largest nor most commercially important river in the greater watershed that supports the Great Bay. But through time, it has played a significant role in the establishment and support of the region. The region’s continuing growth and development pressures make the river’s value for water supply, significant natural communities, opportunity for education, research and recreation, and sense of place worthy of the highest level of protections for current and future generations.

Table 25. Historical and Archaeological Resources

[Source: National Register of Historic Places, National Historic Landmarks Survey]

Historical/Archaeological Resource	Listing/Eligibility	Location	Community
John Sullivan House	NHL	23 Newmarket Road	Durham
Durham Historic District	HD	Main St. & Newmarket Rd.	Durham
*Thompson Hall	NRHP	Main St. & Newmarket Rd.	Durham

***Thompson Hall is not within the river corridor, but is located in close proximity**

Oyster River Nomination Form

NH Rivers Management and Protection Program

Submitted June 1, 2010

(b) Community Resources

Briefly describe how the river is recognized or used as a significant community resource. If the river's importance is recognized in any official town documents, such as a master plan, include reference to such documents.

Master Plan Language in Support of the Oyster River

TOWN OF DURHAM – MASTER PLAN

4.2 Surface Water and Estuarine Resources

(a) The Town of Durham contains three primary watersheds: the Oyster River watershed, the Crommet Creek/Great Bay watershed, and the Lamprey River watershed. Durham has a major responsibility in managing these three watersheds. How the watersheds are managed defines the health of both Great and Little Bays. Stormwater runoff, wastewater management, and identification and control of point source contaminants all impact the environmental health of the Great and Little Bay estuarine systems.

(b) Despite Durham's investment in bringing secondary treatment capability to its Wastewater Treatment Plant, the sanitary sewer system remains a significant concern with respect to the discharge of nutrients and coliform bacteria into the Oyster River. A study of the fecal coliform levels of all the tributary rivers for the Great Bay from 1993 through 1996 found that the freshwater portion of the Oyster River has the second highest coliform levels under wet conditions (300 units/100 ml), behind the Cocheco River. The levels are such that they are well in excess of the safe levels for shellfishing and also exceed the levels acceptable for State recreational waters. There are many factors that can contribute to this high level of coliform bacteria, but one of the likely sources is inflow and infiltration from sewer pipes.

Goals and Recommendations

1. Ensure that septic systems and the Durham wastewater treatment plant are operated and managed to minimize any and all adverse effects on the water quality of the bays and the tributaries that feed the bays.

As part of the Town's renewal of the Wastewater Treatment Plant's discharge permit, improvements in the plant's technology should be made to improve the water quality in the Oyster River and Great/Little Bays.

2. The Town should provide for comprehensive protection of the wetlands and shoreland through regulatory, educational, and voluntary efforts.

When updating the Town's current ordinances with respect to wetland and shoreland buffers, the criteria established in *Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities* should be used as a primary reference. Areas for which larger buffers may be warranted over the standard buffer recommended by the State include: Johnson Creek, Little Bay, Great Bay, Lamprey River, Oyster River, Bunker Creek, Wagon Hill/Tirrell marshes. These areas have been identified as sensitive resources through the NH Coastal Method and other studies.

3. The Town of Durham should update its ordinances and regulations to adequately address the issues of stormwater management, erosion, and sediment control. The Town should also review and upgrade its stormwater facilities to improve the water quality of the Great Bay estuary.

The Zoning Ordinance should strive to keep impervious surface below 15% within each of the primary estuarine tributary watersheds for the Great and Little Bays. The primary estuarine watersheds within Durham for the Great and Little Bays are as follows: Lamprey River, Crommet Creek, several creeks in the vicinity of Colony Cove, Oyster River, and Bellamy River.

4.9 Drinking Water and Aquifer Protection

(a) Durham's municipal water supply comes from a combination of wells drawing from this sand and gravel aquifer and directly from the Lamprey and Oyster Rivers. A regional approach to the management of this asset is essential since activity in Lee, Madbury, and Newmarket will affect the same resource that is utilized by Durham and those communities. Lands which are presently identified as important in the 1989 Master Plan do not adequately provide drinking water resource protection. That is because there are no sand and gravel deposits in the area of the greenway, and there is no water source with the potential necessary to sustain a municipal water supply.

Goals and Recommendations

1. Drinking water resource protection is currently done on a community-by-community basis, while the resource transcends political boundaries.

The adequacy of the drinking water resource must be assessed in reference to the regional demands on the resource. The Town of Durham's needs for this resource cannot be effectively considered in isolation to the projected demands of the adjacent towns and the University of New Hampshire. The in-flow characteristics of the Lamprey and Oyster Rivers needs to be assessed. The sovereign exemptions of the municipalities and the University must not limit protective measures.

4.22 Urban Service Area Greenways

(a) The Oyster River is a historic connection with the Great Bay communities and provides a tangible physical connection to Little Bay, Great Bay, and the Piscataqua River. The Oyster River is a visible link to Durham's history as a vital colonial center and thus it is the centerpiece of the urban service area greenway.

Goals and Recommendations

1. Create an urban service area greenway system that is based upon the major streams and rivers within the core – College Brook, Beards Creek, Oyster River, Littlehale Creek, Pettee Brook, and Reservoir Brook. Although the greenway system will serve primarily as a resource protection measure, pedestrian connections should be aggressively pursued by working with willing landowners. The greenway system should also be linked by offroad bike and pedestrian trails/Class VI Highways, such as the Wagon Track Trail.

College Brook should be restored in those areas where it has experienced degradation. The Mill Pond and adjacent wetlands should be enhanced as a demonstration of the importance of greenway extensions into the downtown core. Enhancement of foot paths and passive recreational use of this area should be encouraged for the benefit of those living in the immediate neighborhood and to enhance the vision of Durham's special relationship with its fresh- and saltwater bodies. Sightings of rare and endangered species have been recorded in the College Brook greenway and Mill Pond area. The fact that unusual and important wildlife sightings can take place immediately adjacent to the Town's commercial core is of great importance to the sense of the Town of Durham as a place where modern presence can exist in concert with nature.

4.34 Historic and Archaeological Resources

(a) Durham has a complex past with nearly four hundred years of predominantly Western European settlement, preceded by thousands of years of an aboriginal presence. The pre-historic antecedent to the European presence extends to the last ice age, but is now present only in the archeological record. There is a great deal of documentation of the relationships between the European settlers and the Native American population.

(b) Durham's abundant history is shown by the numerous historic sites and markers present within the community. An archeological inventory of Durham exists at the Division of Historical Resources (DHR) in Concord; however, the DHR has a policy of not releasing this information to protect landowners from trespassing and the resources from illegal takings.

Goals and Recommendations

1. Provide Durham residents with a broader historical knowledge of their community to include pre-Colonial history and the archeological resources in the community.

Durham's historic orientation to the Oyster River, Great Bay, and Little Bay should be emphasized to highlight the vital importance of these waterways in the development of commerce and transportation and the present-day importance of these waterways with our relationship to our sister seacoast communities. This could be done through both a pamphlet and historic marker signs.

TOWN OF MADBURY – MASTER PLAN

2.2 Water Resources

(a) The protection and use of water resources are critical concerns to the Town of Madbury. With virtually all residents dependent upon private wells for domestic use, the quantity and quality of available groundwater must be protected from depletion and contamination. Other Town water resources, such as swamps, ponds, streams, and wetlands are important because they are hydrologically related to groundwater, and provide ecological, scenic, and recreational value to residents.

Goals and Recommendations

1. Madbury has a policy statement to vigorously protect water resources from contamination, depletion, and visual disfigurement. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

Support the efforts of watershed associations, regional planning commissions, and municipalities to coordinate water protection and management within the Bellamy and Oyster River watersheds.

Take reasonable and prudent precautions to protect all water resources from incompatible land uses, thus protecting the health and general welfare of the community.

Insure that sufficient water supplies exist for use by Madbury residents, as well as native wildlife and plant communities. The Town needs to examine and address water supply issues, watershed management, pollution, and potential aquifers/gravel areas.

2.3 Natural Resources

(a) Madbury straddles the boundary of the Oyster River and Bellamy River Watersheds. Consequently, anything that affects surface water characteristics within town boundaries potentially affects all downstream areas in two watersheds, both of which contain critical wetland habitat and extremely important water sources for people in Madbury and in surrounding communities.

Goals and Recommendations

1. Protection of water resources through the use of a wetlands conservation overlay zone applied to salt marshes, wetlands, and surface water (ponds, first order streams, headwaters) is a priority of the Town to be enforced by the Planning Board.

