

# Wildlife Habitat and Land Stewardship Plan for the Oyster River Forest

Durham, New Hampshire



*Prepared for the:*  
Durham Conservation Commission  
Durham, New Hampshire

*Prepared by:*



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for the  
Oyster River Forest  
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## Acknowledgements

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An anonymous donor generously funded the development of this Stewardship Plan. Thanks to the Durham Conservation Commission for their support and encouragement for this Plan. Special thanks to Commission Chair Ann Welsh for her leadership and to Commission member Otho Wells for his interest in and input on trails. The Durham Land Stewardship Committee also provided support and encouragement for the ongoing habitat restoration and trail improvements. Several town staff were particularly helpful in finding documents or offering office support, including April Talon, Mike Lynch, and Janice Richard (Public Works), Karen Edwards (Planning), and Stefanie Frazee (Parks & Recreation).

I greatly appreciate the work of other consultants and resource professionals who provided data or for whose reports I incorporated into this Plan. This includes: Mark West (wetlands), John Magee (NHFG-fisheries), Chris Kane (natural resource assessment), Kyle Pimental (SRPC-watershed), Emma Carcagno (wildlife sightings), and Jeremy Lougee (NRCS-background documents).

In the midst of writing this Plan, we began to implement habitat restoration to create habitat for New England cottontail and improve the trail network. The habitat restoration is funded by the Natural Resources Conservation Service (NRCS) in partnership with the Rockingham County Conservation District (RCCD). Thanks to Brooke Smarte (NRCS) and Tracy Degnan (RCCD) who've provided essential support in implementing some rapid response and new techniques in restoring habitat.

My thanks go to Vermont consultants Mike Bald (Got Weeds?) and Gerry Hawkes and John Dumas (Forest Savers) who provided creative and quick responses to the management of invasive plants on the Oyster River Forest. Several town residents, led by Land Stewardship Committee member Malin Clyde, have taken a lead in improving the trail system in collaboration with the Student Conservation Association. And special thanks to all the volunteers who are helping to restore habitat, improve trails, and contribute in other ways.

Finally, thanks to all the partners (including the leadership of Gregg Caporossi at the Trust for Public Land), Durham community, and other donors who helped conserve this great property to benefit wildlife, water, and people.

## Purpose of this Plan

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The goal of this Stewardship Plan was to assess the current condition of the property and to guide the implementation of restoration and management activities to benefit wildlife, protect water quality and other ecological values, and enhance recreational opportunities on the Oyster River Forest. This was achieved by identifying and evaluating the soils, topography, plants, animals, habitats, wetlands, trails and other cultural features, environmental health, and landscape setting of the property.

This Wildlife Habitat and Land Stewardship Plan includes the following chapters and materials:

- ❖ **Chapter 1 – Property Description** describes the location, property history, conservation easement deeds and associated documents.
- ❖ **Chapter 2 -- Ecological Features** describes the landscape setting, topography, soils, water features, habitats, restoration, plants and animals, and environmental health of the property.
- ❖ **Chapter 3 – Cultural Features** describes the trails, woods roads, and other cultural features.
- ❖ **Chapter 4 – Wildlife Habitat and Land Stewardship Recommendations** presents management actions to meet stewardship objectives: wildlife habitat, water quality, and recreation.
- ❖ **A set of maps is included as Appendix 1** to further illustrate the property features.
- ❖ **Appendices 2-10** provide additional background material and property documents.

## Plan Preparation

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Ibis Wildlife Consulting is also writing a similar plan for the abutting town-owned 42-acre Spruce Hole Conservation Area. Since the two properties are contiguous and management objectives are compatible, several of the maps included in the Plans show both properties. Both are funded by an anonymous donation to the Town of Durham.

Ibis Wildlife Consulting participated in the following meetings and site walks to gather input for the Wildlife Habitat and Land Stewardship Plan:

- Durham Land Stewardship Committee meeting, May 23, 2014, 8 am
- Durham Conservation Commission site walk at Oyster River Forest, June 24, 2014, 4 pm
- Durham Conservation Commission monthly meetings, Aug 14 and Nov 13, 2014, 7 pm

Ibis Wildlife Consulting also provided periodic updates to Town decision-makers to keep them abreast of habitat restoration activities that were underway in collaboration with the Natural Resources Conservation Service and Rockingham County Conservation District.

# Chapter 1      Property Description

## Location and General Description

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The Town of Durham owns the 172-acre Oyster River Forest. The property is located in the northwest region of town, near the boundary with the Town of Lee. It is about 3 miles from downtown Durham and is bounded by Mill Road and Packers Falls Road to the south, the Town's Spruce Hole Conservation Area and private landowners to the west, the Oyster River to the north, UNH's College Woods, Emeritus at Sprucewoods retirement community, and a soon-to-be-developed private land to the east (Map 1--Appendix 1).

Durham is home to the University of New Hampshire and in the 2010 US Census its population was 14,638. The town is situated on the southern edge of Strafford County in the coastal region of New Hampshire. The Oyster River flows through the community and into the Great Bay Estuary on Durham's shores. The Oyster River Forest lies upstream with 4,640 feet of frontage along the Oyster River. It connects to over 2,000 acres of other conserved lands and open space (Map 1--Appendix 1).

The Oyster River Forest is a mix of forests, fields, and wetlands, with a network of trails that connect to other conserved lands. A small, gravel parking lot is located on Packers Falls Road, close to the intersection with Mill Road (Map 5--Appendix 1). Stonewalls form some of the property boundaries, an indication of the agricultural history of this land. A 20+ acre old field was farmed in the not too distant past. Recent logging is evident in the forested region between the field and Packers Falls and Mill Roads.

The property was acquired in 2013 with funding from multiple partners that included the Town of Durham, Natural Resources Conservation Service (NRCS), NH Department of Environmental Services, Land and Community Heritage Investment Program, NH Moose Plate Program, Lamprey River Advisory Committee, and many private donations. The Trust for Public Land coordinated the acquisition on behalf of the Town. The Oyster River Forest was permanently conserved via the NRCS Wetlands Reserve Program, which holds conservation easements on the property.

Conserving the Oyster River Forest protected many values important to the Durham community and its partners. The property helps protect the town's water supplies, including the Oyster River and the Spruce Hole Aquifer. The large network of conserved lands and waters provides habitat and travel corridors for fish and wildlife. New England cottontail, a state endangered species, is a focus of habitat restoration on the Oyster River Forest. Existing woods roads and trails and potential new trails offer visitors enhanced outdoor experiences including hiking, nature viewing, snowshoeing, x-country skiing, and fishing.

## History of the Property

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The Town of Durham acquired the Oyster River Forest in March 2013. The Durham Conservation Commission championed and helped fund the acquisition. The Trust for Public Land (TPL), a national conservation organization that helps communities protect lands as natural areas, open spaces, and

parks, coordinated the project, helping to raise more than \$4 million for the purchase. Funds for the project came from the following sources:

- USDA Natural Resources Conservation Service (NRCS) = \$2.46 million
- NH Department of Environmental Services Aquatic Resource Mitigation Fund = \$500,000
- NH Land and Community Heritage Investment Program (LCHIP) = \$ 76,700
- NH Moose Plate Program = \$ 35,000
- Lamprey River Advisory Committee (LRAC) = \$ 20,000
- Durham Conservation Fund = \$375,000
- Private donations (115 private individuals and foundations) = \$556,000

The property is made up of what were two separate ownerships, with different land use histories (Table 1). Sprucewoods Retirement Trust owned the western ¾ of the property, about 124 acres. This parcel is mostly forested except for a 20+ acre old field at the north end along the Oyster River. The land was historically farmed as indicated by the old field and extensive stonewalls, although the fields have been fallow for many years. The forest was harvested many times, including within the last 10 years; log landings, skid roads, young tree growth, and a flush of invasive buckthorn in thinned areas are evident. Chet Tecce, Jr. owned the eastern ¼ of the property (about 48 acres). The Tecce family historically pastured sheep here, although that ceased more than 50 years ago. The forest shows fewer signs of any recent or extensive logging.

On May 20, 2013, the Durham Town Council approved the renaming of this property to the “Oyster River Forest.” The NRCS, in their internal documents, will continue to refer to the two parcels that make up the Oyster River Forest as “Tecce” and “Sprucewoods” since those reflect the separate easements held by NRCS (Appendix 5).

**Table 1. Ownership history of the Sprucewoods parcel (Map 13 Lot 14-2) and Tecce parcel (Map 13 Lot 6-3); excerpted from R.W. Gillespie & Associates, Inc., 2008.**

Summary of Property Ownership History - 124 Acre Parcel (Map 13 Block 14 Lot 2)		
Owner of Record	Term of Ownership	Comments
John H. Farrell	2005- Present	
Various members of the Worthen Family	1976-2005	Granted to John H. Farrell
Mildred M. Phair	1947 -1976	Granted to Edith P. Worthen
Elizabeth W. Crowell & Dora M. Steuber	?-1947	Granted to Mildred M. Phair

Summary of Property Ownership History - 111 Acre Parcel (Map 13 Block 6 Lot 3)		
Owner of Record	Term of Ownership	Comments
Louise Tecce Revocable Living Trust	1998- Present	Parcel I of V
Louise Tecce	?-1998	Granted to Louise Tecce Rev. Living Trust
Chester Tecce	1925 -?	Granted to Louise Tecce by inheritance
Michael Tecce	?-1925	Granted to Chester Tecce by inheritance

Prior to the fee simple conveyance of the property to the Town of Durham, the Sprucewoods Retirement Trust and Chet Tecce, Jr. conveyed conservation easements (“Warranty Easement Deeds”) on their respective parcels to the Natural Resources Conservation Service (NRCS). Table 1 shows the ownership history of the two properties over the past 60+ years, as documented by R.W. Gillespie & Associates, Inc. (2008).

**Table 2. Documents and reference information related to the Oyster River Forest.**

<b>Document/Reference Information</b>	<b>Date Recorded</b>	<b>Registry of Deeds and/or Prepared By</b>
Durham Tax Map 13 Lot 14-2; 172 acres	-----	(Appendix 2)
LCHIP Project Agreement	3/29/2013	BK 4112 PG 0225 (Appendix 6)
Warranty Deed (Sprucewoods Retirement Trust and Chet Tecce, Jr to the Town of Durham)	3/29/2013	BK 4112 PG 0213 (Appendix 4)
Wetland Reserve Program Warranty Easement Deed (Sprucewoods Retirement Trust to USA)	3/29/2013	BK 4112 PG 0186 (Appendix 5)
Wetland Reserve Program Warranty Easement Deed (Tecce to USA)	3/29/2013	BK 4112 PG 0170 (Appendix 5)
Boundary Survey – Tecce and Sprucewood parcels	3/29/2013	Plan No. 105-27; Prepared by David W. Vincent Land Surveying Services 10/23/2012 (Appendix 3)
Boundary Survey – Sprucewoods parcel	3/29/2013	Plan No. 105-26; Prepared by David W. Vincent Land Surveying Services 01/15/2013 (Appendix 3)
Boundary Survey – Tecce parcel	3/29/2013	Plan No. 105-25; Prepared by David W. Vincent Land Surveying Services 01/16/2013 (Appendix 3)
60’-wide Access Easement	01/08/2013	BK 4087 PG 716; Plan 105-25
60’-wide Access Easement	01/07/2013	BK 4087 PG 218; Plan 105-25
Construction Easements	06/07/2001	BK 2323 PG 230; Plan 105-26
Groundwater Easement	06/23/1998	BK 2017 PG 290
Waterline Easement	09/24/1970	BK 876 PG 266

## Reports and Studies

Several reports were referenced in this Plan. Those of particular relevance are listed below. These were not included as Appendices; however, they are compiled (both hard copy and digitally) in an Oyster River Forest Property Inventory Notebook created for the Town of Durham.

- *Notes from Field Visit to the Tecce Parcel* by NH Fish and Game Fisheries Biologists, May 15, 2013.
- *Baseline Documentation Report Sprucewood Forest Owned and Managed by Sprucewood Retirement Trust and Chet Tecce, Jr. Revocable Living Trust.* 2013. Trust for Public Land.



- *Aquatic Resource Mitigation Fund Documentation—A Wetland Inventory, Function, & Value Assessment for Sprucewood Forest Durham*, by West Environmental, Inc., September 2010. Prepared for the Trust for Public Land.
- *Phase I Environmental Site Assessment Report*, by R.W. Gillespie & Associates, Inc., April 9, 2008. This report, completed for JLB Partners of Irving, Texas, covered 55 acres—a portion of the now Oyster River Forest east of the old field.
- *Natural Resources Assessment for the Property of JLB Partners, Worthen Rd, Durham, NH*, by Christopher Kane, May 13, 2008. This report covered 85 acres—a portion of the now Oyster River Forest east of the old field.

