



**Ecological Inventory of the
Cocheco River Watershed (Dover)
and the
Follet's Brook Watershed
(Durham, Newmarket, and Lee)**

December 2004



**The Nature
Conservancy** 
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*Alder-dogwood-arrowwood
alluvial thicket, Blackwater
Brook, Dover, NH*
Photo by Bill Nichols

*Scirpus pendulus (lined
bulrush), Dover, NH*
Photo by Bill Nichols

*Exemplary low brackish tidal riverbank marsh at the
mouth of Garvin Brook in Dover, NH*
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(Durham, Newmarket, and Lee)**

December 2004

Compiled and edited by
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Developed through a partnership of:
The Nature Conservancy
Audubon Society of New Hampshire
New Hampshire Natural Heritage Bureau

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New Hampshire
Estuaries Project

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Acknowledgements

This report was a collaboration of The Nature Conservancy, the Audubon Society of New Hampshire, and the New Hampshire Natural Heritage Bureau. We express our gratitude to the members of the Great Bay Resource Protection Partnership, who have endorsed ecological inventory projects throughout the Great Bay watershed in service of making informed, scientifically justified natural resource conservation decisions. Special thanks to Dea Brickner-Wood, Great Bay Partnership Coordinator, for her help in engaging local communities, communicating project goals, and contacting landowners.

We sincerely appreciate the financial support for this project given by the City of Dover and the Towns of Durham and Newmarket. In addition, several community members provided valuable assistance in identifying potentially significant habitat areas and in identifying and contacting landowners. Thanks to: Tom Fargo, Steve Bird, Joyce El Kouarti, Wendy Scribner, Cheryl Niles, Dona Layton, Anna, Boudreau, Judith Spang, George Gavutis, Hunter Brownlie, and Ellen Snyder.

Finally, we express our gratitude to the New Hampshire Estuaries Project for its continued support of the Great Bay Resource Protection Partnership. The results of this study will help to guide land conservation efforts in the Follet's Brook and Cocheco River watersheds, helping to conserve critical lands for plant and wildlife habitat, water quality, scenic resources, and public recreation in the watershed of Great Bay estuary.

Introduction

Southeastern New Hampshire contains extraordinary biological and ecological diversity. The natural landscape is increasingly threatened by development and other land use conversion, and has been the subject of intensive land conservation efforts by towns, watershed groups, conservation organizations, and public agencies.

In 2004, an ecological inventory and assessment of the Follet's Brook and Cocheco River watersheds was conducted by The Nature Conservancy, Audubon Society of New Hampshire, and the New Hampshire Natural Heritage Bureau. The purpose of the ecological inventory project was to document significant habitat for wildlife, plants, and natural communities of conservation concern in the Great Bay region. The ecological inventory covered two watershed study areas:

1. The Cocheco River corridor and intact tributaries within the City of Dover.
2. The block of relatively unfragmented habitat incorporating the Follet's Brook watershed in Newmarket, Durham, and Lee.

Figures 1 and 2 broadly depict the geographic scope of the project.

The results of this project will help to direct the conservation activities of the Great Bay Resource Protection Partnership by providing field data on the occurrences of significant biological and ecological features. The Great Bay Partnership fully respects the rights and wishes of private landowners, and only works on conservation initiatives with willing landowners on a voluntary basis. Our hope is that the report will also serve as a valuable guide, tool, and information resource for landowners, communities, land trusts, and public agencies that are interested in conserving sensitive coastal resources. By considering natural resources information in planning and decision-making, citizens can make a meaningful contribution toward maintaining a high quality of life for residents, and can help to preserve New Hampshire's irreplaceable natural heritage.

Funding support for the project was provided by the New Hampshire Estuaries Project, City of Dover, Town of Durham, Town of Newmarket, and private donors.