Consider placing mandatory conservation easements on wetlands within subdivisions. Use the Town of Lee as a model.

Consider providing stricter protection of the ecological services of wetlands, such as filtration.

Officially designate prime wetlands for Madbury.

Protect water supplies around wells and rivers, possibly through establishment or upgrade of ordinances, such as wellhead protection districts, well recharge areas, aquifer protection districts, and substantial riparian setbacks for water conservation.

TOWN OF LEE – MASTER PLAN

V.8 Trails System

(a) The Lee Forest Complex, which covers almost 200 acres, running from the bog behind the Library to the shore of Wheelwright Pond, provides a very helpful addition to the idea of a “livable, walkable community” by means of the several walking paths that wind throughout the area. The system of trails has been developed over the years through a combination of scout projects and cooperation by a number of volunteers. There is a total of over 3 miles of walking trails on Town-owned land in this area. There are several points where the trails can be accessed from easily available locations. In addition to the Town Forest Complex, there are other Town-owned lands that also have walking trails on them. They include:

- James Farm, accessible from the pond along the James Farm loop road

- Little River Reserve, accessible from Cartland Road
- Maud Jones Memorial Forest and Tree Farm, accessible from Garrity Road
- Oyster River Reserve, accessible from Route 155A (Old Concord Turnpike)

Goals and Recommendations

1. Establish a low impact, interconnecting system of trails to link the neighborhoods with the Town Center of Lee to enhance the history, transportation options, and healthy quality of life of the town.

Link the trails of the Lee community to existing trail systems within the surrounding towns of Madbury, Durham, Epping, Nottingham, and Barrington.

Establish a Lee Trails Committee to actively promote the design and use of a community trail system, encouraging safety in recreation activities along roads and trails, such as biking, hiking, horseback riding, bird watching, fishing, cross country skiing, and jogging.

VI.1 Water Resources

(a) The Lamprey, Oyster, Little, and North Rivers comprise the main streams in the Town of Lee. The Oyster River, Chesley Brook, and Dube Brook are the main sources of municipal water for the Durham Reservoir.

Goals and Recommendations

1. Conserve and protect the integrity of the Town's watersheds and surface water resources in their quality, quantity, and their intrinsic scenic and wildlife habitat values.
2. Determine the drinking water quality and quantity deficiencies in the local water supplies.
3. Define the future water resource needs of the community and consider developing Town-owned water supplies.
 - (a) Develop and implement a Water Resource Management and Protection Plan.
 - (b) Continue to develop and maintain a Town database of water wells and water quality.
 - (c) Perform regular voluntary surveys of residential and community wells
 - (d) Evaluate the future demand on existing water resources and the potential need for future Town owned water supplies.

TOWN OF BARRINGTON – MASTER PLAN

(a) The Oyster River originates in Barrington in the vicinity of Creek Pond, south of Swains Lake. The Oyster River flows east 13 miles to Little Bay at Durham Point. The major surface water features of the watershed are the river, Wheelwright Pond, and Durham Reservoir. Other features include Caldwell Brook in Barrington. The maximum elevation in the watershed is 300 feet near Swain's Lake.

(b) The Oyster River Watershed Association as part of the NHDES Volunteer River Assessment Program (VRAP) has conducted water quality sampling over the years. The result of the monitoring support the upper reaches of the Oyster River as Class A water.

Strategic Objectives

1. The Town of Barrington should endeavor to protect and enhance key natural resources in the community that define the town's rural character such as scenic vistas, river corridors, lakes and ponds, woodlands, fields and farmland.
2. Promote the preservation of large tracts of unfragmented open space that provides important wildlife habitat and offers opportunities for traditional recreation activities such as hunting, fishing, and hiking.
3. The Town should evaluate alternatives for determining the existing condition of key environmental attributes within Barrington (especially lakes, ponds, and rivers) and then periodically monitor these sites over time to determine any changes in quality or possible source of degradation.

4. Recreational Resources

(a) Fishery

Identify the type and location of any high quality recreational fisheries or areas with such potential, which are present in the river (as determined by the NH Fish and Game Department). Also indicate areas that have potential to be significant fisheries.

Upstream of Route 155A Crossing in Durham

Popular fishing spots are located in the upper part of the river. Many people fish for brook trout, which are both stocked and wild.

Wheelwright Pond

Wheelwright Pond is an excellent warmwater fishery for largemouth bass, yellow perch, and sunfish (including black crappie).

Locally Important Fisheries, Outside the River Corridor

The tidal portion of the Oyster River is a well-known winter smelt fishery. This part of the river also has the potential to be a striped bass fishery if river herring runs improve.

[Source: Matt Carpenter, New Hampshire Fish and Game Department]

(b) Boating

Describe any significant recreational boating opportunities, which are present on the river, including whether it is used for motorized boating. Indicate if the river is cited as significant for recreational boating in a publication of a national, regional or statewide recreation organization. Refer to the NH River Protection and Energy Development Project to determine the river's significance as a recreational boating river. Also note if boaters are attracted from beyond the local area and if there are areas with potential to be significant boating resources.

List of boating opportunities present on the Oyster River

[Source: Outdoor Recreation Sites. Parks & Recreation Durham, NH.]

Mill Pond – Durham

Site: Freshwater pond and marsh

Boating: Limited to canoes and rowboats: no ramps. Launching difficult.

Picnicking: Benches and tables.

Old Town Landing – Durham

Site: Tidal river and marsh

Boating: Limited to canoes, kayaks, rowboats; no ramp; dock provides access to boats moored in Oyster River.

Picnicking: Tables and benches.

(c) Other Recreational Opportunities

List of Recreational Resources in the River Corridor and Watershed

1. DeMerritt Memorial Park – Madbury

DeMerritt Memorial Park is a 12-acre Town-owned parcel within the Civic District of Madbury. It has two baseball fields and a soccer field. It also contains 4 acres of wooded area with trails, a picnic area, and a historical marker. Local youth sport associations as well as Town residents and the elementary school students use this area. Drainage from this area runs to Beards Creek and then into the tidal portion of the Oyster River.

2. Tibbetts Property – Madbury

The Tibbetts property is a 50-acre Town-owned parcel with two large open fields (16 acres) and woodlands of white pine and mixed hardwoods. Recently, a portion of one field was upgraded making it usable for organized soccer. The other field is mowed annually, and along with the woodlands has trails usable for hiking, biking, and horseback riding. The natural areas provide habitat for wildlife and opportunities for forest management. Wetlands on the property flow into Beards Creek.

3. Gerrish Brook Area – Madbury

The Gerrish Brook Natural Area is a 6.5-acre Town-owned property consisting of ravines and drainages leading into Gerrish Brook, which joins Johnson Creek draining into the tidal portion of the Oyster River. It abuts the newly acquired Town-owned Hoyt Pond Conservation and Recreation Area, which has a one acre fly fishing pond and various beaver dam impoundments. The area has numerous undeveloped hiking trails and valuable wildlife habitat. The red-finned pickerel, a species of interest in the region, has been found in Gerrish Brook.

4. Jacksons Landing – Durham

Located at the tidal portion of the Oyster River and marsh, the Landing has ramp access for all boats; tide dependent for motorized boats. The boat shed and dock are shared by the Town and University of New Hampshire. Picnicking is made possible with an abundance of tables and benches at the playground.

Note: Town operates both a playground for small children and a covered ice skating rink.

5. Durham Historic District – Durham

Durham's Historic District is on the National Register of Historical Places and is home to the Smith Family Chapel, Oyster River dam (the oldest Ambursen dam in NH), and the General Sullivan House (1740), which is also on the National Register.

6. Old Town Landing – Durham

Located at the tidal portion of the Oyster River and marsh, this area limits boating access to canoes, kayaks and rowboats. There is no ramp, but the dock provides access to boats moored in the Oyster River. Picnicking is encouraged with tables and benches. *Note:* Information posted at the site, describes the area when the landing was a center of activity in the 1800s.

7. Oyster River Park – Durham

The Oyster River Park is an area of mowed fields and woodlands along the river. There are approximately 0.4 miles of trails along the river. Benches provide excellent places for lunch or taking in the views.

8. Hoyt Pond Conservation and Recreation Area – Madbury

Hoyt Pond Conservation and Recreation Area is a 37-acre Town-owned parcel containing a unique fly-fishing impoundment managed by NH Fish and Game. Consisting mostly of woodlands, the property has drainages that flow into Gerrish Brook, which has numerous beaver impoundments. The red-finned pickerel has been found in Gerrish Brook, which joins Johnson Creek and ultimately flows into the tidal portion of the Oyster River. There are undeveloped and developed trails on the property used for hiking, snowshoeing, and cross-country skiing.