## Warranty and Easement Deeds

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### Warranty Deed

On March 29, 2013, John H. Farrell, Trustee of the Sprucewoods Retirement Trust, and Chet Tecce, Jr., conveyed fee ownership of their respective parcels to the Town of Durham. The 124-acre Sprucewoods parcel (Tax Map 13 Lot 14-2) and 48-acre Tecce parcel (Tax Map 13 Lot 6-2) were combined to create the 172-acre Oyster River Forest (Tax Map 13 Lot 14-2). A copy of the entire recorded warranty deed is included in Appendix 4.

### The properties were conveyed with the following matters of record and other interests (see Table 2):

- Water pipe easement granted to UNH (Recorded as Book 876 Page 266) – see Plan No. 105-026
- Ground water easements (Recorded Book 2017 Page 290, 291)
- Access and Utility easement and two slope and drainage easements to Sprucewoods Realty Trust and Orbit Construction, Inc. (Recorded Book 2323 Page 230) -- see Plan No. 105-026
- NRCS Wetlands Reserve Program Easements – see Easement Deeds
- 60'-wide Access Easement (Recorded Book 4087 Page 716) – see Plan No. 105-025
- 60'-wide Access Easement (Recorded Book 4087 Page 218) – see Plan No. 105-025
- LCHIP Executory Interest to the property – see Warranty Deed
- NH DES Third Party Right of Enforcement – see Warranty Deed

### Conditions and Restrictions:

- No Transfers: No transfer of the property without prior written approval of the LCHIP Authority. [Note: A clause in this section refers to two existing lease lots. That language is in error and a revised deed is being investigated by TPL to correct that error.]

- **Public Access:** The Town shall allow pedestrian access to, on, and across the property for hunting, fishing, and transitory passive recreation, but not camping. Posting against access is possible with prior approval from LCHIP, if needed to protect purposes for which the property was conserved. [Note: A Town of Durham ordinance prohibits hunting on town land, so these requirements are in conflict—see Chapter 4 for recommendations.]
- **Posting Re: Vehicles:** The Town can post against vehicles, motorized or otherwise.
- **Posting Re: Timber Harvests:** The Town can post against hunting during timber harvests.
- **No Structures:** Except for allowed conservation uses or as needed for allowed water uses.
- **Fees:** The Town can collect fees in support of stewardship.
- **No Commerce:** Except agriculture and forestry.
- **No Subdivision**
- **Land Use Regulation:** Not be used to meet open space requirements of any land use regulation

**Exclusions:**

The Wiggin/Tuttle burial ground (see Plan No. 105-026) is excluded from the warranty deed conveyance.

**Wetlands Reserve Program Easement Deeds**

As noted above, a “warranty easement deed” was conveyed from the Sprucewoods Retirement Trust to the U.S. Department of Agricultural Natural Resources Conservation Service (NRCS) on 124 acres (“Sprucewoods” parcel). A similar easement was conveyed from Chet Tecce Jr. Revocable Living Trust to the NRCS on 47 acres (“Tecce” parcel). These easements were acquired under the NRCS Wetlands Reserve Program and are in perpetuity. Collectively these two parcels comprise the 172-acre Oyster River Forest. Some of the sections of the easement deeds most relevant to this Plan are excerpted, paraphrased, and provided here. For the complete text of the Easement Deeds see Appendix 5; the two deeds have identical provisions.

Purposes and Intent for which the property was conserved:

- To restore, protect, manage, maintain, and enhance the functional values of wetlands and other lands.
- For the conservation of natural values including fish and wildlife and their habitat, water quality improvement, flood water retention, groundwater recharge, open space, aesthetic values, and environmental education.

- The restoration of the easement area and grants the right to carry out such restoration to the United States.

Landowner Reserved Rights:

- *Quiet Enjoyment*: the right to enjoy the rights reserved on the easement area without interference from others.
- *Control of Access*: the right to prevent trespass and control access by the general public.
- *Recreational Uses*: the right to undeveloped recreational uses, including undeveloped hunting and fishing and leasing of such rights for economic gain. Undeveloped recreational uses must be consistent with the long-term protection and enhancement of wetland and other natural resource values. Undeveloped recreational uses may include hunting equipment, such as, tree stands and hunting blinds that are rustic and customary for the locale as determined by NRCS.
- *Subsurface Resources*: the right to oil, gas, minerals, and geothermal resources underlying the easement area, provided that any drilling or mining activities are located outside the boundaries of the easement area.
- *Water Uses and Water Rights*: the right to water uses and water rights according to Exhibit D (see below).

Landowner Prohibitions:

- Haying, mowing, or seed harvesting for any reason;
- Altering of grassland, woodland, wildlife habitat or other natural features by burning, digging, plowing, disking, cutting, or otherwise destroying the vegetative cover;
- Dumping refuse, wastes, sewage, or other debris;
- Harvesting wood products;
- Draining, dredging, channeling, filling, leveling, pumping, diking, impounding, or related activities, as well as altering or tampering with water control devices, except as specified in Exhibit D.
- Diverting or causing or permitting the diversion of surface water or underground water into, within, or of the easement area by any means, except as specified in Exhibit D.
- Structures, except as related to undeveloped recreational uses;
- Planting or harvesting any crop;
- Grazing or livestock;

- Disturbance of nesting or brood-rearing activities by wildlife;
- Developed recreation, such as camping, recreational vehicle trails and tracks, sporting clay and skeet shooting, firearm range, infrastructure for raising, stocking, and releasing captive raised waterfowl, game birds, and other wildlife for hunting or fishing;
- Activities which adversely impact or degrade wildlife cover or other habitat benefits, water quality benefits, or other wetland functions and values of the easement;
- Activities carried out on the landowner's land that is adjacent to and functionally related to the land subject to the easement if such activities will alter, degrade, or otherwise diminish the functional value of the eligible land.

Compatible Uses by the Landowner:

- The U.S. Government may authorize, through a Compatible Use Agreement, the use of the easement area for compatible economic uses, including but not limited to, managed timber harvests, periodic haying, or grazing.
- Such uses must be compatible with the easement purposes; NRCS will prescribe the amount, method, timing, intensity, and duration of the compatible use.

Rights of the United States:

- Management activities: to undertake efforts to restore, protect, manage, maintain, enhance, and monitor the wetland and other natural values.
- Access: to access the property to exercise any of its rights under this easement deed.
- Easement management: may delegate all or part of the easement management, monitoring, and enforcement to another entity.

Exhibit D: Water Uses and Water Rights:

For a detailed understanding of the reserve water rights, read Exhibit D in the Warranty Conservation Deeds (Appendix 5). In summary, here are the three main reserved rights:

- To continue to use the surface water impoundment in Oyster River behind a dam near the current or former Arthur Rollins Water Treatment Plant, and within the easement area, for water storage and withdrawal.
- To transfer water from the Lamprey River, or a groundwater source to the Oyster River, or to a subsurface aquifer within the easement area.

- To withdraw groundwater from available groundwater sources near or within the drainage area contributing to the Oyster River, including groundwater from the aquifer under the easement area.

For each water right, the Town must obtain approval from NRCS prior to commencing any substantial maintenance, repair, or construction of existing facilities.

### **LCHIP Project Agreement**

The LCHIP Project Agreement with the Town of Durham (Appendix 6), includes the following provisions:

- Requires that the following statement be included on informational materials including kiosk: “The Oyster River Forest was protected with assistance from the NH Land and Community Heritage Investment Program (LCHIP).
- Requires town to provide a copy of the annual easement monitoring report to LCHIP. [Note: The Town can provide a letter to NRCS, requesting/giving permission for NRCS to send their annual easement monitoring reports to LCHIP; this will satisfy this requirement (Brooke Smarte, NRCS, personal communication)].

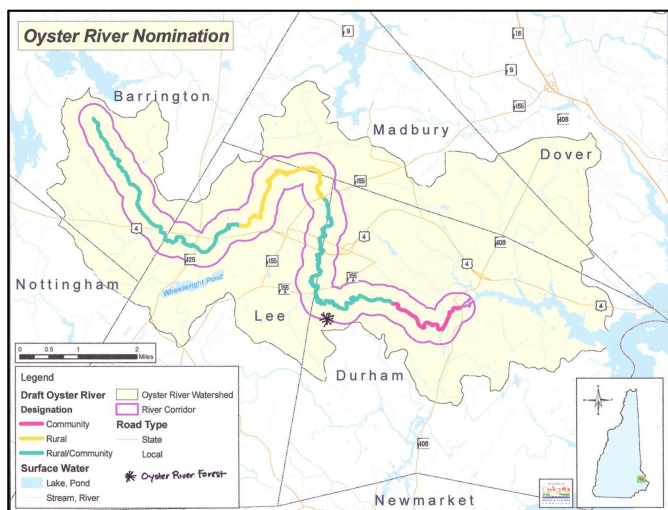
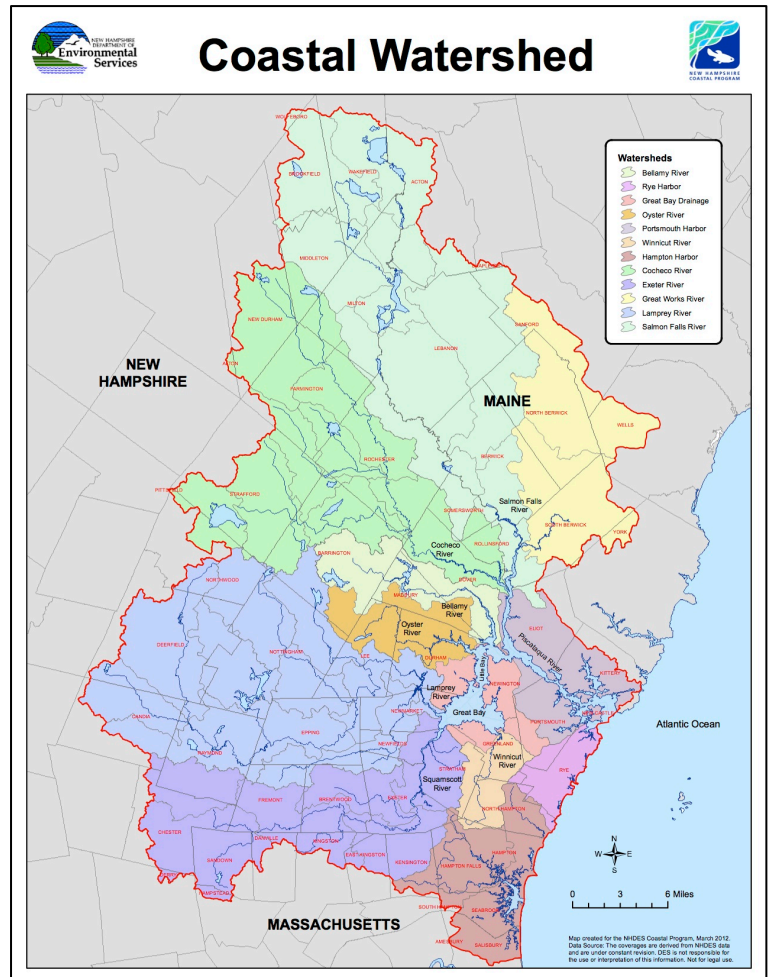
## Chapter 2 Ecological Features

### Landscape Setting

#### Oyster River Watershed

The Oyster River Forest lies mostly within the Oyster River watershed (Figures 1 and 2, Map 1-Appendix 1). The Oyster River is one of seven major rivers that flow into the nationally significant Great Bay estuary. At 19,875 acres, the Oyster River watershed is one of the smallest watersheds in the entire coastal region of New Hampshire. Portions of six towns make up the watershed: Durham (38%), Lee (24%), Madbury (17%), Barrington (15%), Dover (5%), and Nottingham (2%). Nearly half of Durham lies within the watershed.

In 2000, local volunteers formed the Oyster River Watershed Association, a 501(c)(3) nonprofit, to protect the ecological integrity and environmental quality of the watershed through community participation and involvement. The group wrote a management plan in 2001 and in 2010 nominated the entire freshwater portion of the river, stretching from the headwaters in Barrington to the Mill Pond dam in Durham, for designation in the NH Rivers Management and Protection Program (ORWA 2001, 2010).



**Figure 1.**  
Above: Location of Oyster River watershed within the Coastal Watershed of New Hampshire (Map from NH DES).

**Figure 2.**  
Left: Location of Oyster River Forest within the Oyster River watershed (Map from Oyster River Watershed Association).