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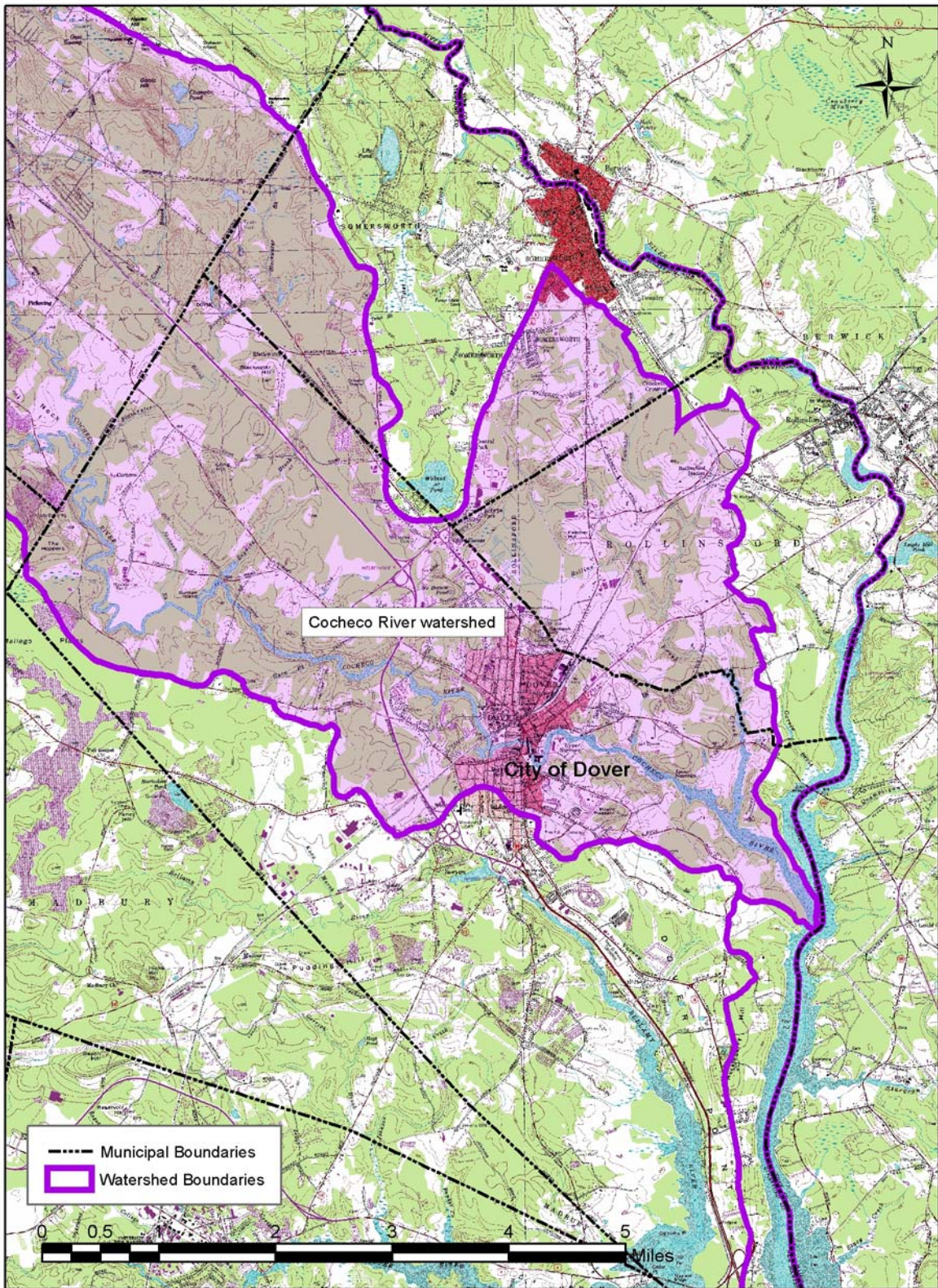


Figure 1. Cocheco River study area in Dover, NH.

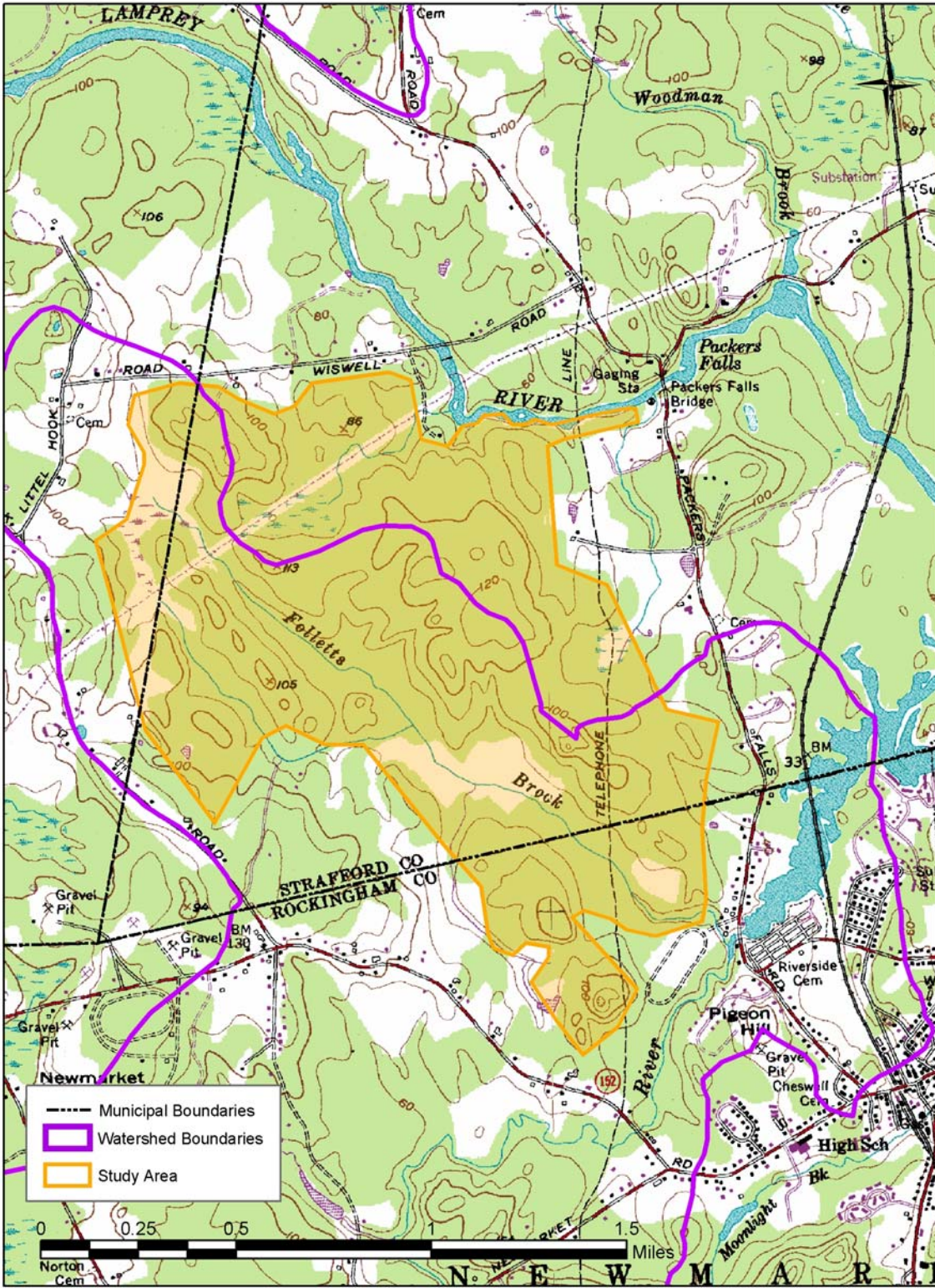


Figure 2. Follet's Brook study area in Durham, Newmarket, and Lee, NH.