9. College Woods – Durham

College Woods is roughly a 250-acre UNH-owned property with almost 1-mile of river stretch that encompasses a reservoir, woodlands, and natural area. There are approximately 3-4 miles of well-maintained trails, while other trails are intermittent. A visitor can enter on the south side of Main St, 500 feet east of Mast Rd. or behind the UNH Field House from Service Rd. to Ocean Engineering Building on the north side of Mill Road 300 feet west of railroad tracks. With no formal parking, the Field House and other UNH parking areas are often used by visitors.

10. Bolstridge Forest – Madbury

The Bolstridge Forest is a 90-acre Town-owned property of mixed terrain, including woods, fields, and wetlands. The wetlands drain to Dube Brook which flows into the Oyster River making it, at that point, a fourth order stream. Its undeveloped trails and secluded nature make the area a popular hunting ground for both local and regional hunters.

11. Samuel A. Tamposi Water Supply Reserve (SATWaSR) - Barrington

The Reserve is a 1,377-acre parcel, which is home to the headwaters of the Oyster and Bellamy Rivers, which are both significant water supplies for the coastal communities; it includes a wide variety of habitats, including populations of moose, bear, fox and fisher. Features also include globally rare Atlantic white cedar swamp communities. The Town of Barrington owns the land and it is protected by an easement held by the Society for the Protection of NH Forests.

12. Town Forest Complex - Lee

This land is made up of four contiguous parcels (196 acres), with over 850 feet of shoreline on Wheelwright Pond (100 acres), the outflow of which flows into the Oyster River near the Lee traffic circle. Most of the land in the Town Forest is permanently protected by means of a conservation easement. There are several access points and a well-used complex of walking trails throughout the area.

13. Old Mill Reserve - Lee

This recently acquired land along Old Mill Road (90 acres) includes approximately 2300 feet of Oyster River shoreline. This is the site of an active Wetland Restoration Project (Natural Resources Conservation Service, USDA), scheduled for completion in 2010. There is walking access from Old Mill Road. The Reserve is part of a larger protected area, made up of both Town-owned and private land under conservation easements.

Table 26. Other Recreational Resources in the Watershed
 [Source: NH GRANIT, 2008]

Recreation Area	Community	Primary Use	Acres
Garrison School	Dover	Field Sports	22
Oyster River High School	Durham	Field Sports	5
Oyster River Middle School	Durham	Field Sports	4
UNH Field House	Durham	Field Sports	19
Lee Community Park	Lee	Field Sports	5
Woodridge Recreation Area	Durham	Field Sports	8
Hayes Hill Playground	Madbury	Park	2
Mast Way Elementary School	Lee	Park	3
Morningside Park	Dover	Park	2
David N. Allen Park	Lee	Park	1
UNH Outdoor Pool	Durham	Water Sports Area	2
Whittemore Center	Durham	Winter Sports Area	3
Durham Skating Rink	Durham	Winter Sports Area	1
Bunker Creek Easement	Durham	Natural Area	1
Boat Landing	Durham	Natural Area	1
Centennial Park	Durham	Natural Area	1
Mill Pond and Oyster River	Durham	Natural Area	1
Thompson Tot Lot	Durham	Natural Area	1
Smith Chapel	Durham	Natural Area	2
Memorial Park	Durham	Natural Area	1

(d) Public Access

List any existing public access sites located along the river. These may be formal or non-formal access points. Include the type of public access (e.g., canoe only), related facilities (e.g., parking), and if known, ownership at each site.

Table 27. Public Access to the Oyster River
 [Source: Oyster River Watershed Association]

Community	Location	Ownership	Description
Barrington	Samuel A. Tamposi Property	Barrington	Headwaters of the Oyster River and a Society for the Protection of New Hampshire Forests easement. Residents interested in using the trail system or pond for non-motorized recreation can park in a pullout space next to Province Road across from the Pond View retirement Home on Route 9.
Lee	Old Mill Road	Lee	Kelley and Cheney gravel pits being restored to wetlands. Access to river.
	Route 155 at bridge and power line crossing	NHDOT	Wide-turnoff. Could handle several cars on both sides. Has hunter access.
	Route 155A crossing at USGS gauging station	Lee	Turnoff on Mast Road next to the Swaan Drive Open Space conservation easement. Access to the river.
Durham	College Woods	UNH	College Woods main trails on Colovos Road, behind the UNH Field House. Parking is available at the trailhead. Access for walking, running, and general natural relaxation.

College Woods	UNH	Kiosk behind the UNH water treatment plant. Leads down to the river. Limited parking. Access to hiking, walking, skiing, jogging, bird watching, and general relaxation. Other activities occurring in areas outside the Natural Area are horseback riding, biking, and hunting (except North of the Oyster River).
Oyster River Park	Durham	Small neighborhood park with mowed fields and woodlands along the river that has access for walkers and benches for picnicking.
Public Park	Durham	Public access area at Mill Pond. Access for canoes, kayaks, and rowboats.
*Jackson's Landing	Durham	Public park and ramp access for all boats. Tide dependent for motorized boats. Boat shed and dock shared by the Town and UNH. There are tables and benches at the playground for small children and a covered ice-skating rink.
*Wagon Hill	Durham	Public land with access to woodlands, fields, tidal marsh and bay. Trails run through northern part of the Farm connects with Route 108 at the Evangelical Church. Carry-on launching access 0.5 miles from parking lot. There are picnic tables for visitors. Wagon Hill is also a popular sledding location for local residents in the winter. Site of Durham Community Gardens.

*Found in the tidal portion of the river

5. Other Resources

(a) Scenic Resources

Briefly describe any significant scenic focal points along the river including designated viewing areas and scenic vistas and overlooks. Indicate the location of the significant views to and from the river.

An extensive portion of the Oyster River corridor passes through farmland and forests, removed from public access and viewing, so casual viewers must take advantage of public road crossings to see the river and riparian features. This description will take two approaches; one dealing with views from public roads and locations, and one describing views requiring a bit of effort.

Views from crossings and public places.

As described elsewhere, the headwaters of the river are located in the Samuel A. Tamposi Water Supply Reserve (SATWaSR) in Barrington, far removed from easy access. The first opportunity to see the river as it flows from the reserve is at the bridge of the entrance road to Emerald Acres mobile home community in Barrington. This is a few hundred feet below where the river is joined by a major tributary, Caldwell Brook. The stream flows freely, and the water is clear, though colored due to its organic bog origins in Atlantic white-cedar and peat moss swamps.

There is one highway crossing in Barrington, U.S. Route 4 west of the Lee traffic circle. Although the river somewhat parallels the highway, one can only catch glimpses of the very slow-flowing, braided stream to the south of Route 4.

There are two crossings in Lee in the vicinity of the traffic circle at Routes 125 and U.S. Route 4. The 125 crossing is south of the Sunoco station and can be seen only as a brushy, wooded wetland area; the river itself is barely visible. The Route 4 crossing provides a good view of the river, both upstream and downstream. Upstream is a large, brushy wetland, hundreds of acres in extent, that serve as an important flood plain. Downstream, the river becomes more free-flowing, passing over an old beaver impoundment into a well-defined channel. There are stopping places for vehicles along the highway, at the gas station and at the driving range on either side of the river.

There are two town road crossings where vehicles can pull off to the side of the road to view free-flowing sections of the river in pristine settings, Old Mill Road and Snell Road. Downstream from the Old Mill Road bridge is a falls at the site of the old mill for which the road is named. The sight is spectacular, but there is quite a circuitous walk to get to it.

There are four more highway crossings in Lee - Route 155 north of Lee Five Corners, Route 155A (Old Concord Turnpike) east of Lee Five Corners, U.S. Route 4 (again), and Route 155A (Mast Road), the latter three being very close to the Durham-Lee town line. All are quite rural settings where the river is free flowing. The first two have convenient parking areas close to the bridge to facilitate stopping to view or fish. The Old Concord Turnpike crossing is frequently stocked with trout, so it is a favorite fishing spot. In addition, that is the site of a U.S.G.S gauging station, where flow measurements have been taken continuously for 75 years.

There are two crossings in Durham – Mill Road, downstream from the UNH-Durham water supply reservoir, and Route 108 (Newmarket Road), just downstream from the Mill Pond Dam. It is tidewater from that point downstream. Mill Pond is a very scenic area, with easy driving and parking access along Mill Pond Road. There has been a resident pair of swans gracing the pond for many years. Downstream from the dam, the Durham Landing Park is accessible via Old Landing Road, with parking, landscaped open area, picnic sites and a footbridge across the river.