## Conservation Focus Areas and Important Habitat

### ***Oyster River Forest Conservation Focus Area***

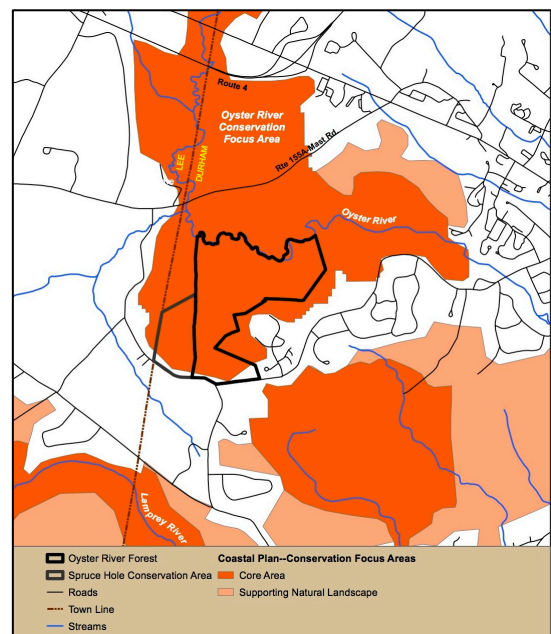
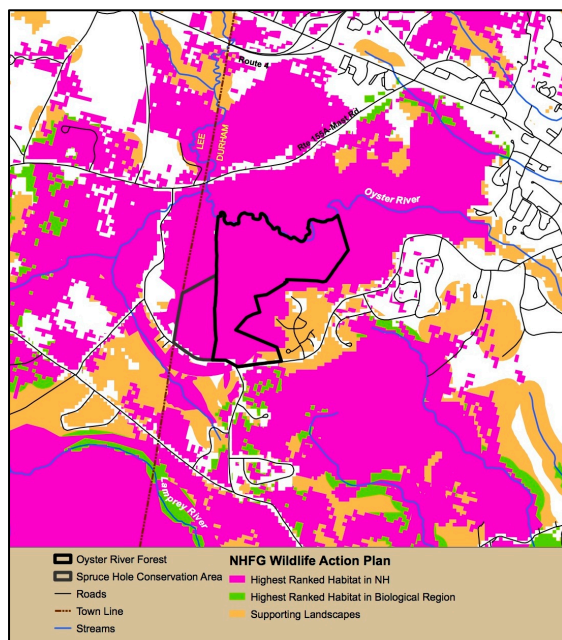
In 2006, The Nature Conservancy, Society for the Protection of New Hampshire Forests, and the Rockingham and Strafford Regional Planning Commissions published *The Land Conservation Plan for New Hampshire's Coastal Watersheds* ("The Coastal Plan") (Zankel et al. 2006). The authors identified 75 Conservation Focus Areas that comprise over 190,000 acres or 36% of the coastal watersheds that are of exceptional significance for living resources and water quality. The Oyster River Forest is core area within the Oyster River Conservation Focus Area (Figure 3).

### ***Highest Ranked Wildlife Habitat in New Hampshire***

Since wildlife don't recognize ownership or political boundaries it is useful to see how a particular property fits into the larger landscape of wildlife habitats. To identify areas of statewide importance for wildlife, the NH Fish and Game Department (NHFG) analyzed the condition of broad habitat types, based on biological, landscape, and human factors that were impacting the habitat. Biological factors included rare plant and animal species and overall biological diversity. Landscape factors included size of habitat and how close it was to other patches of that habitat. Human impact factors included density of roads around the habitat, dams, recreational use, and pollution. Different factors were used to evaluate a particular habitat. For example, hiking trails may reduce the habitat quality in alpine areas, but are likely less damaging to oak-pine forests, such as on the Oyster River Forest.

Nearly all of the Oyster River Forest falls within what the New Hampshire Fish and Game Department (NHFG) Wildlife Habitat Action Plan (NHFG 2006) identified as 'highest ranked habitat in the state.' (NHFG 2010; see Figure 3).

**Figure 3.** Below left: The Oyster River Forest in relation to "highest ranked habitat in the state" from the NH Fish and Game Department based on the Wildlife Action Plan (NHFG 2006, 2010). Below, right: In relation to the Coastal Plan's Oyster River Conservation Focus Area (Zankel et al. 2008).

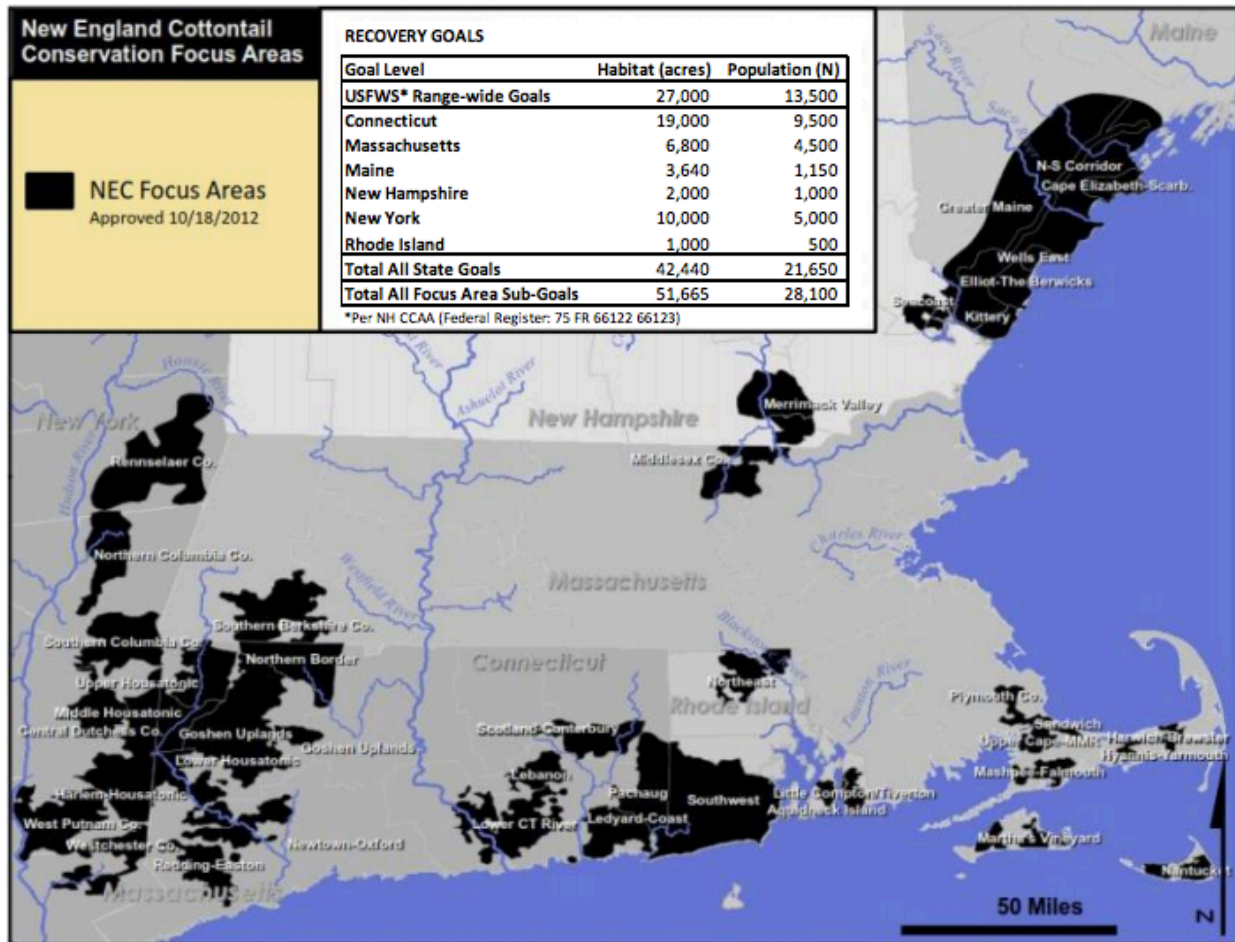


**New England Cottontail Initiative Focus Area**

The New England cottontail (*Sylvilagus transitionalis*) is a native rabbit that has declined significantly throughout its range. As recently as the 1960s, these rabbits were found throughout southern and central New Hampshire. Today, only a few remnant populations, occupying less than 25% of their historic range, remain in the state (UNH Cooperative Extension, undated).

The New England cottontail is listed as an endangered species in New Hampshire and is the focus of a range-wide partnership to restore the rabbit (<http://newenglandcottontail.org/>). This cottontail depends on dense, woody cover such as shrub thickets, shrub swamps, brushy areas near wetlands, utility and railroad corridors that are shrubby, young regenerating forests, and potentially reverting gravel pits. Unlike eastern cottontails, they do not occur on lawns, golf courses, or active farmland. Mature forests also do not provide suitable habitat as it lacks a dense understory. If you can't walk through it then it is probably good New England cottontail habitat! The Oyster River Forest is within the historic range of the New England cottontail and lies within a focus area for New England cottontail restoration (Figure 4).

**Figure 4. New England cottontail conservation focus areas in New England and New York. The Oyster River Forest lies within the Seacoast (NH) focus area (From Fuller and Tur 2012).**





### ***Neighboring Lands***

The conservation and land use status of surrounding ownerships are described here to provide a broader context in which to consider potential management objectives on the Oyster River Forest (Map 1--Appendix 1). This is especially pertinent when considering wildlife and their habitats since most wildlife species travel across ownership boundaries. In addition, aquatic species are affected by upstream land uses and any habitat restoration, management, and uses on the Oyster River Forest can in turn affect the quality of riverine habitats.

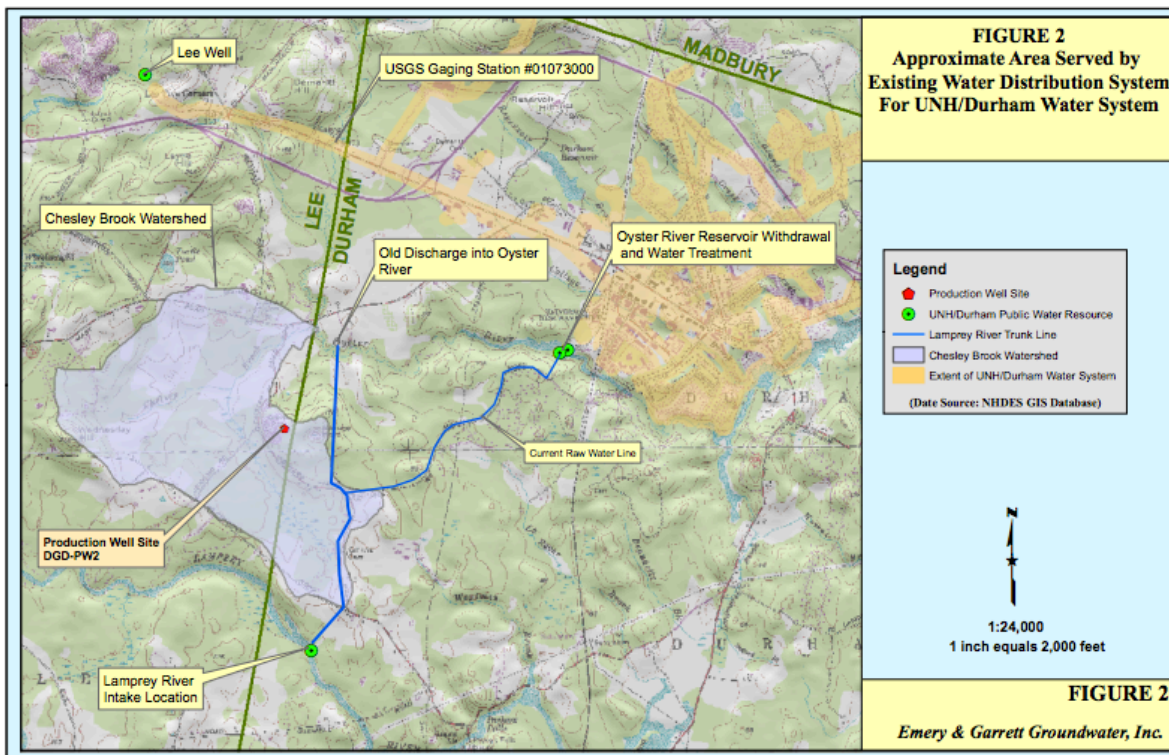
- **Spruce Hole Conservation Area** (42 acres)—The property is owned in fee by the Town of Durham and protects the Spruce Hole Bog and the Spruce Hole Aquifer. It is entirely upland woods, except for the 2.5-acre kettle hole bog, which is recognized as a National Natural Landmark by the National Park Service. A trail network leads from the Oyster River Forest to the bog. In 2010, a portion of the Spruce Hole Conservation Area was logged under the supervision of forester Charlie Moreno on behalf of the Town of Durham. A water supply line was laid in 2014, extending from the aquifer recharge land to the Oyster River Forest.
- **Packers Falls Gravel Pit/Spruce Hole Well**--Located just over the border in Lee, to the west of the Spruce Hole Conservation Area, this land was a Town of Durham sand and gravel pit and is now reclaimed as a Durham groundwater recharge site and Spruce Hole well. Water will be pumped from the Lamprey River during periods of high water and piped to this aquifer recharge site. Water from the aquifer will then be pumped into the town's water supply network.
- **College Woods** (376 acres)—This UNH-owned land is not permanently protected, but serves as an important educational and outdoor environment for the University and broader community. It lies just downstream of the Oyster River Forest and has frontage on both sides of the Oyster River. It is mostly forested with an extensive trail network.
- **Hartgerink/Lee Conservation Easement** (5 acres). These private landowners maintain a large meadow, mowed late in the season.
- **Amber Acres Conservation Easement** (39 acres)—This property is privately owned by Chet Tecce, a local farmer on Mast Road (Rte 155A) and lies across the river from the Oyster River Forest. It was permanently conserved in 2012 in conjunction with the Oyster River Forest initiative, funded by the Farm and Ranchlands Protection Program (FRPP). The Southeast Land Trust of New Hampshire (SELTNH) holds a conservation easement on Amber Acres. The Easement Deed includes a 75-foot wide Natural Riparian Buffer to be retained in natural vegetation. A 50-foot wide Public Access Corridor within the riparian buffer is open to the public for pedestrian access, including fishing, but not hunting.
- **Tecce Farmland** (62 acres)—Chet Tecce owns and manages additional farmland to the east of Amber Acres and across the river from the Oyster River Forest (Tax Map 13, Lot 6-3). Mr. Tecce manages much of this land as hayfields or as cornfields, providing diversity of habitat within the matrix of open lands along the Oyster River.