Methodology

This report was developed through a partnership of The Nature Conservancy, Audubon Society of New Hampshire, and the New Hampshire Natural Heritage Bureau. The partners undertook the steps described below to complete the ecological inventory. Additional information on field survey methodology is provided in the Audubon and NH Natural Heritage reports presented in [Appendix 1](#) and [Appendix 2](#).

1. Identify target areas for inventory through landscape analysis and expert opinion

NH Natural Heritage Bureau, TNC, Audubon, and other partners reviewed and analyzed geospatial data and interviewed local experts to identify areas in the City of Dover, and in the Follet's Brook watershed, with a relatively high probability of supporting rare plants, significant natural communities, and important wildlife habitats. Sources of information included wetland and soil maps, land cover, forest blocks, aerial photography, known occurrences of rare species and exemplary natural communities, and other geographic data. The partners conducted two local stakeholder outreach meetings in March to introduce the project and seek input. Stakeholders reviewed draft focal area maps, provided feedback on potential additional areas for study, and offered advice on seeking landowner permission.

The partners identified the following areas as priorities for ecological inventory:

Area	Town(s)/City
Follet's Brook Watershed	Durham, Newmarket, and Lee
Lower Cocheco River Corridor	Dover
Garvin Brook Mouth	Dover
Lower Fresh Creek	Dover
Central Cocheco River Corridor	Dover
Blackwater/Clark Brook Vicinity	Dover
Mallego Plains	Dover
No Bottom Pond/Gates Corner Area	Dover
Sixth Street Meadow	Dover
The Hoppers	Dover

2. Compile landowner information and secure landowner permission for field inventory

The partners collected and sorted landowner information for more than 200 parcels in the Cocheco River and Follet's Brook study areas. Landowner information was derived from municipal GIS data and hardcopy parcel maps and data held in municipal offices.

For private properties, the partners' standard operating procedure was to conduct inventories only on those tracts for which we received explicit permission from the landowner. SOP was to assume permission for publicly owned properties. In April 2004, The Nature Conservancy sent a landowner permission letter and response postcard to each landowner in the inventory focus areas. A copy of the letter is presented in [Appendix 3](#). We also contacted approximately 25 landowners by telephone, in those cases where one of the project partners had a pre-existing relationship with the landowner. In May 2004, we sent a follow-up letter to all landowners that had not yet responded.

We received unconditional permission to access 88 parcels, conditional permission (e.g., call first) to access 26 parcels, a "No" response for 21 parcels, and no reply for 88 parcels. Responses include multiple parcels owned by single owner, as well as municipal/state parcels where permission not specifically sought. For privately owned properties, the "yes" rate was very high in Durham and Newmarket and medium in Dover.

3. Compile existing information on species and natural communities of conservation concern

Audubon Society of New Hampshire compiled and reviewed information on occurrences of wildlife species of conservation concern, particularly waterfowl, wading birds, grassland birds, turtles, salamanders, and odonates. Specific data sets included the NH Birds Records and the NH Fish and Game Department's Reptile and Amphibian Reporting Program.

New Hampshire Natural Heritage Bureau compiled and reviewed previously-obtained plant and natural community data; most of this data was stored in the Heritage Bureau's BCD/Biotics geospatial database. These data were incorporated into findings and the analysis of conservation priorities.

4. Conduct field inventory

Field inventory was divided into two components:

1. Rare Plant and Exemplary Natural Community Surveys
Conducted by the New Hampshire Natural Heritage Bureau

2. Wildlife Species of Concern and Significant Wildlife Habitat Surveys
Conducted by Audubon Society of New Hampshire

Data was collected by qualified botanists, ecologists, and wildlife biologists, and was recorded on standardized field forms agreed to in advance by the project partners. In addition, NH Audubon recruited and trained six volunteers to assist with wildlife data collection; these volunteers contributed 16 survey days and produced valuable information.

NH Natural Heritage staff spent approximately three weeks conducting field surveys on targeted tracts where landowner permission was granted, documenting potential exemplary natural communities, rare plants, and other significant features.

Audubon staff conducted broadcast surveys for secretive water birds at emergent wetlands in both study areas, and documented breeding bird activity in wetlands and uplands, including forested and non-forested habitats. Audubon Society staff and volunteers also searched for and mapped vernal pools.

In each survey location, an observation (or survey) point of the immediate area was established and spatially documented through the use of Global Positioning Systems (GPS) technology. Surveyors then collected the following kinds of information:

- General habitat type and size
- Species composition and percent cover
- Habitat structure
- Natural community types
- Presence (or sign) and behavior of wildlife species of conservation concern
- Presence and cover of non-native invasive species
- Human impacts

The inventory reports presented in [Appendix 1](#) and [Appendix 2](#) contain more detailed explanations of data collection methodology.

5. Compile and analyze field data

All rare plant and exemplary natural community data were documented and inputted as “element occurrences” into the Natural Heritage Bureau’s Biotics database. Attributes of each occurrence were also entered including lat/long, quality, habitat type, and other features. All wildlife data was compiled by

Audubon Society of New Hampshire and will be entered into the appropriate state wildlife databases (e.g., NH Bird Records).