Views from paths and trails.

With a bit of walking, there are several opportunities to view pristine sections of the river. In the Tamposi Reserve in Barrington, there are several old Town roads that have walking access that cross various portions of headwaters streams. Also along these roads are stone walls and building foundations, dating to the time when this was a farm community. There are several access points to the reserve, the most common one at the end of Tibbetts Road, off Hall Road.

In Lee, Oyster River Reserve (Town-owned) is located opposite the U.S.G.S. gauging station along Old Concord Turnpike. The east shore of the river is forested flood plain with easy access to the river in several places. This area is often covered with 1 to 3 feet of water during and following severe storm events. The west side of the river is accessed via a Boy Scout constructed walking trail that comes to the river banks in several places.

In Durham, the University of New Hampshire College Woods is over 200 acres in extent on both sides of the Oyster River and the water supply reservoir. There is an extensive network of trails throughout the property; many are along and near the shores of the stream, with foot bridges across the river. Over 60 acres of the land is designated a Natural Area. Some of the trails are designed to be handicap accessible. Additional information is available at the web site for the UNH Office of Woodlands and Natural Areas.

(b) Land Use

Briefly describe the general patterns of current land use in the river corridor. Include location of significant developments within the river corridor including agricultural, residential, commercial, and industrial developments, and solid waste management facilities. Also include location of lands used for forest management or which are undeveloped. Identify such features as roads along the river, railroads, bridges, and utility crossings. Describe the type and location of any proposals for major developments within the river corridor.

Following is a general description of the land characteristics that comprise the Oyster River Watershed.

Table 28. Land Characteristics of the Oyster River Watershed
 [Source: Strafford Regional Planning Commission]

Section of River	Towns	Area (acres)	Land Characteristics
Headwaters of Oyster River	Barrington	570	The river originates in Barrington with a number of small streams that feed the surrounding wetland at Creek Pond. The headwaters continue to flow through the Samuel A. Tamposi Water Supply Reserve, a conserved area protected for its water resources, ecosystems, and wildlife habitat. This area is largely rural and very little development exists. As the river heads east towards Lee, more densely populated areas can be found with a regional commercial zoning area that surrounds the Route 4 crossing in the vicinity of the Lee traffic circle.
Rural Segments of Oyster River	Lee, Madbury, Durham	2,484	As the river enters Lee it flows near the commercial zone that crosses at the Lee traffic circle. The river then opens up into a large wetland area where it is joined by outflow from Wheelwright Pond. Largely made up of rural and agricultural lands, the river meanders through Lee past Old Mill Road and through the Kelley and Cheney gravels pits being restored to wetlands and into Madbury where it is joined by Dube Brook. It flows south straddling the Lee and Durham boundary before finally crossing into Durham at the Route 155A. The river opens up in College Woods and flows to the impoundment at the water treatment facility.
Community Segment of Oyster River	Durham	591	After the reservoir the river flows under the railroad bridge and continues to head east through dense woodland before crossing Mill Road and flowing toward downtown Durham. This area is densely populated with residential housing and university residents. The river meets up with Hamel Brook before the impoundment at Mill Pond.

Table 29. Railroad Crossings at the Oyster River
 [Source: NH Department of Transportation]

Community	Total Number of Crossings	Location
Durham	1	Less than a quarter mile North of the Mill Road crossing

Table 30. Bridges of the Oyster River Corridor
 [Source: NH Department of Transportation]

Community	Total	Private-Local	State Highway
Barrington	1	0	1
Durham	6	3	3
Lee	6	2	4
Madbury	-	-	-
Total	13	5	8

Table 31. Utility Line Crossing at the Oyster River
 [NH Department of Transportation]

Community	Total Number of Crossings	Locations
Barrington	1	Approximately a quarter mile North of Route 4
Lee	2	Between Old Mill and Snell Rd; Just North of Demerit Hill Farm and Madbury Lee Rd

(c) Land Use Controls

Identify the municipalities with existing master plans and zoning ordinances within the river corridor. Identify existing or significant proposed land use controls, which affect the river and the river corridor (e.g., zoning, easements, subdivision regulations).

Following is a listing of **local zoning requirements and overlay districts** adopted in each corridor community that apply to the Oyster River, and its corridor and watershed.

Town of Barrington – Zoning Ordinance

Wetlands Protection District Overlay – Article 9.1

The general purpose of this District is to preserve and protect the many wetland areas in Barrington for the benefit of public health, safety and welfare. The intent of this section is to restrict the use of wetland areas and their buffers to promote the following goals: 1) Prevent the pollution of surface waters and groundwater; 2) Prevent the dewatering of wetlands; 3) Prevent adverse impact to wetlands that provides flood protection, recharge of groundwater supply, augmentation of stream flow during dry periods, habitat for plants, fish or wildlife, or commerce, recreation or aesthetic enjoyment; and 4) Permit those uses that can be appropriately and safely located in wetlands and their buffer areas.

Shoreland Protection District Overlay – Article 11.1

The purpose of the Shoreland Protection District is to preserve the overall quality of surface waters, and their adjacent environs, in the Town of Barrington in order to protect the public health and maintain the ecological integrity associated with these resources. More specifically, the intent of the regulations established in this Article are: 1) Maintain the quality of surface waters to insure protection of groundwater and drinking water supplies; 2) Conserve and protect the aquatic and terrestrial habitat associated with the town’s rivers, lakes and ponds; and 3) Preserve and enhance the aesthetic values associated with shoreline areas in order to maintain the town’s rural character; and 4) Encourage those uses that can be appropriately located adjacent to the town’s surface water resources.

Groundwater Protection District Overlay – 12.1

In the Town of Barrington, where water is drawn almost exclusively from wells, the protection of groundwater and the capability to recharge this water supply are issues of town-wide importance. Therefore, the intent of the Groundwater Protection District is to address the need to protect, preserve, and maintain groundwater resources within the town. The establishment of these regulations is also intended to address the following specific issues: 1) Protect the public health and general welfare of the citizens of Barrington; 2) Prevent development and land use practices that would contaminate or reduce the recharge of the groundwater supplies and aquifers; 3) Provide for future growth and development of the town, in accordance with the Master Plan, by ensuring the future availability of public and private water supplies; and 4) Encourage uses that can appropriately and safely be located in the groundwater and aquifer recharge areas.

Town of Durham – Zoning Ordinance

Wetland Conservation Overlay District – Article 13

The Wetland Conservation Overlay (WCO) District is an overlay district intended to protect the quality and functioning of wetlands through the Town by managing the use of the wetland and upland buffer adjacent to the wetland in coordination with the state dredge and fill permit system. The provisions in this article are intended to: 1) Protect the water quality of wetlands by appropriately managing stormwater runoff, siltation and sedimentation, and the construction or alteration of allowed or pre-existing buildings and structures; 2) Minimize flooding and flood damage by preserving the flood storage capacity of wetlands; 3) Protect wildlife and fisheries habitats and wetlands vegetation; 4) Maintain stream flow and groundwater recharge; 5) Conserve natural beauty and scenic quality; and 6) Limit uses of the wetland and upland buffer to those that are consistent with the objectives.

Shoreland Protection Overlay District – Article 14

The Shoreland Protection Overlay (SPO) District is an overlay district intended to protect the quality of the Town's surface waters in order to promote health and safety, maintain wildlife habitat, and conserve and protect shoreline and upland resources. The district is intended to implement and expand upon the provisions of the Comprehensive Shoreland Protection Act, NH RSA 483-B. The provisions of this article are intended to: 1) Protect the water quality of Great and Little Bays, the Oyster and Lamprey Rivers, and the Town's other surface waters by managing stormwater runoff, siltation and sedimentation, and the construction or alteration of buildings and structures in proximity of these resources; 2) Minimize the potential for the pollution of these water bodies; 3) Protect wildlife and fisheries habitats and travelways; 4) Conserve the natural beauty and scenic quality of the shoreland; and 5) Allow uses of the land adjacent to these water bodies that are consistent with these objectives.

Aquifer Protection Overlay District – Article 16

The Town of Durham adopts an Aquifer Protection Overlay District and accompanying regulations in order to protect, preserve and maintain existing and potential groundwater supplies and related groundwater recharge areas within the town. The objectives of the Aquifer Protection Overlay District are: 1) Protect the public health and general welfare of the citizens of Durham; 2) Prevent development and land use practices that could potentially contaminate or reduce the rate of recharge of identified aquifers; 3) Provide for future growth and development of the town, in accordance with the Master Plan, by ensuring the future availability of safe public and private

water supplies; 4) Permit uses that can appropriately and safely be located in the aquifer recharge areas.