## Wellhead Protection Area and Stratified Drift Aquifers

The Oyster River Forest lies entirely within the Emeritus at Sprucewoods wellhead protection area and a small portion of the property lies within the Spruce Hole wellhead protection area. Two separate stratified drift aquifers lie beneath portions of the property. The Town of Durham was pumping water from the Lamprey River to the Oyster River for storage in the downstream Oyster River Reservoir; the water was pumped via the water pipe buried beneath a 20-foot wide easement that runs through the Oyster River Forest. The Town is in the process of installing a new wellhead on town-owned property west of Spruce Hole Conservation Area. A new water line has been laid from the wellhead and recharge sites on that property to the existing water line on the Oyster River Forest (Figure 5). The Town will pump water from the Lamprey River during periods of high water to recharge the Spruce Hole Aquifer that underlies this new wellhead (TPL 2010).

Stratified drift aquifers are composed of layers of sand and gravel deposited by glacial meltwater coming from glaciers. These layers are partially or fully saturated by groundwater. Beginning in the early 1970s, the Town of Durham sought ways to protect the unique kettle-hole bog that is located on the now conserved Spruce Hole Conservation Area. Subsequently, several studies identified the aquifer as a potential future public water supply (ORLAC 2014). Most recently, Emery & Garrett, Inc. (2012) completed a final investigation of the potential water supply prior to the Town of Durham's installation of the new production well.

**Figure 5. Location of Durham water lines that pass through the Oyster River Forest (from Emery & Garrett, Inc. 2012). A new water line now runs from the production well site to the water line on the Oyster River Forest.**



## Topography and Soils

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The Oyster River Forest has flat to rolling terrain. Elevations range from approximately 60 feet above sea level at the Oyster River on the northern boundary of the property, to approximately 170 feet on a hillside on the western edge of the property near the Spruce Hole Conservation Area. Most of the property drains north to the Oyster River. The southeast corner drains southeasterly under Mill Road toward and eventually into the Lamprey River.

Table 3 lists the individual soil types found on the Oyster River Forest; these are also depicted on Map 4 (Appendix 1). The major soil types include:

- Hollis-Charlton (HcB, HcC, HdC) = 59.5 acres (35%)
- Windsor (WdA, WdB, WdC, WfB) = 53.2 acres (31%)
- Buxton (BzB) = 28 acres (16%)
- Scantic (ScA) = 18.5 acres (10%)
- Hinckley (HaA, HaB, HbE) = 6.3 acres (4%)
- Saugatuck loamy sand (Sb) = 4.1 acres (2%)

Only 13% (22 acres) of the soils on the Oyster River Forest are considered poorly drained: **Scantic silt loam** and **Saugatuck loamy sand**. These soils are associated with the wetlands, streams, and the Oyster River. The rest of the property has well, moderately well, or excessively drained soils. **Buxton silt loam** is a prime farmland soil and underlies much of the old field at the north end of the property—the area that was historically plowed for crops and where habitat restoration is currently underway. Seasonal wetness and slow permeability are characteristics of this soil type.

The excessively drained **Windsor** soils overlay the Spruce Hole Aquifer in the southwest region of the property. Overall, 34% of the Oyster River Forest has excessively drained soils (**Windsors** and **Hinckleys**). These soils support the dry-Appalachian oak-pine forest. The excessively drained soils are also favorable for growing pine.

The **Hollis-Charlton** soils are well drained till soils that are considered IB forest soils. Hardwoods often outcompete softwoods on these sites. Mixed oaks are most prevalent on these soil types on the Oyster River Forest, along the boundary in the northwest region and in the eastern portion of the property.

**Table 3. Soils for the Oyster River Forest (USDA 2001).**

Soil Symbol	Soil Name	Slope	Parent Material	Drainage	Forest Soils	Farm Soils	Total Acres
HcB/82B	Hollis-Charlton fine sandy loams	3-8%	Till	Well drained	IB	Local importance	29.6
BzB/32B	Buxton silt loam	3-8%	Marine	Moderately well drained	IB	Prime	27.8
WdB/26B	Windsor loamy sand	3-8%	Outwash	Excessively drained	IC	Local importance	26.1
HdC/185C	Hollis-Charlton very rocky fine sandy loams	8-15%	Till	Well drained	IB	-----	25.4
ScA/33A	Scantic silt loam	0-3%	Marine	Poorly drained	IIB	Local importance	18.5
WdA/26A	Windsor loamy sand	0-3%	Outwash	Excessively drained	IC	Local importance	14.8
WdC/26C	Windsor loamy sand	8-15%	Outwash	Excessively drained	IC	-----	11.0
HaB/12B	Hinckley loamy sand	3-8%	Outwash	Excessively drained	IC	-----	5.5
HcC/82C	Hollis-Charlton fine sandy loams	8-15%	Till	Well drained	IB	Local importance	4.5
Sb/16	Saugatuck loamy sand	-----	Outwash	Poorly drained	IIB	-----	4.1
WfB/327B	Windsor loamy fine sand, clay subsoil variant	0-8%	Outwash	Well drained	IA	Prime	1.3
EaB/238B	Elmwood fine sandy loam	3-8%	Marine	Moderately well drained	IA	Prime	1.1
HaA/12A	Hinckley loamy sand	0-3%	Outwash	Excessively drained	IC	-----	0.4
HbE/212E	Hinckley gravelly loamy sand	15-60%	Outwash	Excessively drained	IIA	-----	0.4

## Wildlife and Plant Observations

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A systematic inventory of all plants and animals was not completed as part of this planning effort. However, as a result of my site visits, gleaned data from other reports, and observations from other resource professionals, I've assembled a list of plants (137 species) and animals (101) documented for the Oyster River Forest (Table 4, Appendix 10). Deer sign—tracks and pellets—was plentiful throughout the property. The reports of Kane (2008) and West Environmental, Inc. (2010) were especially helpful. I also used reports from NHFG (2013) and Emma Carcagno (wildlife biologist, personal communication). Undoubtedly there are many more species on the property than are currently documented.

**Table 4. Number of plant and animal species documented for the Oyster River Forest.**

<b>Taxa</b>	<b># Species</b>
<b>ANIMALS</b>	<b>(101)</b>
Amphibians	8
Birds	50
Fish	15
Invertebrates	14
Mammals	13
Reptiles	1
<b>PLANTS</b>	<b>(137)</b>
Trees	28
Shrubs and Vines	29
Herbaceous Plants	55
Ferns	12
Clubmosses and Horsetails	4
Sedges, Rushes, and Grasses	7
Non-Vascular	2

**Rare Species**

The New Hampshire Natural Heritage Bureau (NHNHB, Bureau) tracks rare species and exemplary natural community locations throughout the state. Appendix 9 includes a report from the NHNHB (2014) that documents the known rare plants and animals and exemplary natural communities for the Oyster River Forest and the Spruce Hole Conservation Area. Several of the records are for the Spruce Hole Bog and are historical records with current conditions uncertain or no longer supporting these elements: bog elfin, lyre-tipped spreadwing, ringed boghaunter, and netted chain fern.

As reported by NHNHB (2014), vesper sparrow and a good example of a red maple floodplain forest are documented for the Oyster River Forest. Since vesper sparrows prefer short grasslands, pastures, and hayfields, it is likely that the vesper sparrow does not occur on this property, but might occur on farmlands across the river along Mast Road. The red maple floodplain forest is described below under Wetlands and Tributaries.

**Fisheries**

The Oyster River watershed contains the only known population of state endangered American brook lamprey (*Lethenteron appendix*) in New Hampshire. The brook lamprey is a small, eel-like fish that depends on streams and rivers with cool temperatures, sand and gravel substrate for spawning, and areas of loose sand or silt for burrowing immature lamprey. In the Oyster River, brook lamprey are usually found in areas where the river channel meanders through open wetlands and wood in the stream traps fine sediments. Intact riparian habitat is essential for maintaining a healthy brook lamprey population. Stream bank vegetation provides shading, which reduces extreme temperature fluctuations, and slows erosive forces during storm events (NHFG 2014). Surveys by NHFG fisheries biologists found brook lamprey upstream in Chelsey Brook (in 2006) and at the downstream end (in 2008) of the Oyster River Forest (John Magee, NHFG, personal communication).

Wild brook trout also occur in this stretch of the Oyster River. The population is augmented by annual stocking by NHFG. For example, in May 2014, the Oyster River was stocked with 620 brook trout--480 in Durham and 140 in Lee (ORLAC 2014).

The NHFG recommends adding woody debris to some stream stretches to enhance fisheries habitat, especially brook trout. However, the impact of adding significant amounts of in-stream wood on brook lamprey is unknown. While brook lamprey do rely on “wood jams” adjacent to gravel for their preferred habitat, this type of habitat already exists as a result of beaver activity along several stretches of the Oyster River. Therefore, NHFG recommends that any woody additions be done away from known populations of brook lamprey and in reaches that are known to support brook trout (from field notes: NHFG 2013). NHFG (John Magee, NHFG Fisheries Biologist, personal communication) is investigating whether woody material should be added to the tributary (on the Oyster River Forest) that flows into the main stem.

The fish surveys by NHFG (including and two more in 2005 and 2007), revealed 15 species of fish in this region of the Oyster River. In addition to American brook lamprey and wild brook trout, three other species of conservation concern were detected: American eel, sea lamprey, and swamp darter. Other, more common, species in the river include common shiner, common white sucker, fallfish, largemouth bass, pumpkinseed sunfish, bluegill, blacknose dace, brown bullhead, eastern chain pickerel, and black crappie (John Magee, NHFG, personal communication).

## **Rivers, Wetlands, and Water**

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### **Oyster River**

In 2014, the Oyster River Local Advisory Committee (LAC) drafted the Oyster River Management Plan with the assistance of the Strafford Regional Planning Commission (SRPC and ORLAC 2014). The Local Advisory Committee was formed after the Oyster River was accepted into the NH Rivers Management and Protection Program. The Oyster River Management Plan is intended to guide river communities in protecting and managing the valuable resources of the Oyster River. The Plan “...proposes a management approach focused on protecting and conserving the rivers many resources, advocating for water quality and quantity to sustain aquatic and recreational uses, protecting riparian and aquatic habitat, and balancing the development of land and water uses for other public needs within the river corridor and watershed.” By conserving the 172-acre Oyster River Forest, including its 4,640 feet of frontage on the River (the property extends to the center-line of the river), and its section of the Spruce Hole aquifer, the Town of Durham and its partners fully endorsed this management approach.

#### ***Water Quality of the Oyster River***

The state legislature (RSA-A:8) classifies all surface waters as either Class A or Class B. Class A is the highest quality designation; these waters are considered potentially acceptable for water supply uses after adequate treatment. The Oyster River and all its tributaries from the headwaters to the Oyster River reservoir dam (downstream of the Oyster River Forest) are designated as Class A waters.

Since 2001, members of the Oyster River Watershed Association have monitored water quality in the Oyster River as part of the NH DES Volunteer River Assessment Program (VRAP). In 2014, the Watershed

Association's Water Testing Committee summarized 11 years of data from 21 monitoring sites on the main stem and tributaries (ORWA 2014). Their overall conclusion was that "the water quality at most sites on the main stem of the Oyster River and on its tributaries appeared to be unimpaired or minimally impaired by human activity."

The Oyster River Forest is bracketed by two monitoring sites: upstream at Mast Road (8-OYS) and downstream at the College Woods footbridge (7-OYS). In their report, the Water Testing Committee concluded the following: "Long-term studies of water quality should allow detection of directional decline or improvement in water quality over time. Although the mean values of specific conductance, dissolved oxygen, turbidity, pH, temperature, and most ions varied significantly over the 11 years of the study, the only variable that showed directional change was turbidity. The trend toward lower turbidity over the duration of the study should, if anything, be viewed as a positive trend."