Complete field season inventory reports are presented in [Appendix 1](#) and [Appendix 2](#). These reports include narrative descriptions of ecologically significant areas, including rare plants, exemplary natural communities, wildlife species of conservation concern, and exemplary ecological systems.

6. Develop conservation priorities

In December 2004, representatives from The Nature Conservancy, Audubon Society of New Hampshire, NH Natural Heritage Bureau, and the Great Bay Resource Protection Partnership convened to review inventory results and identify conservation priority areas.

The partners used the following criteria to identify conservation priorities:

- **Presence of rare species or exemplary natural communities**
- **Presence of significant wildlife habitat**
- **Presence of un-developed buffer for streams, wetlands, and riparian areas**
- **Presence of larger blocks of relatively unfragmented natural habitat**
- **Retention of key ecological processes such as natural beaver dynamics and flooding regimes**
- **Absence of dams**
- **Absence or small numbers of non-native invasive species**
- **Conservation feasibility, such as the number and size of parcels**

These areas are described in further detail below in the section entitled [Important Areas for Plants, Natural Communities, and Wildlife Habitat](#). In addition, [Appendix 4](#) provides detailed tax parcel maps and landowner contact information for each conservation priority area.

Results

Through this ecological inventory of the Follet's Brook and Cocheco River watersheds, we were able to document many areas supporting rare plant species, exemplary natural communities, wildlife species of conservation concern, and significant wildlife habitat. We have synthesized the field data and associated information to delineate priority areas for conservation attention, but we also present the complete inventory findings.

Unless otherwise cited, descriptions of rare species, natural communities, and wildlife habitat are derived from the NH Natural Heritage Bureau (Nichols 2004) and Audubon Society of New Hampshire (Deming 2004) reports contained in [Appendix 1](#) and [Appendix 2](#).

Plants and Natural Communities

NH Natural Heritage Bureau ecologists collected data at 123 observation points in 13 study sites.

Highlights include:

- Documentation of six rare plant species including: ***Eleocharis parvula*** (small spike-rush, State Threatened, S2), ***Lilaeopsis chinensis*** (eastern lilaeopsis, State Threatened, S2), ***Samolus parviflorus*** (false water pimpernel, State Threatened, S2), ***Carex cristatella*** (small crested sedge, State Threatened, S2), ***Potamogeton nodosus*** (knotty pondweed, State Endangered, S1), ***Scirpus pendulus*** (lined bulrush, State Endangered, S1).
- Documentation of three exemplary natural communities including: **Low brackish tidal riverbank marsh**, **High brackish tidal riverbank marsh**, and **Red maple floodplain forest (low variant)**.
- Identification of four "Higher Conservation Priority" and eight "Moderate Conservation Priority" areas.

Wildlife

NH Audubon staff and volunteers completed 49 field surveys, approximately evenly divided between Follet's Brook and Cocheco River study sites.

Highlights include:

- Documentation of 127 vertebrate species at Follet's Brook, and 150 vertebrates and 44 invertebrate species in the Cocheco River watershed.

- Observations of 49 species of conservation and/or management concern, including four State Endangered, one State Threatened, and five Special Concern.
- Observations of thirty species of birds listed as priority species by Partners In Flight (PIF) in Bird Conservation Region 30, which covers this area.
- Four of these bird species – American black duck, American woodcock, Canada warbler, and wood thrush - are considered by PIF to be of highest priority and were found in both study watersheds.
- An additional eleven bird species are listed as “high priority” by PIF.
- Abundant high quality wildlife habitats including beaver flowages, emergent and scrub-shrub wetlands, riparian corridors, vernal pools, upland forests, and grasslands.

Important Areas for Plants, Natural Communities, and Wildlife Habitat

The partners identified four areas considered to be of exceptional habitat significance from a regional or statewide perspective.

- 1. Follet's Brook Watershed** – Newmarket, Durham, and Lee
- 2. Lower Cocheco River¹** - Dover, Rollinsford
- 3. Blackwater Brook** – Dover, Rochester
- 4. Strafford County Farm/Jackson Brook** - Dover

These landscapes should be viewed as the highest priorities for focused conservation attention. The natural resource values of each area are detailed below. In addition, [Appendix 4](#) provides detailed tax parcel maps and landowner contact information for each conservation priority area. We wish to emphasize that the Great Bay Resource Protection Partnership fully respects the rights and wishes of private landowners, and only works on conservation initiatives with willing landowners on a voluntary basis.

Although our inventory of the Cocheco River watershed evaluated many areas of potential conservation significance, it was not comprehensive. Our study area was limited to Dover, and did not cover the uppermost portions of the river system. In addition, resources for the study were limited, and we were unable to secure landowner permission to visit all targeted areas. For example, the area along the Cocheco mainstem immediately upstream of Route 16 appeared to harbor potentially significant habitat based on our landscape analysis, however we were unable to secure landowner permission for ecological survey work. Thus, although we are confident that the priority areas identified in this study are indeed ecologically significant, we do not intend to suggest that there are no other significant habitat areas in the watershed. These may well be uncovered by future studies.

Unless otherwise cited, descriptions of rare species, natural communities, and wildlife habitat are derived from the NH Natural Heritage Bureau (Nichols 2004) and Audubon Society of New Hampshire (Deming 2004) reports contained in [Appendix 1](#) and [Appendix 2](#).

¹ This area, as delineated by the project partners, incorporates several sites identified as “Higher” or “Moderate” conservation priorities by the New Hampshire Natural Heritage Bureau including: Cocheco River East, Garvin Brook, Piscataqua/Cocheco Point, East of Middle Road, and Gulf Road.