Town of Lee – Zoning Ordinance

Aquifer Conservation District – Article 13

The purpose of this article is to protect the public health, safety and general welfare by providing for the protection and preservation of existing and potential groundwater resources, known as aquifers, in the Town of Lee, New Hampshire. The intent of this article is to protect our known aquifers by preventing adverse land use practices and by limiting the kinds of development which are inconsistent with the preservation of potable groundwater supply. This district will be managed in the interest of providing water of acceptable quality and adequate quantity for the use by present and future generations of Lee residents. The Aquifer Conservation District is identified as those areas depicted on the Lee Zoning Map, which are designated as having the potential to yield groundwater.

Shoreland Conservation District – Article 14

The intent of this district is to protect water quality, visual character and the wildlife habitat of the Shoreland areas. The Shoreland Conservation District shall be all land located one hundred (100) feet of the shores of the Lamprey River, Little River, North River, Oyster River, Dube Brook, Chesley Brook and Wheelwright Pond.

Wet Soils Conservation Zone – Article 15

Includes those areas such as swamps, marshes, and bogs that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support prevalence of vegetation for life in saturated soil conditions. The limits of the Wet Soils Conservation Zone are hereby determined by the areas subjected to high water tables for extended periods of time and includes, but are not necessarily limited to all such areas delineated as Wet Soils on the current Town of Lee Wet Soils Map, which is on file in the Office of Planning and Zoning.

Town of Madbury – Zoning Ordinance

Wet Area Conservation Overlay District – Article 9

The purpose of this article is to implement Madbury’s adopted Master Plan’s first priority policy goal to “Protect and manage...wetlands...for the benefit to present and future generations.” and “Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles.” In support of these goals, this article will help to: 1) Prevent the pollution of surface water and ground water by controlling the development of structures and land uses on naturally occurring wetlands; 2) Prevent the destruction of natural wetlands that provide flood protection and stormwater storage, recharge of ground water supply, and augmentation of stream flow during dry periods; 3) Protect presently existing natural wetland wildlife habitat; 4) Prevent any inharmonious use of wetlands that would cause excessive or untimely expenses or environmental degradation to the Town; and 5) Accommodate those uses that can be appropriately and safely located in a wetland.

Aquifer and Wellhead Protection Overlay District – Article 9A

The purpose of this article is to implement the adopted Town of Madbury Master Plan priority objective to: “Protect water resources in Madbury from contamination, depletion and

disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.” Clean and abundant water from Madbury’s ground water aquifers is necessary for the health, welfare, safety and prosperity of the Town and its surrounding area. Wells serving public water systems are critical resources. This article provides protections for these essential resources from risks associated with adverse land use and development.

Shoreland Protection Overlay District – Article 10

The purpose of this article is to implement Madbury’s adopted Master Plan’s first priority goal: “Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles” and “Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.” In support of these goals, this article will help to: 1) Preserve and maintain surface water quality in Madbury; 2) Conserve and protect aquatic and terrestrial habitat associated with inter-tidal and riparian areas; 3) Preserve and enhance those aesthetic values associated with the natural shoreline; and 4) Encourage those uses that can be appropriately located adjacent to the shorelines.

Table 32. Zoning Districts for Towns in the Oyster River Corridor
 [Source: SRPC 2009 Zoning and Land Use Database]

Town	Zoning District	*Acreage
Lee	Residential	1393.5
	Commercial	154.5
Durham	Office and Research District	419.8
	Residence B District - Medium Density	360.4
	Water	33
	Residence A District - High Density	177
	Central Business District	4.5
	Rural District	82.5
	Residence Coastal District	34.6
	Multi-Unit Dwell/Office	181.9
	Coe's Corner	0.1
	Courthouse	11.5
	Church Hill	26
	Madbury	Residential/Agricultural
Barrington	Regional Commercial	177.1
	General Residential	702.9
Total		3910.1

*All acreages calculated within Oyster River corridor.

Following is a summary for the local zoning requirements and regulations to building setbacks, use setbacks, and riparian buffers that apply to the Oyster River

Table 33. Town Zoning Requirements and Regulations for the Oyster River
 [Source: Piscataqua Region Environmental Planning Assessment, 2010.]

ZONING ORDINANCE	BARRINGTON	DURHAM	LEE	MADBURY
Building Setback	75ft	125ft	100ft	75ft
Septic Setback	75ft	125ft	125ft	100ft
Wetland Setback/Buffer	Septic - 50ft Building - 50ft	Septic - 125ft Building - 75ft Fertilizer - 75ft	Septic - 125ft Building - 75ft	Septic - 75ft Building - 75ft Fertilizer - 25ft
Impervious Surface Limits (% Lot Coverage)	ND	No more than 20% impervious surface area in Aquifer Protection Area.	Not to exceed 10% of impervious surface area in Aquifer Protection Area.	Not to exceed 20% of impervious surface area in Aquifer Protection Area.
Natural Vegetative Buffer	-	-	-	50ft
Solid Waste Facility	-	Prohibited in Aquifer Protection Zone	Prohibited in Aquifer Protection Zone	100ft
Wellhead Protection Regulations	Yes	No	No	Yes
Aquifer Protection Regulations	Yes	Yes	Yes	Yes
Water Resource Mgmt. Plan in Master or Comp Plan	No	No	Yes	Yes

(d) Water Quantity

List the location of all operating stream gauge stations maintained by the U.S. Geological Survey, U.S. Army Corps of Engineers or the Department of Environmental Services. Include the number of years of record and whether it is a partial or full record station.

USGS Gage Station #01073000 Oyster River Near Durham, Strafford County, NH
 Latitude 43°08'55", Longitude 70°57'56" NAD27; Gage Datum: 65.29 feet above sea level NGVD29, Hydrologic Unit 01060003, Drainage area: 12.1 square miles. Data from 1934 to current year; Full Record Station. The USGS estimates that there are 12.1 square miles of drainage basin upstream from this discharge monitoring station. The Durham gage has been collecting discharge measurements since October 1934. Discharge data from 1934 to the present

and station gage information is available at the USGS National Water Information System Web Interface at: <http://waterdata.usgs.gov/nwis/>.

(e) Riparian Interests/Flowage Rights

Describe riparian interests within the corridor, specifically legislatively granted flowage rights. For example, a town given legislative authorization to water for public consumption in the 19th century.

The Towns of Durham, Epping, Lee, Newmarket and Raymond shall have the use of the waters of the Lamprey River and its tributaries within said towns for the purpose of public water supplies to the exclusion of all other municipalities. Durham shall have the right to acquire by purchase or by eminent domain in accordance with the procedures of RSA 38:13 and 14 (1) the right to divert waters from the Lamprey River by means of any dam that it may build or acquire at or near: the location of the dam at Wiswall Falls and (b) flowage rights in the Town of Lee to the extent necessary to maintain a dam at the Falls at or near the location of the dam owned by Carl. F. Spang. The Town of Durham shall have the right and authority to protect the purity of the water from the Lamprey River as granted under RSA 38:21 provided that there shall be no curtailment of present or future recreational uses, namely, swimming, boating and fishing.

Any person who shall willfully and maliciously corrupts the waters of any of the sources of supply or reservoirs of the Durham Water Works Company, or shall willfully injure any dam, reservoir, conduit, pipe, hydrant, or other property held, owned, or used by said company, for the purposes of this act, shall, on conviction of either of said acts, be punished by fine not exceeding five hundred dollars, or be imprisoned not exceeding one year. There are no known significant flowage rights on the Oyster River. [Durham-UNH Water Works. 1965 C. 332-1; 1998 UNH Doc.]

SECTION VIII. RIVER POINT EVALUATION SUGGESTION AND JUSTIFICATION

Explanation: By law, the rivers coordinator must evaluate the nomination using a system that has been designed to both identify significant resources and to ensure consistency in the manner in which each river nomination is evaluated. The system consists of a general evaluation and the awarding of points for the presence of significant resources within each resource category. Sponsors of the nomination are requested to suggest the number of points they feel should be awarded for the significant resources contained within each resource category and a brief justification regarding why those points should be awarded.

Instructions: Complete the table below. Please note that if a resource is present that all points for that resource should be awarded, however, only these points may not exceed the maximum points in each resource category.