Turbidity was lowest at upstream sites and increased progressively downstream, with the highest values of turbidity at Mast Road, the footbridge, and one other site. The Water Testing Committee noted the following: "The pattern of increased turbidity downstream probably exists for two reasons. First, discharge rates and velocity of water generally increase downstream, and greater flow means greater ability of water to carry sediment. Second, there is a change in geologic surface materials across the watershed. Upstream, west of Lee Circle, surface materials are mainly sandy outwash and till, dominated by sand and gravel, materials which are not easily moved by flowing water. East of Route 125 and downstream, there are extensive deposits of marine silt and clay. These materials are easily suspended in flowing water. Anthropogenic inputs do not seem to influence any of the main stem sites at present" (ORWA 2014).

## **Wetlands and Tributaries**

In 2010, Mark West (West Environmental, Inc. 2010) assessed the wetlands on the 172-acre Oyster River Forest. He documented 14 wetlands totaling 34 acres (20% of the property), ranging in size from 0.04 acres to 11 acres (Map 5--Appendix 1). I grouped 9 of these wetlands into four larger wetland systems based on West's report. The remaining 5 wetlands (3a, 3b, 5a, 5b, and 6) are scattered across the property and collectively total less than one acre. Most of the wetland systems are infested with invasive plants, particularly glossy buckthorn.

- **Tributary Stream Wetland System**

This combines 4 wetlands (1a, 1b, 1c, and 1d) into a **12-acre** wetland system that is associated with the unnamed tributary that flows north from the boundary with Emeritus at Sprucewoods, bisects the field then enters the Oyster River. The upper part of the wetland is a mix of emergent marsh, shrub thickets, and forested wetland. Much of the emergent marsh is now dominated by invasive reed canary grass. Six or more stems of invasive purple loosestrife are scattered throughout, while invasive glossy buckthorn grows around the edges among the native trees and shrubs.

The most common native shrubs include speckled alder, pussy willow, meadowsweet, silky dogwood, northern arrowwood, and wild raisin. A stand of broad-leaved cattail is visible along with a diverse mix of shorter wetland plants including sedges and ferns. Highbush blueberry, winterberry, witch hazel, silky dogwood, and musclewood comprise the shrub thickets. Red maple, hemlock, and white pine are the dominant trees in the forested wetland.

Speckled alder and silky dogwood are the most common shrubs bordering the tributary as it flows through the field. Invasive buckthorns and bush honeysuckles are also prevalent. The tributary carries sediment even in the upper portions that are not disturbed, as indicated by a murky color to the stream flow. Presumably sediment laden water is seeping out of the stream bank along the tributary.

- **Oyster River Floodplain System**

The wetlands along the Oyster River (2a, 2b, and 2c) total about **7 acres**. The overstory is dominated by red maple, but also includes black cherry, American elm, musclewood, shagbark hickory, and American basswood. Some of the herbaceous plants include lady fern, sensitive fern, beaked rush, white turtlehead, heart-leaved tearthumb, arrowhead, water plantain, among others. This wetland system includes red maple floodplain forest, riverside seeps, and old oxbows. Mammal tracks—especially mink, deer, beaver, and raccoon—are a common site in soft, exposed mud along the river. The NH Natural Heritage Bureau (NHNHB) identified a specific series of small patches of red maple floodplain forest as an exemplary natural community along a one-mile stretch of the Oyster River in College Woods and extending onto the Oyster River Forest (Map 5--Appendix 1) (NHNHB 2014).

- **Seepage Wetland**

This **11-acre** wetland is surrounded by a mesic Appalachian oak-hickory forest and is located in the eastern region of the Oyster River Forest. It is drained by an intermittent stream that flows into the Oyster River. Overstory and midstory trees include red maple, red oak, white ash, musclewood, and hop hornbeam. Understory shrubs are dominated by highbush blueberry, winterberry, and silky dogwood. Ground vegetation includes several ferns (intermediate wood, sensitive, royal, cinnamon), marsh horsetail, and fringed sedge, among other herbaceous plants. Kane (2008) suggested it had features resembling a red maple—black ash—swamp saxifrage swamp community.

- **Mill Road Forested Wetland**

This 3+ acre wetland is located along the southeastern boundary with the Emeritus at Sprucewoods community. An intermittent wetland drains south under Mill Road and eventually into the Lamprey River. This is the only portion of the Oyster River Forest that does not drain into the Oyster River watershed. Red maple and red oak dominate the overstory, while speckled alder, highbush blueberry, maleberry, and winterberry form the shrub layer. Ground flora include sensitive, cinnamon and royal ferns, fringed sedge, spaghnum moss, and goldthread.

The health of larger streams and water bodies (such as the Oyster River, Lamprey River, and Great Bay Estuary) is dependent on the health of smaller streams and wetlands farther up in the headwaters of a watershed. These small headwater streams often make up 80 percent of the stream network in a region and include both seasonal and year-round streams. Headwater streams may begin as trickles, seeps, or depressions that overflow and are often not named or mapped. Yet, the quality and integrity of these headwater streams is critical to downstream habitats. Water flowing from the land into the stream carries insects, leaves, soil, branches, and other material that are the start of a food chain. The upper reaches of a watershed also store water, recharge groundwater, and reduce the intensity and frequency of floods (American Rivers and the Sierra Club 2007). The wetland systems described above, therefore, are important to the health of the Oyster and Lamprey Rivers and downstream waters including the Great Bay Estuary.



## Upland Habitats

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### Woodlands

Approximately 80 percent of the Oyster River Forest is wooded (Maps 2 and 5—Appendix 1). The major, broad forest type is **Appalachian oak–pine forest**. It covers less than 10% of the state and is found mostly below 1000 feet in elevation in southern NH and along the Connecticut River in western NH. Intense development has dramatically reduced the area of this forest type, in which natural disturbance (including fire) is typically needed to create a diverse forest age structure (NHFG 2006).

Appalachian oak-pine forests typically grow on nutrient-poor, dry, sandy soils and in warm, dry climates. Some of the dominant plants in these forests are more abundant south of New England, including white oak, black oak, hickories, and pitch pine. Red oak and white pine are common in these forests, as they are in another broad forest type in this region: hemlock–beech–oak-pine forest. Oaks are more abundant on the dry or dry-mesic (moist) glacial till soils, while pines are more abundant on the dry sand plain (outwash) soils. In the absence of fire, other fire-intolerant species such as red maple, American beech, and birches (black, paper, gray) increase in abundance (Sperduto and Kimball 2011). This describes much of the woodland on the Oyster River Forest.

Among the oak and pine overstory, the most common understory plants include highbush blueberry, lowbush blueberry, black huckleberry, sweet fern, maple-leaved viburnum, and ironwood. Wintergreen is the most common herbaceous plant. Bracken fern is common on dry sites. On wetter, slightly richer upland sites, such as south of the old field/west of the tributary, the oaks and pines are mixed with a greater diversity of plants including shagbark hickory, black birch, red maple, and more diverse shrubs and herbs.

Two specific oak-pine natural community types are present on the Oyster River Forest: **dry Appalachian oak forest** and **mesic Appalachian oak-hickory forest**. Red, white and black oaks dominate the tree canopy of both community types. Hemlock is mostly absent from the dry Appalachian oak forest, which covers most of the western section of the property. Heath shrubs—such as lowbush blueberry and huckleberry—dominate the understory of the dry forest. Herbaceous plants are relatively sparse. Large (12-inch plus diameter) pitch pines (along with the oaks and white pine) are found in this community in the southern section of the property close to the main gate.

The mesic Appalachian oak-hickory forest has a more diverse canopy of oaks, shagbark hickory, white ash, white pine, birches, hemlock, maples, and beech. It occupies the eastern region of the property. Dry-site understory plants—lowbush blueberry, huckleberry, sweet fern, bracken fern—are largely absent. Instead, the understory includes witch-hazel, beaked hazelnut, maple-leaved viburnum, hophornbeam, musclewood, Canada mayflower, partridgeberry, rough-leaved ricegrass, wood anemone, trout lily, dwarf ginseng, among others (Kane 2008).

Given the latitude (in a transition zone between northern and southern forest types), slight variations in elevation and different soil types, forest types can vary and be intermixed in some areas. For example, a few pockets of **hemlock-oak-beech-pine** may be present on the Oyster River Forest. In particular in the northeast corner along the Oyster River, where hemlock is most abundant. Eastern hemlock and American beech are the dominant late successional species in these forests (Sperduto and Kimball

2011). However, early and mid-successional species, including red oak, white pine, and red maple, are often common, a result of past land uses including logging and farming.

The forest immediately to the east of the old field at the north end of the property includes a stand of old pasture pine. The understory is nearly barren, except for an emerging stand of invasive glossy buckthorn. The presence of large, gnarly pine, a clear understory, and remnants of eastern red cedars (“junipers”) are all indications that this area was once pasture in the not too distant past. A rusting disk harrow rests beneath a large red maple near the field edge, left as another reminder of the agricultural past of this land.

### **Early Successional Habitat: Fields, Shrub Thickets, Young Forest**

*Early successional habitat* includes fields, shrub thickets, young forest, and other openings such as reverting gravel pits. This habitat is by its nature dynamic and transitional. The proportion of the landscape in an early successional stage varies over time depending on natural and human disturbances. In the heavily developed southeast corner of New Hampshire land use changes and development have greatly limited the amount of this habitat in the landscape as well as the ability of natural disturbances and human management to create and maintain such habitat conditions. The Oyster River Forest has 20-30 acres of old field at the north end of the property. This area was last farmed 15 to 20 years ago and has been fallow since then. It now supports native plants such as common milkweed, goldenrods and asters, grasses, and clumps of raspberries, blackberries, and dogwoods. However, large invasive shrubs—common and glossy buckthorn, multiflora rose, bush honeysuckles, bittersweet—came to dominate much of the field.

This old field habitat within the larger matrix of undeveloped land along the Oyster River was identified as a potential site for New England cottontail habitat restoration. This rabbit is listed as a state endangered species, and although it is not known to occur on the property, it is within its historic range and the property is a good candidate for future reintroduction efforts. The Natural Resources Conservation Service (NRCS) is funding habitat restoration here, including removal of the invasive shrubs, which is described in more detail below.

#### ***New England Cottontail***

The New England cottontail relies on shrub thickets and young forest for food and cover. Preferred food includes bark, twigs, leaves, fresh fruits, buds, flowers, grasses, rushes, and sedges. In spring and early summer they eat the tender shoots of grasses and herbs; later they shift to fruits, and then to a winter diet of bark, twigs, and buds. Some of their preferred foods include raspberry, blackberry, highbush blueberry, and willow (see Figure 6 for a complete list).

New England cottontails are extremely susceptible to predation from coyotes and foxes, as well as fisher, weasel, domestic cats, owls, and hawks. The cottontail does not survive well in small patches of habitat (less than 6 acres) and does much better in patches of 25 acres or larger (Arbuthnot 2008). The goal for habitat restoration at the Oyster River Forest is to create a 25-30 acre block of suitable habitat that includes a mix of shrub thickets, herbaceous patches, and young forest.

**Figure 6. Preferred foods of New England cottontail (Arbuthnot 2008).**

<b>Preferred Foods of the New England Cottontail</b> (from Arbuthnot 2008)		
<u>Shrubs &amp; Vines</u>	<u>Herbs &amp; Grasses</u>	<u>Trees</u>
raspberry	goldenrod	red maple
blackberry	rushes	aspen
dewberry	clovers	gray birch
winterberry	lance leaf plantain	apple
willow	chickweed	choke cherry
maleberry	sheep sorrel	black cherry
highbush blueberry	wintergreen	sugar maple
lowbush blueberry	buttercup	oaks
silky dogwood	wild strawberry	white birch
native roses	cinquefoil	yellow birch
spiraea	violet	black birch
chokeberry		beech
sumac		striped maple
greenbriar		

## Habitat Restoration

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In summer 2014, in partnership with NRCS, the Town of Durham began to enhance the habitat for New England cottontail on the Oyster River Forest. This management—with an emphasis on controlling invasive plants and replanting with native shrubs--will benefit many other wildlife species, especially birds that depend on this same habitat. These include eastern towhee, American woodcock, chestnut-sided warbler, prairie warbler, blue-winged warbler, black racers, and many pollinating bees and other insects. This work is also improving the trails that run through this region of the property, to create better recreational opportunities for hiking, running, nature viewing, x-country skiing, snowshoeing, and fishing.

The following restoration efforts were implemented in 2014:

### Wild Parsnip Removal

Ibis Wildlife Consulting discovered a large stand of invasive wild parsnip on July 30, 2014 on the Oyster River Forest while conducting fieldwork for this Plan for the Town of Durham. Since this was an early detection of a species not known to occur in this region and due to its potentially caustic nature (the plant sap can cause severe burns in presence of sunlight), we initiated a rapid response to control the plant with the support of the Town of Durham and NRCS. A rapid response was also needed since the plant was discovered late in the growing season, when some of the plants were beginning to produce seed.