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Follet's Brook Watershed

Location: The Follet's Brook Watershed area is located in northern Newmarket, southwestern Durham, and southeastern Lee (see Figure 3a). The area is roughly bounded by Lee Hook Road on the west, Wiswall Road on the north, Packers Falls Road on the east, and Rte. 152 to the south.

Size: The Follet's Brook Watershed area is approximately 1,200 acres.

Description: The Follet's Brook Watershed area is a relatively large, unfragmented area of natural landscape (see Figures 3a and 3b). The largely intact forest, stream, wetland ecosystem retains very good connectivity between upland, lowland, and aquatic natural communities, and provides important and diverse wildlife habitat.

Follet's Brook is a small, free-flowing tributary (i.e., no man-made dams) feeding into the Piscassic River just upstream of the Piscassic-Lamprey confluence. The brook is characterized as low-gradient, with a small narrow channel (~3 feet wide) and a soft substrate of clay and sand. The focus area also contains more than one-half mile of frontage on the Lamprey River mainstem, providing connectivity to a larger river system.

Follet's Brook contains an abundance of wetland resources that provide wildlife habitat, and play an important role in maintaining water quality and quantity. According to the National Wetlands Inventory, the area contains approximately 122 acres of wetlands including 29 acres of Palustrine Emergent, 19 acres of Palustrine Scrub-Shrub, 72 acres of Palustrine Forested, and 2 acres of Palustrine Unconsolidated Bottom. Extensive beaver activity has created a network of swamps, marshes and pools throughout the drainage. The largest wetland complex is located in the lower river along the Durham-Newmarket town line. Notable wetland natural communities and systems include:

- **Emergent marsh – shrub swamp system**²
- **Red maple – black ash – swamp saxifrage swamp** and **red maple – sensitive fern swamp** forests
- **Subacid forest seeps**
- **Low gradient silty-sandy riverbank system** (along Lamprey mainstem)

Uplands are dominated by 2nd and 3rd growth **Appalachian oak – pine forests**, with a small patch of **hemlock – white pine forest** northeast of Follet's Brook and south of the powerline corridor. Although these natural communities are

² We highlight in **bold** all documented rare plants, wildlife species of conservation interest, and natural communities.

not considered exemplary (due to current condition, historical land use, etc.), the forest is notable in the rapidly developing Seacoast region for its relatively large size, lack of fragmentation, and intact connectivity with the Follet's Brook aquatic and wetland habitats. Our study documented several species that benefit from, and are typically found in, larger forest blocks including **black bear, moose, bobcat, great-horned owl, and red-shouldered hawk**. In addition, several migratory songbirds known to be sensitive to forest fragmentation were detected including **veery, wood thrush, blue-headed vireo, black-throated blue warbler, blackburnian warbler, black and white warbler, ovenbird, Canada warbler, and scarlet tanager**. Notably, brown-headed cowbird, a non-native nest predator, was not detected in the interior forest habitats.

The upland forest, particularly the area between Follet's Brook and the Lamprey River, contains a complex of isolated, disjunct vernal (seasonally saturated) pools and other forested and shrub-swamp wetlands. These special, fishless habitats provide important breeding grounds for amphibians (salamanders, frogs) and invertebrates. The co-occurrence of these isolated wetlands within an intact forested landscape, and with unimpeded connectivity to the Follet's Brook and Lamprey River aquatic ecosystems, provides a very good landscape setting for plant and animal populations to persist over time. It is also likely that many species, such as Blanding's and Spotted turtles, use Follet's Brook as an important travel corridor for dispersal.

Large hayfields along the periphery of the focus area, and shrubby habitat along the bisecting powerline corridor, provide another type of wildlife habitat important for some species of concern such as grassland and shrubland birds. The hayfields and associated shrubby areas are not large enough to support area-sensitive grassland species such as upland sandpiper, but do support other species of management concern including **bobolink, eastern meadowlark, blue-winged warbler and Canada warbler**.

Notable wildlife and wildlife sign observed in the Follet's Brook area include:

- **Canada goose, mallard, wood duck, hooded merganser, and green-backed heron**, all with broods
- **American black duck** and **great blue heron**
- **Red-shouldered hawk** exhibiting territorial behavior
- **Bobolink, eastern meadowlark, blue-winged warbler, and Canada warbler**
- **Spotted turtle, Eastern painted turtle**
- **Spotted salamander, four-toed salamander, wood frog, American toad, gray treefrog, spring peeper, green frog, and pickerel frog**
- **Beaver, muskrat, otter**
- **Black bear, moose, and bobcat**

Notable plant species observed in the Follet's Brook area include:

- ***Carex cristillata* (small crested sedge)** – State Threatened, State Rarity Rank S2 (imperiled)
- ***Potamogeton nodosus* (knotty pondweed)** – State Endangered, State Rarity Rank S1 (critically imperiled)

In addition to the observed species listed above, there are several species of concern that, while not documented during this study, are likely to occur in Follet's Brook Watershed including: Blanding's turtle, spotted turtle, American bittern, Virginia rail, spotted sandpiper, common snipe, northern waterthrush, and willow flycatcher. Two state rare plant species – *Aureolaria virginica* (downy false-foxglove) and *Liatris scariosa var. novae-angliae* (northern blazing star) – were not observed during this study but are historically known to occur in the area.

Other Natural Resource Features and Public Values:

- 3.6 miles of stream frontage on Follet's Brook and its tributaries, and 1.6 miles of frontage on the Lamprey River and its tributaries.
- The focus area includes approximately 420 acres of Group 1 Important Forest Soils (1A- 65 ac, 1B- 310 ac, 1C- 46 ac).
- The entire focus area is within the Source Water Protection Area for Newmarket Water Works. It also includes two Public Water Supply points listed as Newmarket Water Works. The focus area also includes 395 acres within two well head protection areas, also listed as Newmarket Water Works.
- The focus area contains a network of pedestrian trails that are used by local residents.