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
NATURAL RESOURCE CATEGORY		205		
(a) Geologic Resources		30		
(1) national or regional significance	30		30	The Spruce Hole Bog was recognized by the National Parks Service (NPS) as a unique geologic occurrence.
(2) statewide significance	20			
(3) local significance	10			
(b) Wildlife Resources		30		
(1) endangered or threatened species		15		
a. national significance	15		15	There are 6 species of endangered or threatened animals within the Oyster River Watershed.
b. statewide significance	10			
(2) significant wildlife habitat		10		
a. Habitat that is within a conservation focus area or that is known to have contained or currently contains state or federally listed endangered or threatened species	10		10	Both the Land Conservation Plan for NH's Coastal Watersheds and Wildlife Action Plans recognize several core focus areas and highest quality habitat.
b. Habitat that is within an area of highest quality habitat statewide or highest quality in the biological region and/or is a habitat for a species of special concern	5			

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
c. Habitat that is within an area of supporting landscapes or that contains other species of greatest conservation moderately diverse	3			
d. Adjacent habitat	1			
(3) wildlife travel corridor		5	5	Critical for the movement of several wildlife species between large habitat areas.
(c) Vegetation/Natural Communities		20		
(1) endangered or threatened plant		15	15	There are 5 known occurrences of endangered or threatened plant species.
a. national significance	15			
b. statewide significance	10			
(2) exemplary natural ecological community		5	5	There are 4 known exemplary natural ecological communities within the watershed.
(d) Fish Resources		35		
(1) endangered or threatened fish		15		
a. national significance	15			
b. statewide significance	10		10	Contains the only documented population of American Brook Lamprey in New Hampshire.

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
(2) significant aquatic habitat		10		
a. Habitat that is within a conservation focus area or is known to have contained or currently contains state or federally listed endangered or threatened species.	10		10	Area is known to contain several endangered or threatened fish species as well as a 9 species of conservation concern in NH's Wildlife Action Plan.
b. Habitat that is within an area of highest quality habitat statewide or highest quality in the biological region and/or is a habitat for a species of special concern	5			
c. Habitat that is within an area of supporting landscapes or contains other species of greatest conservation need.	3			
d. Adjacent habitat not located within any of the above.	1			
(3) fish reproduction		5		
a. natural reproduction	5			
b. some stocking	3		3	Small number of brook trout are stocked each spring.
c. stocking	1			

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
(4) anadromous fish		5		
a. reproducing populations of diadromous fish	5		5	Several species of diadromous fish migrate through the Oyster River.
b. restoration begun	3			
c. documented restoration plan	1			
(e) Water Quality		30		
(1) Class A	30		30	The Oyster River and all its tributaries are designated as Class A waters.
(2) Class B	15			
(f) Open Space	10 per occurrence	30	30	There are over 1,200 acres of protected land in the river corridor.
(g) Natural Flow Characteristics		30		
(1) 100 percent free-flowing	30			
(2) largely free-flowing	15		15	There are a few dams within the corridor that prevent the river from being
SUBTOTAL NATURAL RESOURCES		205	183	

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
MANAGED RESOURCE CATEGORY		90		
(a) Impoundments		30	30	There are 5 impoundments present according to the NH Dam listing at DES.
(b) Water Withdrawals and Discharges		30		
(1) water withdrawals		20		
a. existing public drinking water supply	10		10	Significant water withdrawals as a community-drinking supplier.
b. potential public drinking water supply	5		5	The Spruce Hole Aquifer has potential to yield drinking water.
c. existing industrial water supply	5			
d. potential industrial water supply	3			
e. existing agricultural water supply	5		5	Water supply for UNH agricultural department and surrounding fields.
f. potential agricultural water supply	3			
(2) wastewater discharges		10		
a. wastewater treatment facility discharge	10			
b. industrial wastewater discharge	5			
(c) Hydroelectric Resources		30		
(1) existing hydroelectric power production	30			
(2) potential hydroelectric power site	15			
SUBTOTAL MANAGED RESOURCES		90	50	

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
CULTURAL RESOURCE CATEGORY		60		
(a) Historical or Archeological Resource		30		
(1) national significance	30		30	Several historical and archeological resources have been listed by the National Register of Historic Places.
(2) regional significance	15			
(3) statewide significance	10			
(b) Community River Resource	10 per occurrence		30	All of the Towns within the corridor have significant language about the protection and preservation of the river in their master plans.
SUBTOTAL CULTURAL RESOURCES		60	60	
RECREATIONAL RESOURCE CATEGORY		120		
(a) Fishery		30		
(1) Year-round coldwater, warmwater, and saltwater fish species fish habitat.	30		30	There are several excellent, high quality recreational fisheries present in the river.
(2) Year-round habitat for 2 or more coldwater, warmwater or saltwater fish species.	20			
(2) Year-round habitat for wither coldwater, warmwater or saltwater fish species.	10			
(b) Boating		30	15	Limited to canoes, kayaks, rowboats.

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
(c) Other Recreation	10 per occurrence	30	30	There are a number of recreational resources in the river corridor and watershed.
(d) Public Access		30		
(1) on publicly-owned land	30		30	Several access points for walking, running, hiking, and general relaxation sites along the river.
(2) on privately-owned land	15			
SUBTOTAL RECREATIONAL RESOURCES		120	105	
OTHER RESOURCE CATEGORY		120		
(a) Scenery		30	30	Numerous significant scenic focal points along the river.
(b) Land Use		30		
(1) high quality scenic and natural resources; corridor generally undeveloped or limited to forest management or scattered housing	30			
(2) corridor partially to predominantly used for agriculture, forest management and residential housing	20		20	Predominantly rural and little development exists, until the downtown area of Durham, which is densely populated with residential housing and university residents.
(3) corridor populated; some residential or other building developments; readily accessible by road	10			

Category	Points Available	Maximum Points	Suggested Points to be Awarded	Justification for Points
(4)corridor highly populated; contains significant development	5			
(c) Land Use Controls	10 per occurrence	30	30	All Towns within the river's corridor identify zoning ordinances and overlay districts protecting the river.
(d) Water Quantity		30	30	There is a USGS gauging station along the Oyster River in Durham.
SUBTOTAL OTHER RESOURCES		120	120	
TOTAL POINTS		595	518	

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APPENDICES

Appendix A. Letter of notification sent to all riparian landowners.

Appendix B. Copy of questionnaire.

Appendix C. Survey results

Appendix D. Community Involvement

Appendix E. Letters of Support

Appendix F. Map Set

Figure 7 – Water Resources: Aquifers and Wetlands

Figure 8 – Conservation Focus Areas

Figure 9 – Core Focus Areas and Areas of Ecological Significance

Figure 10 – Existing Land Use

Appendix A. Letter of notification sent to all riparian landowners.

August 21, 2009

Greetings!

We, members of the Oyster River Watershed Association, are interested in protecting the resources of the Oyster River and have identified you as a property owner on or near the river. We are sending you the enclosed questionnaire to help us in gauging perceptions, concerns, and protection strategies with regard to the river. We would appreciate your help in responding to the questionnaire and returning it in the enclosed envelope by **September 10th**.

The Oyster River Watershed Association (ORWA) is a 501(c)(3) nonprofit that seeks to protect, promote and enhance the ecological integrity and environmental quality of the Oyster River watershed through community participation and involvement. Members of the river communities are welcome to join the association. Our activities include monthly meetings and river walks, outreach and educational activities, and water quality monitoring.

Recently ORWA was awarded a grant to nominate the Oyster River for designation under the state's Rivers and Management Protection Program (RMPP). The grant will fund the Strafford Regional Planning Commission's assistance with the nomination application and public outreach. The RMPP is based on a two-tier (state and local) approach to river management and protection. OWRA is especially interested in the RMPP's establishment of a Local River Advisory Committee, which would have representation from each town in the river corridor and promote a regional cross-town approach to watershed issues. This questionnaire is part of our nomination process; it will allow us to compare your responses with a survey done in conjunction with a 2001 watershed management plan.

Additional sources of information about the RMPP include:

- NHDES RMPP website: www.des.nh.gov/organization/divisions/water/wmb/rivers
- www.OysterRiver.org, which is more specific to the Oyster River nomination
- Contact us by email at: mailbox@oysterriver.org
- By phone to Eric Fiegenbaum at: (603) 750-7519

There is a comment section on the questionnaire where you can leave your email or address so we can inform you of outreach efforts.

Thank you again for your time and prompt response to our questionnaire,

The Oyster River Watershed Association

Appendix B. Copy of questionnaire.

Oyster River Landowner Questionnaire

The first group of questions refers to your property on the river.