Ellen Snyder worked with consultant/specialist Mike Bald (Got Weeds?) from Vermont to hand pull all visible second year plants on approximately 2.3 acres in the northeast corner of the east field (see Map 5—Appendix 1). Together they hand pulled 3,741 2nd year wild parsnip plants; this plant is a biennial,

producing flowers and seeds in year two. A smaller second population of about 40 plants was discovered and also pulled, in the southeast area of the west field.

A manual treatment approach (rather than herbicide) was deemed the best control option, given cost, density and distribution of the parsnip among many native field plants, proximity to the Oyster River, Mike Bald's expertise with hand-pulling parsnip, and the ability to respond quickly in the face of an impending seed rain. This population of wild parsnip has likely existed on the property for several years undetected. It will require several more years of similar control work to exhaust the soil seed bank.

The parsnip was piled onsite in existing "hot spots" with all seed heads directed in toward the center of the pile. Three hotspot piles were created. One pile included use of pallets under the pile to allow for air-drying of the plant material. Of the remaining two piles, one was covered with an 8' x 10' green tarp to prevent high winds and animal traffic from dispersing any potentially viable seed. The viability of seed on pulled plants was and remains an unknown. Wild parsnip phenology covers a wide timeframe; from late June into September some plants are already mature while others are just beginning to flower. One additional densely infested area was solarized with clear 4-mil plastic; solarization is an experimental technique that seeks to destroy seeds in the soil, effectively accomplishing five years of work in sixty days. The solarizing pad covered an area of approximately 10 by 25 feet.

The site presented some difficult working conditions including the maturity of the plants (many plants 6-7' tall and some seed heads were drying out, requiring careful pulling and piling to avoid spreading seed), density and distribution of the population, some plants growing among thorny multiflora rose or blackberries, and presence of ground-nesting bees and wasps.

### **Invasive Shrub Removal and Native Shrub Planting**

A tributary that flows north into the Oyster River bisects the old field. The west side of the field ("West Field") is approximately 8.5 acres, while the east side ("East Field") is approximately 11.5 acres. The entire 20 acres of field is targeted for habitat restoration to benefit New England cottontail and other shrub-dependent wildlife. The goal is to remove the existing large invasive shrubs that are growing throughout the 20 acres and replant with native shrubs. This work was begun in fall 2014, with the following efforts:

#### ***Invasive Shrub Removal***

Forest Savers of Woodstock, Vermont (Gerry Hawkes and John Dumas) was hired to grub out, grind up, and mulch the large, invasive shrubs in the 8.5-acre West Field. They spent one week uprooting the invasive shrubs and shredding the vegetation, preparing the site for native shrub planting. Prior to the shrub removal, Ibis Wildlife Consulting flagged patches of native plants—milkweed, raspberries, dogwoods—to be left unmowed and coordinated a 3-hour workday with volunteers to hand pull additional invasive plants, remove flagging around no mow areas, and map patches of retained native plants.

A similar approach to removing invasive shrubs in the 11.5-acre East Field was initiated on December 1, 2014 by Forest Savers, but the site conditions were completely different and soils were not conducive to operating heavy equipment and uprooting shrubs as the ground had turned very soft. Forest Savers and Ibis Wildlife Consulting concluded that future invasive species control in the East Field and along the Oyster River and tributary should not involve uprooting given the site conditions. And any work to remove invasive plants in the riparian areas should be done by hand with no heavy equipment. Forest Savers used the existing crossing to reach the East Field and that proved undesirable as the approaches

to the tributary were soft and it seems extremely easy, in any condition, to create ruts. The tributary/stream bottom is actually quite solid. One crossing with heavy equipment was too many, multiple crossings would be untenable, based on the experience of Forest Savers when they attempted to cross and work in the East Field. The operation was halted on the first morning and the equipment removed with some difficulty given very wet and muddy conditions. A further recommendation by Forest Savers based on the sensitivity of the soils and site at the existing crossing, is that this leg of the trail be closed and a new bridge crossing be constructed at the south end of the fields.

### ***Native Shrub Planting***

Cameron's of Farmington, NH brought in a crew to plant 2,400 native shrubs a month after the invasive shrub control was completed in the West Field by Forest Savers. A similar planting plan is intended for the East Field, once the invasive shrubs are removed. On two different days Cameron's crew planted the following shrubs that were grown in one-gallon containers purchased from a nursery. Two men operated a mechanized auger, digging 2,400 holes for the planting crew of eight.

Planted October 6, 2014 by AJ Cameron Sod Farms, Inc., Farmington, NH

- 300 highbush blueberry
- 300 chokeberry
- 100 spiraea
- 200 raspberry
- 100 aspen
- 100 witch-hazel
- 100 hazelnut

Planted October 9, 2014 by AJ Cameron Sod Farms, Inc., Farmington, NH

- 200 American hazelnut
- 100 American elderberry
- 100 arrowwood viburnum
- 100 winterberry
- 100 pussy willow
- 300 highbush blueberry
- 100 buttonbush
- 200 witch-hazel

### **Wildlife Habitat Features**

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Wildlife need food, water, cover, and space to live and reproduce--collectively known as their *habitat*. Each species has unique habitat requirements, and the presence of a given species in an area varies depending on the availability of the habitat that they depend on. Wildlife *food resources* include aquatic and upland plants, fruits, seeds and nuts, insects and other animals, and nectar. All wildlife require *water*, almost daily, yet aquatic organisms clearly depend on it more than upland species. *Cover*

provides protection from weather and predators and sites for nesting, resting, travel, and other activities.

The juxtaposition of food, water, and cover determines the wildlife community that occurs in a given area. The ability of wide-ranging animals to move across the landscape—known as wildlife connectivity—is also important. As part of one of a large unfragmented block of land in coastal New Hampshire, the Oyster River Forest and surrounding lands provide opportunities for wide-ranging wildlife to travel across the landscape to forage, to disperse, and to find mates. This includes species that we might not expect to endure in this developing landscape, such as moose, black bear, bobcat, and fisher. These are some of the forest-dependent species that often travel long distances during the course of a year and possibly occur on this property at least sometime during the year.

Wildlife species diversity and abundance in a given area is often dependent on elements of *habitat structure* such as horizontal and vertical habitat diversity; the presence of cavities, other nest trees, and woody debris; and the variety of food resources. These habitat features are described below in the context of the Oyster River Forest.

#### ***Horizontal vegetation diversity***

This refers to the horizontal arrangement of different plant communities (including type and age) in a given area. Areas with aquatic habitats and non-forest habitats such as fields, as well as forest, are more horizontally diverse than an area that is just forested. A 100-acre forest that has a mix of tree ages that includes herbaceous openings, young forest, saplings, mature trees, and old trees is more diverse than a 100-acre forest with just sapling and pole-sized trees. A wetland or river that has zones of open water, emergent marsh, shrub thicket, and tall trees is more horizontally diverse than an open-water pond edged by mowed lawn.

The Oyster River Forest supports a diverse mix of habitat types—oak-pine forest, oak-hickory woodland, old field, shrub and forested wetlands, riverine and riparian habitat, woods roads and trails—and thus a diverse horizontal structure that is beneficial to wildlife. Woods roads and trails are not typically thought of as habitat; however, many animals take advantage of these linear corridors for travel and foraging.

#### ***Vertical vegetation diversity***

Vertical diversity refers to the extent of layering within a forest or other habitat. Layering within a forest includes the arrangement of ground cover (lichens, moss, ferns, herbaceous plants), vines and shrubs, and trees (including sizes and ages). More vertical layers create a greater diversity of habitat, which typically supports more wildlife diversity. These layers provide cover from predators, nest and den sites, foraging surfaces, food sources, shade, and more. Vertebrate wildlife, especially birds, typically respond more to vegetation structure than to the presence of specific plant species. Vertical and horizontal structure that is varied, lush, and “messy” is a boon to wildlife. Forests with little ground cover, dead wood, shrubs, and understory have fewer wildlife species.

Natural (storms, fire, wind) and human disturbances (e.g., logging) often result in greater vertical vegetation diversity as new growth emerges in sunlight and forms a dense understory. This is the goal of the habitat management cottontail: to create a dense thicket of shrubs and young forest, which they require for food and cover.

***Cavity trees (live and dead and dying) and other nest trees***

More than two-dozen birds and mammals depend on tree cavities for nesting, roosting, or denning. One species, the brown creeper, nests under the loose bark on standing dead or dying trees and some bats roost beneath loose bark. These species require a range of cavity tree size classes and rely on a mix of dead or partially dead standing trees (called “snags”) as well as live trees with cavities. In addition, a mix of softwood and hardwood cavity trees will benefit more species. In addition, artificial nest boxes (such as those in the fields) can augment the naturally-occurring cavities.

Woodpeckers, chickadees, and nuthatches are primary excavators (i.e., they make the holes), while others use existing holes. Some species require large trees for nesting. These include broad-winged hawk, red-tailed hawk, and barred owl. Typically these large hawks and owls require large trees with three-pronged branching where they can build a large stick nest. Exposed perches along forest and wetland edges are important to some wildlife species including flycatchers and hawks.

Typical cavity tree sizes (in diameter at breast height or dbh) required by various wildlife species are listed below (Bennett 2010). All of these species do occur or are likely to occur on the Oyster River Forest.

<u>6-8”</u>	<u>6-12”</u>	<u>12-18”</u>
black-capped chickadee	brown creeper	great-crested flycatcher
downy woodpecker	hairy woodpecker	northern flicker
Eastern bluebird	red-breasted nuthatch	
tufted titmouse	white-breasted nuthatch	
winter wren	yellow-bellied sapsucker	
	northern flying squirrel	
<u>&gt;18”</u>	<u>&gt;24”</u>	
barred owl	big brown bat	
fisher	black bear	
gray squirrel	gray fox	
porcupine	little brown bat	
long-tailed weasel	raccoon	
pileated woodpecker		

Given past land uses, including logging and farming, many of our forests have a shortage of large, old trees (> 24” dbh). Much, if not all, of the Oyster River Forest was pastured or logged, in some places within the last 10 years, so there are few large trees. Some of the biggest oaks and hickories are located along the northwest boundary.

***Dead and down woody material***

Dead and down woody material (often called “coarse woody debris”) on the forest floor is important for many reasons. Woody material in various stages of decay includes logs, stumps, branches, upturned roots, and tree falls. These provide wildlife habitat, serve as nurse logs for regenerating plants, and contribute to nutrient cycling. As with cavity trees, the larger the fallen log or stump the greater the biological diversity. Decaying wood supports many insects and other invertebrates, which are food sources for shrews, woodpeckers, and black bears. Snakes, fisher, and weasels hunt among the woody debris. Many species including mice, voles, salamanders, snakes, chipmunks, red squirrels, weasels, and black bear use coarse woody debris for cover, den sites, or escape areas. The winter wren nests in

upturned tree roots. Mosses, fungi, and lichens are often associated with decaying wood. Fallen logs and other woody debris are also important in aquatic environments. Turtles, mink, otter, and waterfowl bask on this wood, and fish find cover in woody debris.

In places, the Oyster River Forest has retained or accumulated coarse woody debris, either left behind as part of a logging job or blown down in a storm. Any future forest management should continue to retain this throughout the property.

### ***Hard and soft mast and other food resources***

The availability of food resources for wildlife is a key component of their habitat needs, and often varies seasonally. Breeding birds depend on a flush of insects to feed their young nestlings, while later in summer and into fall and winter they switch to berries, nuts, and seeds. Deer, moose, and other browsers rely on herbaceous vegetation during the growing season and woody growth in winter. Other mammals such as coyote, fox, and fisher prey on other animals as well as eating fruits when available. Seeds are favorites of squirrels, nuthatches, mice, and voles.

Fruits, nuts, and seeds from woody plants that are food for wildlife are collectively known as “mast.” *Hard mast* includes the array of nuts and seeds, which are typically high in fat, carbohydrates, and protein, a food source that is both high in energy content and available into the winter. *Soft mast* includes fruits and berries such as cherries, raspberries, blueberries, winterberry, grapes, apples, and the fleshy fruits of other trees, shrubs, and vines. Soft mast is more perishable and is often high in sugar, vitamins, and carbohydrates. These fruits are a source of moisture for wildlife during drought years, and are a crucial energy source for some migrating songbirds.

A diversity of hard and soft mast producing trees, shrubs, and vines is important. Different mast species are available at different times of year, which is critical to wildlife. Also, some species, such as oak, only produce heavy acorn crops every 3-5 years or more, and this varies among oak species. Seed production varies with age as well. For example, peak acorn production for red oak occurs when the trees are 19-22 inches in diameter at breast height (dbh), while white oak acorn production peaks when the trees are bigger, about 26 inches in dbh.

The major hard mast sources on the Oyster River Forest are: acorns of red, white and black oaks, shagbark hickory nuts, hazelnuts, catkins of birches and alders, and the seeds of white pine, hemlock, and hardwoods (e.g., maples, ash). The conifer seeds are a boon to squirrels, grouse, chickadees, and grosbeaks. The catkins of birches (yellow, paper, and gray), aspens, hop hornbeam, and alders are used by many birds, especially ruffed grouse.