Conservation Lands:

According to the UNH GRANIT conservation lands data layer, there are approximately 87 acres of conservation lands in the Follet's Brook Watershed focus area including:

- UNH, Davis Park, fee ownership, 11 acres
- Town of Durham, Wiswall Dam, fee ownership, 5 acres
- Town of Durham, Weeks Parcel, fee ownership, 20 acres
- Town of Durham, Little John Road Open Space, set aside, 15 acres
- Town of Newmarket, Follet's Brook, fee ownership, 27 acres
- Town of Newmarket, Trotter Park, fee ownership, 9 acres

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Lower Cocheco River

Location: The Lower Cocheco River area is located in eastern Dover (see Figure 4a). The area is roughly bounded by the Salmon Falls River to the east, Isaac Lucas Circle to the south, Back Road and Henry Law Road to the west, and Gulf Road to the north.

Size: The Lower Cocheco River area is approximately 950 acres.

Description:

The Lower Cocheco River area includes the tidal portion of the Cocheco River, extending from the river's mouth upstream nearly to downtown Dover. This narrow river corridor contains a network of important tidal wetlands, remnant patches of riparian forests, and open fields. The focus area also extends upstream along the Salmon Falls River to include the mouth of Garvin Brook, and approximately ½ mile downstream to capture additional wetlands and riparian habitat.

The Lower Cocheco River area is rich in wetland resources. According to the National Wetlands Inventory, the area contains approximately 121 acres of wetlands including 7 acres of Palustrine Scrub-Shrub, 2 acres of Palustrine Unconsolidated Bottom, 101 acres of Estuarine Intertidal Unconsolidated Shore, and 10 acres of Estuarine Intertidal Emergent. A **low brackish tidal riverbank marsh** community dominated by smooth cordgrass (*Spartina alterniflora*), water hemp (*Amaranthus cannabinus*), and narrow-leaved cattail (*Typha angustifolia*) extends intermittently from downtown Dover to the river mouth, and also up the Fresh Creek tributary to Gulf Road. Although this community is considered exemplary because of its rarity in New Hampshire, its condition has been degraded as a result of buffer loss, water quality degradation, and invasive species.

This area's tidal rivers and associated tidal wetlands, mudflats, and sandbanks support a wide diversity of wildlife, particularly waterfowl, shorebirds and wading birds. During our study, sixty-six bird species were observed in this river corridor. Notable species documented to use this area include **great blue heron, green-backed heron, greater yellowlegs, American black duck, green-winged teal, wood duck**, and many others. The tidal portion of Fresh Creek appears to be an important feeding and loafing habitat for many birds. For example, during one fall survey approximately 150 mallards and American black ducks were found feeding and resting in the channel. An **osprey** was observed perched above the tidal portion Fresh Creek, though there is no known nest at this location.

Just north of Salmon Falls River's Eliot Bridge, Garvin Brook mouth supports exemplary **high and low brackish tidal riverbank marsh** natural

communities. The high marsh area is dominated by narrow-leaved cattail, with less frequent salt-meadow cordgrass (*Spartina patens*) and other grasses. The low marsh is dominated by smooth cordgrass and water hemp, with a scattering of other grasses and herbs. Invasive species (Morrow's honeysuckle, common buckthorn, and purple loosestrife) have a foothold in a higher, shrubby portion of the marsh but have not yet become established in the core of the marsh area.

Other wetland natural communities documented in the focus area, particularly along the Salmon Falls River, include:

- **High brackish tidal riverbank marsh**
- **Saline/brackish intertidal flat**
- **Saline/brackish subtidal channel/bay bottom**
- **High salt marsh**
- **Low salt marsh**

A substantial portion of the natural riparian landscape along the lower Cocheco has lost to residential and commercial development, however there are some significant remnant patches of riparian forest. The dominant upland forest type is **hemlock – beech – oak – pine**, with a patch of **semi-rich Appalachian oak – sugar maple forest** in the southernmost portion of the focus area.

The Lower Cocheco River focus area also contains several hay fields that are functioning as grassland habitat for birds of conservation concern. **Bobolinks** were documented in one location, and eastern meadowlarks are also likely inhabitants.

Six plant species of conservation concern were documented in the Lower Cocheco River focus area including:

- ***Scirpus pendulus* (lined bulrush)** – State Endangered, State Rarity Rank S1 (critically imperiled)
- ***Eleocharis parvula* (small spike-rush)** – State Threatened, State Rarity Rank S2 (imperiled)
- ***Lilaeopsis chinensis* (eastern lilaeopsis)** – State Threatened, State Rarity Rank S2
- ***Samolus parviflorus* (false water pimpernel)** – State Threatened, State Rarity Rank S2
- ***Ranunculus cymbalaria* (seaside crowfoot)** – State Watch List, State Rarity Rank S3 (either rare and local throughout its range, or found locally in a restricted range, or otherwise vulnerable)
- ***Aster subulatus* (small salt marsh aster)** – State Watch List, State Rarity Rank S3

Two other rare plant species were previously documented in the focus area but not re-visited during this study: *Sparganium eurycarpum* (giant bur-reed, State Threatened, S2), and *Platanthera flava* var. *herbiola* (pale green orchid, State Threatened, S2).