- 1 Do you currently own land on or near the Oyster River?
In which town is your riverfront land located?
In which town are you are resident?
2a Approximately how many acres of riverfront land and how many feet of frontage do you own?
b How long have you owned your riverfront property (in years)?
3 Did the river play a role in your decision to purchase your property?
4 What is the current use of your property?
5 What plans do you have for your property?

The second group of questions refers to the river.

- 6 Do you think the river contributes to the quality of life in your community?
7 How important is it to you that each of the following characteristics associated with the river and its corridor are conserved?
8 Have you noticed any of the following problems along the river?

The final group of questions relate to possible river protection measures.

- 9 Do you believe that any of the following general measures should be taken to protect the river and the special opportunities it offers to the area? (Please check as many as apply.)
- | | |
|-------------------------------------------------------------------------|-----------------------------------------------------------------|
| <input type="checkbox"/> Protect free-flowing nature of river | <input type="checkbox"/> Provide public access |
| <input type="checkbox"/> Limit residential shoreline development | <input type="checkbox"/> Provide recreation facilities |
| <input type="checkbox"/> Limit commercial shoreline development | <input type="checkbox"/> Protect wildlife and waterfowl habitat |
| <input type="checkbox"/> Limit industrial shoreline development | <input type="checkbox"/> Protect fisheries habitat |
| <input type="checkbox"/> Protect scenic character of the river corridor | <input type="checkbox"/> No additional protection needed |
| <input type="checkbox"/> Protect water quality | |
| <input type="checkbox"/> Other (please specify) _____ | |
- 10 Do you feel any of the specific steps listed below would be appropriate for river and river corridor protection? (Please check as many as apply.)
- Stricter enforcement of local and state regulations related to water and wetlands
 Minimum setback requirements for new construction
 Floodplain protection regulations
 Purchase of property in the river corridor (from willing sellers)
 Purchase of development rights in the river corridor
 Voluntary easement donation program
 Limit dam construction
 No additional protection needed
 Other (please specify) _____
- 11 Are you presently or have you considered using any of the following land protection techniques on your property? (Please check as many as apply.)
- | | |
|--------------------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Conservation easements | <input type="checkbox"/> Deed restrictions |
| <input type="checkbox"/> Development restrictions | <input type="checkbox"/> Land donation |
| <input type="checkbox"/> Scenic restrictions/easements | <input type="checkbox"/> Current use |
| <input type="checkbox"/> Other (please specify) _____ | |
- 12 Do you feel that local governments should take action to protect the river in your community? Yes No
- 13 Are you interested in learning more about the efforts of the River Committee to nominate the river for designation into the New Hampshire Rivers Management and Protection Program? Yes No
- 14 Please add any general comments you may wish to make regarding the river below or on a separate sheet of paper.
- _____
- _____
- _____
- _____

Thank you for completing this questionnaire!



The Oyster River Watershed Association is a 501(c)(3) nonprofit that seeks to protect, promote and enhance the ecological integrity and environmental quality of the Oyster River watershed through community participation and involvement. The ORWA has been awarded a State/Federal grant through the Strafford Regional Planning Commission (SRPC) to nominate the Oyster River for designation under the NH State Rivers Management and Protection Program (RMPP).

Information about the RMPP can be found at the NH DES website: des.nh.gov/organization/divisions/water/wmb/rivers at the ORWA website at: www.OysterRiver.org by email at: mailbox@oysterriver.org or by phone to Eric Fiegenbaum at 750-7519.

Appendix C. Survey Results

Oyster River Landowner Questionnaire Mailed = 158 Responses = 33 Return to sender = 3

The first group of questions refers to your property on the river.

- 1 Do you currently own land on or near the Oyster River? 32 Yes 1 No (If no, please skip to question #6.)
 In which town is your riverfront land located? 1 Barrington 6 Lee 2 Madbury 26 Durham Other _____
 In which town are you are resident? 1 Barrington 5 Lee 1 Madbury 21 Durham Other: **No. Andover, Dover, Nottingham**
- 2a Approximately how many acres of riverfront land and how many feet of frontage do you own?

<u>Acres</u>		<u>Frontage</u>	
<i>smallest</i>	<i>0.25 acres</i>	<i>shortest</i>	<i>15 ft</i>
<i>largest</i>	<i>255 acres</i>	<i>longest</i>	<i>2,892 ft</i>
- b How long have you owned your riverfront property (in years)? *shortest: 1 year, longest: 85 years, average: 22 years*
- 3 Did the river play a role in your decision to purchase your property? 16 Yes 12 No
 If yes, how? *wanted land on river, love rivers, aesthetic and recreational, protect watershed, love beauty - want to be a good steward, on Mill Pond, like to be on water, canoe and fish, no houses behind, scenic;, attracts wildlife, view*
- 4 What is the current use of your property? (Please check the three most important uses.)

25 Full-time residence	4 Farming or Forestry	0 Industrial	Other (please specify) <i>wildlife habitat, conservation easement, family farm, vacant land</i>
0 Second or vacation home	1 Retail business	3 Investment	
4 Rental property	0 Lodging/restaurant	2 Recreation	
- 5 What plans do you have for your property? (Please check up to three answers.) 15 Continue current use

17 Full-time residence	4 Farming or Forestry	0 Industrial	Other (please specify) <i>hopefully better than a gas station, wildlife habitat, wildlife, conservation, selling in 10 years</i>
0 Second or vacation home	0 Retail business	1 Investment	
6 Rental property	0 Lodging/restaurant	2 Recreation	

The second group of questions refers to the river.

- 6 Do you think the river contributes to the quality of life in your community? 27 Yes 0 No
 If yes, how? (Please check as many as apply.)

22 Open space	28 Wildlife and waterfowl habitat	11 Boating	17 Free-flowing water
2 Agriculture	22 Wetland ecosystems	11 Fishing	1 Shoreline development
17 Water supply	3 Swimming	23 Scenic value	8 Historical/cultural sites

 Other (please specify) *Mill Pond and dam contributes; wish more free flowing; Mill Pond*
- 7 How important is it to you that each of the following characteristics associated with the river and its corridor are conserved? (Please circle the number corresponding to your answer; 1=Very Important, 5=Very Unimportant.)

	1	2	3	4	5		1	2	3	4	5
Industrial development opportunity	4	0	1	2	20	Water quality	21	3	2	0	1
Commercial development opportunity	5	0	3	0	21	Free-flowing river	17	2	3	0	3
Residential development opportunity	2	5	4	4	12	Wildlife and waterfowl habitat	21	2	2	0	1
Fishing access	12	5	5	3	5	Fisheries habitat	17	6	1	0	1
Boating access	7	3	6	5	4	Wetland ecosystems	19	4	1	0	2
Swimming access	5	5	7	3	4	Open space	19	5	0	0	3
Scenic quality	19	4	3	0	2						

 Other (please specify) *conserve Mill Pond; Mill Pond is different aspect; any more development would impact natural attributes*
- 8 Have you noticed any of the following problems along the river? (Please check as many as apply.)
 If there are problems that are of particular concern to you, please note their location in the margin.

6 Flooding	0 Recreation overuse
8 Excessive erosion	5 Loss of wetlands
10 Water pollution	8 Loss of wildlife and waterfowl habitat
0 Loss of or damage to historical or cultural sites	8 Loss of fish habitat
2 Loss of farmland	4 Destruction of or injury to critical environmental areas
2 Loss of public access	9 Development too close to the river

 Other (please specify) *Pond becoming marsh; utrification and silt build up; dam impairs fish; undersized culverts; stormwater erosion; fix dam; invasive species if dam removal; beaver damage; improperly sized culverts; beaver activity; fallen trees and erosion may be impacting fish habitat*

The final group of questions relate to possible river protection measures.