The fruit-bearing vines and shrubs, including the newly planted shrubs in the old field, are an important source of soft mast. These include high and lowbush blueberries, raspberries, blackberries, winterberry, maleberry, elderberry, grapes, dogwoods, viburnums, and chokeberry. The open lands also support herbaceous plants, including goldenrods, asters, and milkweed, that are important seed producers or food for pollinators. These openings are also critical insect sources for birds that are feeding nestlings and fledglings. Deer graze in grassy openings, while turkeys and grouse will bring their broods into these openings. Swallows, bluebirds, killdeers, hawks, and other birds forage in or over these clearings.



## Environmental Health

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Environmental health, or *ecological integrity*, can be measured in several ways, such as the quality and quantity of surface waters, degree of erosion and runoff, amount of impervious surface, quality of air, and presence of forest pests or invasive species. Some environmental stressors, such as mercury deposition, air pollution, extreme weather events, and climate change, are large in geographic scope and largely outside the influence of land stewardship decisions on individual ownerships.

### **Phase I Environmental Site Assessment**

JLB Partners, a previous owner of the Sprucewoods parcel, engaged R.W. Gillespie & Associates, Inc. to conduct a Phase I Environmental Site Assessment of 55 acres that now comprise a portion of the Oyster River Forest. The purpose of the assessment was to investigate the possibility of negative environmental impacts within the parcel due to current or previous site uses and activities. They found no record of previous development on the 55 acres or on the larger Sprucewoods and Tecce parcels. Nor did they find any direct evidence of environmental impacts from petroleum or hazardous materials (R.W. Gillespie & Associates, Inc. 2008). To my knowledge, no further environmental site assessments were conducted for the Oyster River Forest.

### **Erosion**

Given the relative level terrain across much of the property, it is unsurprising that there is little erosion on the Oyster River Forest. The places where erosion and rutting are an issue is in the old field, the tributary crossing, and along the trail in the northeast region of the property.

Before locked gates were erected on the property, someone drove a truck out through the field and across the tributary when the ground was soft, leaving deep ruts. Forest Savers smoothed out some of these ruts in the West Field, as part of the invasive shrub removal. However, during the attempted invasive plant removal in early December, some new disturbance occurred that Forest Savers plans to repair with handwork and seeding. Given the soil conditions on the approaches to the tributary crossing, it is easy to create erosive conditions there if care is not taken. Recommendations in Chapter 4 suggest closing this access across the tributary with a new crossing created farther upstream, at the south end of the fields.

The trail that extends from the East Field to College Woods is more undulating and has several sections that require short re-routes, a small bridge, or bog bridging to fix some erosion issues. These trail improvements are discussed in more detail in Chapter 4.

### **Invasive Plants**

The State of New Hampshire defines an “invasive species” as, *a naturalized, non-native plant taxon (species, subspecies, variety, form or cultivars) that invades native plant communities and proliferates, out-competes native species, disrupts ecological processes by threatening imperiled species and decreasing biological diversity. In addition, invasive species can also include plants, insects or fungi that cause economic harm to agricultural and forests crops or pose a serious health hazard.* In essence, it is

any non-native plant, whose introduction causes or is likely to cause economic or environmental harm or harm to human health (NHDA 2006).

Invasive species typically have certain traits that give them an advantage over most native species. These traits include producing many offspring, early and rapid development, and being adaptable and highly tolerant of many environmental conditions. Studies show that invasives can reduce natural diversity, impact endangered or threatened species, diminish wildlife habitat, affect water quality, stress and reduce forest and crop production, damage personal property, and cause health problems.

Humans and wildlife often unintentionally transport invasive plants. Many were planted purposefully in the past for wildlife, erosion control, or as landscape plantings, before it was commonly known about their invasive qualities. Others came in via international commerce. Many invasive plants appear first in disturbed areas such as along roadsides and trails, in gravel pits, or edges of fields. They can be moved along roadways by plowing, mowing, roadwork, landscaping, as well as by animals.

The New Hampshire Invasive Species Act states that “no person shall knowingly collect, transport, sell, distribute, propagate or transplant any living or viable portion of any listed prohibited invasive plant species including all of their cultivars, varieties, and specified hybrids.” For more information on New Hampshire’s invasive species program see [http://www.nh.gov/agric/divisions/plant\\_industry/plants\\_insects.htm](http://www.nh.gov/agric/divisions/plant_industry/plants_insects.htm) and [http://www.nh.gov/agric/divisions/plant\\_industry/documents/booklet.pdf](http://www.nh.gov/agric/divisions/plant_industry/documents/booklet.pdf).

As noted earlier, Invasive plants, especially a suite of shrubs and vines are prevalent in the old field, in riparian areas, and in some recently disturbed areas such as the logged forest in the south-central region of property. Table 5 lists the invasive plants documented on the Oyster River Forest. All but black locust, reed canary grass, and wild parsnip are on the NH prohibited list of species. Black locust and reed canary grass are “restricted” species, such that there is no regulation yet against selling, but they are still considered problem species. Wild parsnip is not listed in NH, but in some states it is considered a noxious weed because of its caustic nature.

**Table 5. Non-native invasive plants found on the Oyster River Forest.**

<b>Common Name</b>	<b>Scientific Name</b>
Autumn olive	<i>Elaeagnus umbellate</i>
Black locust	<i>Robinia pseudoacacia</i>
Burning bush	<i>Euonymous alatus</i>
Bush honeysuckles	<i>Lonicera spp.</i>
Common buckthorn	<i>Rhamnus cathartica</i>
Glossy buckthorn	<i>Frangula alnus</i>
Japanese barberry	<i>Berberis thunbergii</i>
Multiflora rose	<i>Rosa multiflora</i>
Norway maple	<i>Acer platanoides</i>
Oriental bittersweet	<i>Celastrus orbiculata</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Wild parsnip	<i>Pastinaca sativa</i>

## **Chapter 3 Cultural Features**

### **Parking and Access**

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The main access point into the Oyster River Forest is at the main gate on Packers Falls Road. A gravel parking area allows for about 6 cars to be parked without blocking the gate. A kiosk with map of the property is situated just inside the gate. The gate is locked to control access; motorized access is limited to vehicles used primarily for management and related activities. Another small gravel pull-off is located just east, between the main gate and Mill Road. A few hundred yards to the west is another woods gate, but parking is not available there. The service road that leads to the Emeritus at Sprucewoods community has a locked gate on their property. This is an emergency access and is not intended as a public access point into the Oyster River Forest. As such, there is no parking at that location (Map 5—Appendix 1).

### **Woods Roads and Trails**

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A woods road extends north from the parking area on Packers Falls Road to the fields that border the Oyster River. This road continues through the West Field, turns east and crosses the tributary. It peters out, but an informal path continues easterly to the woods. It continues as a footpath to College Woods. Another woods road and farm gate are located just west of the main access point on Packers Falls Road. This woods road leads to the Spruce Hole Bog, although a section was disturbed when the new water line was laid in 2014.

Trails from the Oyster River Forest lead to the Wiggin Cemetery and into the Spruce Hole Conservation Area and the Spruce Hole Bog. A new water line leads west through the Spruce Hole Conservation Area to Durham's new well and aquifer recharge area. A portion of this water line could be converted into a universally accessible walking trail as described in Chapter 4.

Visitors to the Oyster River Forest can also enter on foot or mountain bike from College Woods at the property's northeast corner.

### **Cultural/Historical Features**

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There are no known structures on the Oyster River Forest. An old foundation is located in the southeast corner of the property and is now overgrown with trees and invasive shrubs. The old Wiggin/Tuttle Cemetery is located off the west side of the main woods road not far from the main entrance off Packers Falls Road. A 580-square area that encompasses the cemetery is excluded from the property and conservation easement (Map 5—Appendix 1).

Stonewalls form some of the property boundaries. A rusting farmer's disk, the overgrown field, and the presence of pasture pines and eastern red cedars in the woodland east of the field is a nod to the property's agricultural past.

The Oyster River watershed plan (ORLAC 2014) notes the presence of an old mill in the river, located in the northeast corner of the Oyster River Forest.

The Town of Durham maintains water supply infrastructure that is partly on the Oyster River Forest. This includes an old line that runs under the woods/field road from Packers Falls Road to the Oyster River and the new water line that runs from the new Durham well to the Oyster River Forest. There are several monitoring wells, including at least one on the Oyster River Forest at the north end of the old field.

The boundaries of the Oyster River Forest are well-marked by stonewalls, the Oyster River, or roads. In addition, the entire property boundary is marked by green signs that say: "NRCS conservation easement boundary" and "Town of Durham."

## Chapter 4 Wildlife Habitat and Land Stewardship Recommendations

### Land Stewardship Objectives

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The purpose of this Wildlife Habitat and Land Stewardship Plan was to assess the soils, topography, plants, animals, habitats, wetlands, cultural features, environmental health, and landscape setting of the property as a means of guiding the stewardship activities on the property.

The Oyster River Forest was conserved with many partners including the Natural Resources Conservation Service that holds conservation easements on the property, and the Land and Community Heritage Investment Program (LCHIP) and the NH Department of Environmental Services that hold some Executory Interest in the Oyster River Forest. Perhaps most importantly, the community of Durham contributed significant public and private funds to ensure that this land remain undeveloped and open to the public.

A review of the fundraising documents, the easement deeds, and project agreements that led to the permanent protection of the Oyster River Forest provides some guidance on how to manage the property. From these guiding documents the following primary land stewardship objectives were developed:

- To protect water quality, including the surface water in the Oyster River, tributaries and associated wetlands and the groundwater that contributes to the town's aquifer recharge area and drinking water well.
- To protect important fish and wildlife habitat, particularly for the New England cottontail, a state endangered species and a focus of habitat restoration.
- To enhance and maintain public access for low impact recreational uses such as walking, running, fishing, x-country skiing, and snowshoeing.

The following stewardship recommendations were developed to meet the stewardship objectives listed above based on the site capabilities and existing conditions of the Oyster River Forest.

### General Stewardship and Monitoring

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These recommendations are also summarized in Table 6.

- Work with the NRCS to write a Compatible Use Agreement (CUA), a requirement under the Wetlands Reserve Program Easement. Appendix 8 has sample materials. The CUA relates to any management activities on the property: forest management, invasive species control, trail maintenance, habitat management, etc.

- When possible, participate in the easement monitoring walks held by the Natural Resources Conservation Service, the agency responsible for monitoring the easements.
- Provide a letter from Town Administrator to NRCS that gives NRCS permission to share the easement monitoring reports annually with LCHIP. The LCHIP Project Agreement with the Town requires that a copy of the annual easement monitoring report be provided to LCHIP.
- Periodically walk the property boundaries to maintain boundary signs, to assess stewardship needs such as invasive plant control, and ensure good relations with neighbors.
- Include in informational signs, promotional materials, and kiosk the following statement: *“The Oyster River Forest was protected with assistance from the NH Land and Community Heritage Investment Program,”* per the LCHIP Project Agreement.
- Update the map of the property on the kiosk. Include both the Oyster River Forest (note boundary on existing map is not accurate—missing northwest corner near Oyster River) and Spruce Hole Conservation Area. Show trails and key features (e.g., bog monument, Wiggin cemetery, old foundation, old mill site).
- Update information about the Oyster River Forest on the town website including copy of Stewardship Plan, maps, and related documents.
- Consider hosting a biothon or “bioblitz” where resource professionals and lay people are invited to spend part of a day scouring the property to record all plants and animals (from spiders to mosses to other organisms, large and small) that are encountered. These are fun, educational, and informative events.
- Continue to engage community members and other volunteers in stewardship of the property that can include trail monitoring, sign maintenance, invasive control, and other volunteer workdays.
- Contact the Emeritus at Sprucewoods to assess the interest among community members for a trail kiosk, universally accessible trail, and to alert them to any major management changes on the Oyster River Forest.
- Add small, appropriate signs that direct visitors to key features: Wiggin Cemetery, Old Foundation (if trail is made), Spruce Hole Bog.

## **Parking, Trails, and Public Uses**

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 (See Map 6—Appendix 1 and Table 7)

### **Parking**

- Improve parking area at main gate: add gravel and level the site to allow for angle parking on each side of the gate and to enable universal access (i.e., ADA specifications) if such a trail is developed.

- Consider adding large rocks or more metal posts to reduce opening around the gate; currently some motorized vehicles can get around the gate.
- Consider adding some signs in front of the locked gate, such as “No motorized vehicles,” “Please don’t block the gate.”