Other Natural Resource Features and Public Values:

- 3.4 miles of riparian frontage on the Cocheco River and its tributaries, 0.7 miles of frontage on Fresh Creek, 0.8 miles of frontage on smaller tributaries, and 2.6 miles of frontage on the Salmon Falls River.
- The focus area includes approximately 524 acres of Group 1 Important Forest Soils (1A- 83 ac, 1B- 236 ac, 1C- 205 ac).
- The focus area includes one Public Water Supply points listed as Jolly Rogers PS INF Care Center.
- Approximately 725 acres in the focus area overlay aquifer zones with maximum transmissivity 0-2,000 sq. ft./day, however we are unable to determine from our GIS data what proportion of these would be considered High Yield Aquifer (maximum transmissivity \geq 1,000 square feet/day).

Conservation Lands:

According to the UNH GRANIT conservation lands data layer, there are approximately 97 acres of conservation lands in the Lower Cocheco River focus area including:

- New Hampshire Fish & Game Department, Martineau tract, fee simple, 42 acres (*actual tract size is 50 acres, but not all is in the focus area*)
- Strafford Rivers Conservancy, Franklin tract, conservation easement, 47 acres
- The Nature Conservancy, Martineau tract, conservation easement, 8 acres (*actual tract size 12 acres, but not all in the focus area*)

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Blackwater Brook

Location: The Blackwater Brook area is located in northern Dover along its border with Rochester (see Figure 5a). The area is roughly bounded by Route 16 (Spaulding Turnpike) to the east, the city boundary to the north, the Cochecho River mainstem to the west, and County Farm Cross Road and Fieldstone Drive to the south.

Size: The Blackwater Brook area is approximately 780 acres.

Description: The Blackwater Brook focus area includes the free-flowing (undammed) stretch of Blackwater Brook between Route 16 and its confluence with the Cochecho, the portion of its Clark Brook tributary stretching upstream to Route 16, and the confluence of the Isinglass River and the Cochecho (see Figures 5a and 5b). The focus area also includes the remaining intact forested and agricultural buffer lands, because these areas help to maintain water quality, natural hydrologic regimes, and wildlife habitat.

Blackwater Brook is a low-gradient, moderately sized tributary of the Cochecho River. Blackwater and Clark brooks contain important wetland resources that provide plant and wildlife habitat and play an important role in maintaining water quality and quantity. According to the National Wetlands Inventory, the area contains approximately 76 acres of wetlands including 10 acres of Palustrine Emergent, 11 acres of Palustrine Scrub-Shrub, 54 acres of Palustrine Forested, and 1 acre of Palustrine Unconsolidated Bottom. Our surveys discovered three vernal pools in the headwaters area near Clark Brook, and three other pools in the forested habitat located south-southeast of lower Blackwater Brook.

The Black Brook and lower Clark Brook corridor supports an exemplary red maple floodplain forest: low variant. This wetland community is dominated by red maple but also includes scattered white pine, shagbark hickory, and red oak. Downstream of the railroad bed, the floodplain has thick groundcover and abundant down trees indicative of areas less disturbed by human activities. Field surveys also discovered two vernal pools in this area.

Several wildlife species of conservation interest associated with the Blackwater Brook stream and floodplain area were documented, including **wood duck, mallard, Louisiana waterthrush, spotted sandpiper, Magnolia warbler** and **wood frog**. Surveyors also found evidence of **deer, mink, and otter**.

While not currently active, beavers have occupied Blackwater Brook until very recently as evidenced by numerous abandoned ponds along the stream corridor. In many areas, the red maple floodplain forest is intermixed with areas of open water and riparian natural communities often associated with

historic beaver activity. These more open communities form a **low-gradient silty-sandy riverbank system** consisting of several natural communities including:

- **deep emergent marsh – aquatic beds** and **medium depth emergent marsh** (i.e., emergent marshes)
- **blue-joint – goldenrod – virgin's bower riverbank/floodplain** (i.e., wet meadows)
- **alder – dogwood – arrowwood alluvial thickets** (i.e., shrub thickets)
- **herbaceous sandy river channel**

A large, abandoned beaver pond and swamp occurs just north of the railroad bed. This wetland appears to have suitable habitat for secretive wetland birds such as American bittern, Virginia rail, and marsh wren, though none were detected during this survey.

The uplands around Black Brook consist primarily of managed forest. The dominant forest type is **hemlock – beech – oak – pine forest**. The forest is largely extant immediately adjacent to Blackwater and lower Clark Brook, providing an important buffer for maintaining habitat and water resources, but much of the forest cover further from the streams has been lost to development and farm land.

Other Natural Resource Features and Public Values:

- 3.4 miles of stream frontage on Blackwater Brook and its tributaries, 1.8 miles of frontage on the Cocheco River, and ½ mile of frontage on the Isinglass River.
- The focus area includes approximately 150 acres of Group 1 Important Forest Soils (1A- 51 ac, 1B- 79 ac, 1C- 20 ac).
- The focus area also includes 220 acres within two well head protection areas listed under “City of Dover Water Department.”
- The focus area contains at least 6 acres of land overlaying areas mapped as High Yield Aquifer (maximum transmissivity \geq 1,000 square feet/day). *Note that there may be additional acreage overlaying High Yield Aquifer in the focus area, however the available GIS data lumped together 626 acres of zones yielding from 0-2000 sq. ft./day.*

Conservation Lands:

According to the UNH GRANIT conservation lands data layer, there are approximately 108 acres of conservation lands in the Blackwater Brook focus area including:

- City of Dover, Gabriel tract, conservation easement, 108 acres

Strafford County Farm / Jackson Brook

Location: The Strafford County Farm / Jackson Brook area is located in western Dover (see Figure 6a). The area is roughly bounded by the Cocheco River to the south and east, the railroad bed to the north, and Rochester Neck Road to the west.