- 9 Do you believe that any of the following general measures should be taken to protect the river and the special opportunities it offers to the area? (Please check as many as apply.)
- | | |
|---------------------------------------------------|-------------------------------------------|
| 22 Protect free-flowing nature of river | 11 Provide public access |
| 22 Limit residential shoreline development | 5 Provide recreation facilities |
| 24 Limit commercial shoreline development | 26 Protect wildlife and waterfowl habitat |
| 25 Limit industrial shoreline development | 24 Protect fisheries habitat |
| 26 Protect scenic character of the river corridor | 3 No additional protection needed |
| 28 Protect water quality | |
- Other (please specify) *dredge pond; remove dam; fish ladder; protect buffers; clean and protect Mill Pond; fix dam; reduce impervious surfaces and better stormwater management*
- 10 Do you feel any of the specific steps listed below would be appropriate for river and river corridor protection? (Please check as many as apply.)
- 13 Stricter enforcement of local and state regulations related to water and wetlands
19 Minimum setback requirements for new construction
16 Floodplain protection regulations
16 Purchase of property in the river corridor (from willing sellers)
13 Purchase of development rights in the river corridor
16 Voluntary easement donation program
16 Limit dam construction
4 No additional protection needed
Other (please specify) *repair and dredge; remove dam; fix dam; preserve dam; State has many limits, better sized stream crossings; remove dam and make separate skating area; dredge silt*
- 11 Are you presently or have you considered using any of the following land protection techniques on your property? (Please check as many as apply.)
- | | |
|---------------------------------|---------------------|
| 7 Conservation easements | 2 Deed restrictions |
| 2 Development restrictions | 2 Land donation |
| 1 Scenic restrictions/easements | 5 Current use |
- Other (please specify) *hire consultant; no further development possible; wellhead protection zone*
- 12 Do you feel that local governments should take action to protect the river in your community? 22 Yes 3 No
- 13 Are you interested in learning more about the efforts of the River Committee to nominate the river for designation into the New Hampshire Rivers Management and Protection Program? 21 Yes 4 No
- 14 Please add any general comments you may wish to make regarding the river below or on a separate sheet of paper.
nomination is problematic; State is vested; will destroy pond; against nomination; donated conservation easement to town; 100% support for nomination; use water power to protect air quality; save dam; historical; recreation; scenic; unique; thanks for conservation easement at Milne; don't take property rights; why should small downstream landowner direct larger landowner; have lack of info on current projections; like to see Mill Pond dredged; thanks for good work; keep rivers protected from large commercial and industrial development; protect wildlife habitat; like to see dam removed to have free flowing river

Appendix D. Community Involvement

OYSTER RIVER WATERSHED ASSOCIATION

July 27, 2007

ORWA Riverwalks: What Have We Learned?

From the beginning of the organization, Riverwalks became an important means for ORWA members to explore the watershed and to find out what is happening from a close-up perspective. Each walk explores a portion of the main channel or a tributary. To the extent possible, these walks have been a monthly event, in all seasons and in good weather and bad. It was quickly learned that frozen ground afforded an opportunity to visit portions of the watershed that would be formidable in other seasons.

This report briefly describes the various riverwalks and observations about the streams, the terrain, the vegetation, and the land uses, as well as management challenges and opportunities.

THE MAIN STREAM

There have been four Riverwalks in the source area of the Oyster River in Barrington. Much of this portion of the watershed is in the Samuel A. Tamposi Water Supply Reserve (SATWaSR). This 1200+ acre protected reserve is owned and managed by the town of Barrington; a management plan is being prepared at this writing. A remaining problem in this area is 4-wheel and ATV use on the old roads and trails that traverse the reserve. The Atlantic white-cedar swamps, small ponds and streams that make up the source of the Oyster River remain in close to pristine condition, with perhaps the greatest impacts being beaver impoundments.

The portion of the river from the Sugar Shack (on Route 4 west) through the Lee circle vicinity includes extensive wetlands that are accessible by foot only during frozen ground conditions. The Riverwalks in this section of river have shown impacts that include debris (tires, metal drums, etc.) that has been deposited in past storm/flooding events. In addition, there is evidence of dredging activity in the past. Since this portion of the river is also the location of the commercial zone of the town of Lee, the storm drainage and runoff facilities for the highway and businesses remain a perennial concern. The intensive storm events of 2006 and 2007 have had adverse impacts in these wetlands and tributary streams. The potential threat from spills at the several gasoline/diesel stations in the circle area, as well as the highway traffic, lead to questions concerning the adequacy of emergency clean-up response capabilities in case of accidents.

There have been several Riverwalks along the portions of the main stream from Route 4 east at the Lee circle to the water supply reservoir in College Woods in Durham. There are several sections of this portion of the river that are protected by means of town ownership or conservation easements. The section between Old Mill Road and Snell Road includes sand and gravel pits that are the object of ongoing land protection projects, as are properties along the river between U.S. Route 4 and Mast Road. There is an area of concern below the Old Mill Road Bridge where high storm flows have caused slumping and washouts along a steep, unstable bank.

Development intentions of concern in this portion of the watershed include a 48-unit apartment complex on land along the river on Old Concord Turnpike at the west town boundary of Durham, and the land between Mill Road in Durham and the river. The segments of the river away from roads are quite undisturbed by human activity, and there are very important flood plain areas along this stretch.

The fresh water portion of the river and its tributaries east of the railroad tracks in Durham, as well as the tidal area, are strongly impacted by residential and business development. The adequacy of the wastewater treatment facility, which discharges into the estuary, is severely challenged during severe storm events. In addition, storm water treatment is very limited. Both Mill Pond and portions of the estuary hold high levels of sediment, due to past erosion. There are proposals in place to carry out dredging projects in both instances.

TRIBUTARIES

Caldwell Brook, located largely in Barrington, is a major tributary, providing almost as much flow as the Oyster River at their junction in Barrington, upstream from the Sugar Shack. Much of the upstream area is protected by conservation easements and public ownership, but pressure from residential development appears to be increasing in the Route 4 portion, where the brook crosses the highway twice.

The unnamed stream that flows through the Lee Traffic Circle area and into the river downstream of U.S. Route 4 has been seriously impacted by commercial development and apparently inadequate storm water treatment. Current development proposals constitute further threats for adverse impacts on this stream and its attendant wetland areas

Wheelwright Pond is a natural 100-acre pond, which drains into the large Oyster River wetland to the southeast of the Lee traffic circle. Except for a portion of protected shoreline owned by the town of Lee, the pond is close to maximum residential development. There is a perennial concern about the bacteria level in the pond, presumably related to the proximity of a large number of individual septic tanks and leach fields.

Dube Brook enters the Oyster River from the north to the west of Route 155, draining a portion of Madbury in the Cherry Lane and Hayes Road area. This stream flows largely through undeveloped land, and a portion is protected by town ownership.

A Brook that has its source in the Five-corners vicinity of Lee (**Five-corners/Lane Brook**) flows through land that is currently going through protection measures and enters the river downstream from U.S. Route 4. There are several conservation easements providing protection in the Garrity Road area.

Chesley Brook is the last tributary that flows into the river above the water supply reservoir. The NH Dept. of Fish and Game has identified viable populations of brook lamprey and native brook trout in this stream. Recent efforts to secure protection in this watershed were only partially successful.

College Brook and **Pettee Brook** are both heavily impacted as they flow through residential, campus and business developments in Durham. Both have been highly channelized in places and

flow through long culverts beneath playing fields, parking lots and other developed areas. The Mill Plaza area in Durham, through which College Brook flows, is being studied for further development.

Pettee Brook joins **Beard's Creek**, which also flows through residential and academic areas in Durham, where they enter the Oyster River Estuary below Mill Pond.

Hamel Brook flows into upper Mill Pond from across Route 108 (Newmarket Road). The lower portion of the watershed is protected by a conservation easement. There was substantial impact on the stream from both the Mother's day storm in 2006 and the Patriot's Day storm in 2007, with overflow creating a new temporary stream course into Mill Pond.

The **Gerrish Brook – Johnson Creek** complex flows into the estuary below the Durham wastewater treatment plant discharge. Gerrish Brook is largely in Madbury, and Johnson Creek originates in Dover; where Johnson Creek flows through Madbury there is a municipal water well complex.

Horeshide Brook flows past the Durham solid waste transfer station and closed landfill into the estuary opposite across from the Durham wastewater treatment discharge. Other than the solid waste center, there is little additional impact from development. There is still evidence of a historically significant stone quarry close to the solid waste center.

An unnamed stream ("**Chase Brook**") has its source area on Nature Conservancy Land on Durham Point, and then flows through the Deer Meadow Residential subdivision before discharging into tidal wetlands in the estuary.

There have been several special purpose Riverwalks: looking for and examining old mill sites, inventorying farm and wildlife ponds in the watershed, examining conductance and chemistry anomalies revealed by the volunteer water quality sampling program, and similar quests.

SO....?

On balance the river and its tributaries flow through much natural terrain with a surprisingly pristine character. Much of this probably has to do with lack of easy public access, as well as concerted protection efforts by the towns and their citizens. There are areas, however, that merit much concern and careful attention as development proposals close to the streams proceed.

It is important that the volunteer water quality sampling program continue its work, and that the results be published and recognized. It is also important that vigilance be maintained so that potential threats to the river and to the watershed be identified and thwarted before adverse impacts occur. Continuation of the Riverwalks is an essential element of this vigilance.

Appendix E. Letters of Support

Appendix F. Map Set