## Trails

- Continue to enhance and maintain a trail network that connects to the Spruce Hole Bog Conservation Area to the west and College Woods to the east.
- Seek grants to help with trail improvements. A group of volunteers from the community is submitting a proposal in November 2014 to the State Bureau of Trails for a grant to work with the Student Conservation Association and UNH Woodlands Office to:
  - Create a new trail from the woods road, across the tributary, through the east field and into the old pasture woodland.
  - Install a bridge to cross the tributary at the south end of the field. Note: If the crossing at the north end of the field is closed, then this crossing should be evaluated to accommodate bigger machinery such as a mower and tractor. For example, the Forest Savers tractor weighs 8000 pounds (4 ton) and needs an 8-foot bridge width.
  - Re-route or otherwise enhance a few sections of trail that are eroding in the northeast corner of the property along the Oyster River.
- Consider developing a universally accessible trail (ADA specifications) and seek grant funding and build support among neighbors and community members. The following potential ADA trails are recommend for further study:
  - From the main gate to the Spruce Hole Bog.
  - Consider running another universally accessible trail from the main gate to the old foundation in the southeast corner. This would wind through a lovely stand of pitch pine.
  - Enhance parking area to meet ADA specifications.
  - Contact Emeritus at Sprucewoods to assess their interest in a potential universally accessible trail along the Service Road from their community into the Oyster River Forest.
- In collaboration with NRCS, consider closing the trail that crosses the tributary at the north end of the field. This crossing is near the main stem of the Oyster River and during high water the potential for erosion and sedimentation is high from people walking or biking through the stream. To install a suitable bridge across the tributary at that location will require a large span and might be very costly. In addition, the stream bank may not be stable enough to install bridge abutments or other stabilizes without causing even more disturbance during installation. Under dry conditions this location may appear bone dry, but at other times it becomes soft. Maintaining a trail there with repeated travel across that stretch of field and tributary may create some ongoing sedimentation issues.

## Public Uses

- Consider changes to the town ordinance regarding hunting on town lands. The LCHIP Project Agreement requires that hunting be allowed on lands conserved with LCHIP funds. The Oyster River Forest and the Spruce Hole Conservation Area are conducive to hunting given the relatively rural nature of the area. Hunting supports a traditional recreational activity, encourages use of local food, and helps control the deer population, thereby limiting the amount of deer browsing, which protects regenerating forests, woodland wildflowers, and shrub growth. The town might consider certain provisions such as no deer stands or no permanent deer stands, no baiting. In addition, NH Fish and Game works with towns to allow limitations on certain types of firearms (see <http://www.eregulations.com/newhampshire/hunting/deer-hunting/>). If a change is made to allow hunting, erect signs at key entrant points alerting visitors to hunting seasons.
- Include information on the kiosk and trail maps that inform visitors of allowed public uses on trails: walking, snowshoeing, x-country skiing, mountain biking, but no motorized vehicles except for management purposes. No camping or fires. Decide if snowmobiling and horseback riding are allowed uses.

## Habitat Restoration

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One of the huge benefits of having the NRCS as a funding partner in the acquisition and permanent protection of the Oyster River Forest through their Wetlands Reserve Program is that they also have funds for habitat restoration. The goal of the habitat restoration funded by NRCS on this property is primarily to restore and protect wetlands and to create habitat for the New England cottontail.

As described in Chapter 2, some of this restoration is already underway and will continue for several years. Specifically, the following activities will continue into 2015-2016, and perhaps beyond, and continued funding by NRCS is anticipated:

### ➤ **Old Field Management and New England Cottontail Habitat:**

- Wild parsnip control: A second year of wild parsnip hand-pulling will be conducted in July 2015.
- Invasive shrub removal in East Field: Re-evaluate method for control as Forest Savers was unable to access that field under suitable conditions. Access to the field and method for invasive control need to be identified.
- With the help of volunteers, build 2-3 brush piles for cottontails using some of the bigger trees to be cut down in the East Field.
- Plant native shrubs following the invasives removal.
- Periodic mowing to maintain shrub-field conditions conducive to New England cottontail and other shrub-dependent wildlife and to maintain clumps of milkweed for monarchs and other plants for pollinating insects.



- With help of a consulting forest implement approximately 10-acre harvest of the woods south of the West Field, between the main woods road and the tributary/wetland—to benefit New England cottontail.
- Any forestry activity identified for the old pasture woodland should first consider how logging equipment would cross the tributary to reach the woodland.
- Control invasive plants prior to conducting biomass harvests or other forest management, when feasible.

➤ **Riparian, Riverine, and Wetland Restoration:**

- Invasive shrub removal and planting of native shrubs along the field/Oyster River riparian buffer and along the tributary that bisects the old field, should be done with handwork, such as chainsaws and loppers. No heavy machinery in riparian areas due to soils and site conditions.
- Removal of invasive black locust at the north end of the East Field. Some of this wood can be used to build a tributary crossing and in building brush piles.
- Potential placement of woody debris in the tributary that flows through the field to the Oyster River to benefit brook trout and other fish. NH Fish and Game is investigating the feasibility and need for this management action.
- With the help of volunteers, removal of invasive shrubs in the 11-acre wetland in the northeast region of the property (within the proposed ecological reserve).

## **Invasive Plant Monitoring and Control**

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As described earlier, invasive plants are harmful to native plants and animals and degrade natural systems. Invasive plants, especially glossy buckthorn, are found throughout the property, but are most concentrated in the old field, in riparian and wetland areas, and in recently disturbed logged areas, especially in the southeast corner of the Oyster River Forest.

To help control invasive plants and to prevent further establishment of prohibited plants throughout the Oyster River Forest and beyond, the following recommendations are provided:

- Avoid introducing any non-native, invasive species that are prohibited by the State of New Hampshire and the NH Department of Agriculture for more information on invasive plants: <http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm>. Care should be taken not to plant or re-introduce any plants now considered invasive, as it is illegal in New Hampshire to knowingly collect, transport, sell, distribute, propagate or transplant any living or viable portion of any listed prohibited invasive plant species including all of their cultivars, varieties, and specified hybrids. A wider educational effort within the community, including abutting landowners, would help in future control of invasive plants.

- If new plantings are desired consider the following sources of native plants or check with the Natural Resources Conservation Service and Rockingham County Conservation District on the source of plants for the old field restoration:
  - New Hampshire State Forest Nursery (<http://www.nhnursery.com/>)
  - Wetland Plants Inc (<http://www.newp.com/>)
  - New England Wildflower Society (<http://www.newenglandwild.org/>)
  - Pierson Nurseries, Inc ([www.piercionnurseries.com](http://www.piercionnurseries.com))
  
- Engage volunteers to help with monitoring and controlling invasive plants. With the assistance of The Stewardship Network: New England, plan volunteer workdays that are fun, effective, and community building. Removal of invasive plants around the old foundation and along the trail network would be good volunteer projects.
  
- Annually or periodically monitor the property for invasive plants; specifically look out for new infestations. Invasive plants are difficult to eradicate once well established. For more information on identifying invasive plant species in New Hampshire see the following publications and resources at <http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm>.

## Forest Management

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 (see Map 7—Appendix 1 and Table 8)

The town-owned Spruce Hole Conservation Area had a recent timber harvest under the guidance of forester Charlie Moreno. Prior to town ownership, the former Sprucewoods parcel (now Oyster River Forest) was heavily logged, likely without the guidance of a forester. Going forward, any forest management on these town lands should be guided by a step-down forest management plan. A Forest Plan can reference much of the information on this Stewardship Plan, but should include a more detailed timber inventory and clear goals as to the purpose(s) of any future harvest. It should also cover both the Spruce Hole Conservation Area and the Oyster River Forest since the two properties are contiguous and have some similar forest conditions. Funds generated from forestry activities should be reinvested in the stewardship of the two properties.

The primary goals of any forest management should be to:

- Implement forest harvests near the old field to benefit New England cottontail
  
- Manage the dry Appalachian oak forest to enhance wildlife habitat (i.e., mast crops), to protect drinking water, and to sustain the ecological characteristics of this forest type including the oak and pitch pine components.
  
- Evaluate the old pasture woodland for opportunities to enhance habitat, while maintaining aesthetic backdrop to old field. However, any logging first needs to identify access across tributary.
  
- Evaluate opportunity to create and maintain an opening to and around old foundation, through pitch pine stand.

The size, current conditions, and site capability of the Oyster River Forest (together with the Spruce Hole Conservation Area) provide opportunities for both active management and to allow some areas to be guided by natural processes, including natural disturbances and succession. The 40+ acre mesic Appalachian oak-hickory forest and associated wetland on the Oyster River Forest and the area around the Spruce Hole Bog are recommended as “ecological reserves” or natural areas. Access to the eastern part of the Oyster River Forest (the former Tecce property) is remote and recent land use disturbances such as pasturing and logging are farther back in history compared to the more accessible western reaches of the Oyster River Forest. Encompassing the unique Spruce Hole Bog within a larger natural area will provide added protection. These areas should be monitored annually for invasive species.

Specifically, the following recommendations are made related to any forest habitat management:

- Prior to any forest management, contract with a licensed forester to prepare a “step-down” plan. The Plan does not need to be a comprehensive forest management plan, but rather a silvicultural plan for the long-term management of these areas. The plan should delineate forest stands, access roads, log landings, and methods for avoiding impacts to existing woods roads and trails. If forestry operations are proposed for the area east of the tributary that flows through the fields, then a way to cross the tributary with logging equipment needs to be identified. The Plan should also meet the requirements of the NRCS compatible use agreement.
- Prior to initiating forestry treatments, systematically locate and remove all exotic, invasive plants in any proposed management area, when feasible.
- Forest management should follow the guidelines in Good Forestry in the Granite State (Bennett 2010), with a particular emphasis on:
  - Protecting wetlands and wetland soil; follow recommended setbacks for each wetland type
  - Diversifying the vertical forest structure
  - Maintaining and managing for mature mast trees including red, white, and black oak.
  - Maintain the pitch pine component of the dry Appalachian oak forest
  - Retaining live and dead cavity trees, snags, and other large den or nest trees
  - Ensuring the retention of coarse woody debris during active harvests
- Leave the “ecological reserves” to develop through natural processes and disturbance, except to control for invasive species.

**Table 6. Summary of general stewardship recommendations.**

<b>Location</b>	<b>Stewardship Activity</b>	<b>Notes</b>
Property-wide	Annually walk property boundary	Join the NRCS when they conduct easement monitoring visits
-----	Letter to NRCS from TA	Permission to send monitoring reports to LCHIP
Boundaries	Periodically walk boundaries	To check signage, conditions
Main gate	Update kiosk	New map, key features, allowed uses, LCHIP funding
Website	Update town website	New info on habitat mgmt., trails, Stewardship Plan
Property-wide	Host a bioblitz	Fun, educational, informative
Property-wide	Engage community in volunteer workdays	Trails, cleanups, invasive plants
Trailheads	Add informational signs	

**Table 7. Summary of trail recommendations.**

<b>Location</b>	<b>Stewardship Activity</b>	<b>Notes</b>
Main gate	Improve parking at main gate	Add material to allow for angle parking; consider ADA specifications; consider additional rocks or posts to further block motorized access around gate
Main Gate to College Woods	Improve trail from main gate to College Woods	Included in 2014 grant application to NH Trails Bureau
Trail near north end of property	Create new trail from main woods road, through old field, to old pasture woodland	Included in 2014 grant application to NH Trails Bureau
Old Field	Consider closing trail crossing at north end of field	Work with NRCS to close crossing, if deemed appropriate
Old Field	Install new crossing at south end of field; consider capacity for management equipment	Included in 2014 grant application to NH Trails Bureau
Southern trail network	Consider a universally accessible trail from main gate to Spruce Hole Bog	Seek grant funding and community support; Meet with Emeritus at Sprucewoods to gauge their potential interest in such a trail; consider a similar trail to the old foundation
Property-wide	Change town ordinance to allow hunting	Required by LCHIP funding; Work with NHFG on hunting ordinance

**Table 8. Summary of habitat restoration and management recommendations.**

<b>Location</b>	<b>Management Activity</b>	<b>Notes</b>
East and West Field	Wild parsnip control	NRCS funding; Hand-pulling; mainly at north end of East Field
North end of East Field	Black locust removal	NRCS funding; use logs for new potential bridge crossing and brush piles
East Field	Invasive shrub removal	NRCS funding; determine best method for removal. Forest Savers determined that uprooting not feasible in East Field or in riparian areas
Riparian areas along old field	Invasive shrub removal	NRCS funding. Do by hand – chainsaws, loppers; no heavy machinery
East Field	Build 2-3 brush piles	With volunteers; to benefit cottontails
East Field	Plant native shrubs	NRCS funding; after invasives control
West and East Fields	Periodic mowing	
South of West Field	Biomass harvest/clearcut	NRCS funding
Old field tributary	Addition of woody material to tributary	NRCS funding; NHFG evaluating feasibility
Property-wide	Invasive plant control	Control invasives prior to harvests. Monitor field for re-sprouts—engage volunteers to pull. Clear around old foundation; other sites as feasible and amenable to volunteer workdays; educational outreach within community, including abutters
Old foundation	Clearing around old foundation	Include in a future forest harvest
Property-wide	Forest management plan (step-down silvicultural plan)	Required for any future forestry on Oyster River Forest; to be written by a licensed forester
Northeast corner of ORF and around Spruce Hole Bog	Maintain ecological reserves/natural areas	Mesic Appalachian oak–hickory forest and around Spruce Hole Bog

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