Size: The Strafford County Farm / Jackson Brook area is approximately 700 acres.

Description: the Strafford County Farm / Jackson Brook area includes a relatively undeveloped stretch of the Cocheco River mainstem, the small Jackson Brook tributary, and the County Farm complex (see Figures 6a and 6b). Though impacted by past and current land uses, the area contains a variety of significant upland and wetland wildlife habitats that merit conservation attention.

The Strafford County Farm contains the largest intact grassland in Dover. This study documented **eastern meadowlark** and **savannah sparrow**, while previous efforts have observed bobolink, northern harrier, yellow-billed cuckoo, and upland sandpipers. The Strafford County Farm also supports a pair of nesting **Osprey**, one of only 33 active nest sites documented in New Hampshire in 2004.

Upland forests have largely been lost to development or agricultural land uses, however pockets of **hemlock – beech – oak – pine forest** and **mesic Appalachian oak – hickory forest** remain near the river corridor.

This stretch of the Cocheco River and its Jackson Brook tributary support an array of wetland natural communities. According to the National Wetlands Inventory, the area contains approximately 38 acres of wetlands including 4 acres of Palustrine Emergent, 16 acres of Palustrine Scrub-Shrub, 13 acres of Palustrine Forested, and 5 acres of Palustrine Unconsolidated Bottom. Wetlands along the Cocheco comprise a **low gradient silty-sandy riverbank system**, which consists of a mosaic of meadows, marshes, shrub thickets, and open water. This system of communities is not considered to be exemplary, due in part to the significant long-term impacts on water quality and sediments from the former Dover Municipal Landfill site (located off Tolend Road on Mallego Plains, just south of the focus area).

While not exemplary from a natural community perspective, the wetlands in this area do provide important habitat for an array of wildlife species. Notable wildlife observations included:

- three pairs of **wood ducks**

- a pair of **Canada Geese** with three goslings
- **American black duck** and **mallard**
- **spotted sandpipers** and **solitary sandpipers**

South of the Cocheco River, across from the Jackson Brook mouth, there are additional, isolated forested and emergent wetlands that appear to have good potential for supporting amphibians, turtles, and other wildlife.

Other Natural Resource Features and Public Values:

- 2.9 miles of stream frontage on the Cocheco River, and 1.2 miles of frontage on Jackson Brook and other small tributaries.
- The focus area includes approximately 440 acres of Group 1 Important Forest Soils (1A- 130 ac, 1B- 289 ac, 1C- 21 ac).
- The focus area also includes 238 acres within two well head protection areas listed under "City of Dover Water Department."
- The focus area contains at least 2 acres of land overlaying areas mapped as High Yield Aquifer (maximum transmissivity \geq 1,000 square feet/day). *Note that there may be additional acreage overlaying High Yield Aquifer in the focus area, however the available GIS data lumped together 518 acres of zones yielding from 0-2000 sq. ft./day.*

Conservation Lands:

According to the UNH GRANIT conservation lands data layer, there are approximately 250 acres of conservation lands in the Strafford County Farm / Jackson Brook focus area including:

- City of Dover, Toland & Glen Hill Rd tract, fee ownership, 23 acres
- Strafford County Farm, Strafford County, fee ownership, conservation easement held by SPNHF, 208 acres
- City of Dover, County Farm Road Tract, conservation easement, 4 acres
- City of Dover, County Farm Crossing Open Space, set aside, 15 acres *(actual tract size 29 acres, but not all in the focus area)*

Appendix 1

New Hampshire Natural Heritage Bureau Ecological Inventory Report

Appendix 2

Audubon Society of New Hampshire Ecological Inventory Report

Appendix 3

Landowner Permission Letter

[DATE]

[LANDOWNER NAME]

[MAILING ADDRESS]

Dear [LANDOWNER],

During the 2004 growing season, the New Hampshire Natural Heritage Bureau, the NH Chapter of the Nature Conservancy, and the NH Audubon Society will conduct natural resource inventories within the Cochecho River and Follet's Brook watersheds in Dover, Lee, Newmarket and Durham, NH. The purpose of this project is to identify important plant and wildlife habitats. Data collected in the course of the study will be entered into the state's Natural Heritage database to create a permanent and publicly-available record of ecologically significant features encountered. The results of this project will help New Hampshire landowners and residents make informed decisions when balancing land-use needs with conserving water quality, managing biodiversity, and ensuring the health of our coastal ecosystems..

We would like to visit your land in **[City of Dover / Town of Durham or Newmarket, name and map and lot #]**. We will only visit properties for which landowners have granted us written permission. With the enclosed postcard, we are requesting your permission to allow NH Natural Heritage and Audubon field ecologists to visit your property sometime during the current growing season.

Please take a moment to fill out and mail the enclosed postage-paid postcard back to us. We would be happy to provide you with the survey results from your property. If we do not receive your response by April 16th, we will call you to make sure this letter has been received and a decision has been made.

The information being generated through this project will provide New Hampshire's coastal residents with a better understanding of the natural resource values of their property, and contributes to our knowledge of the state's biological diversity. Thank you for your time and consideration.

Appendix 4

Conservation Priority Area Parcel Maps and Landowner Information

The following maps illustrate tax parcels that fall within the four conservation priority areas detailed in this report, and the accompanying tables provide additional parcel data and landowner contact information. This information is provided to assist conservation organizations, municipalities, and other entities that may wish to engage with landowners in these areas. We emphasize that the Great Bay Partnership fully respects the rights and wishes of private landowners, and only works on conservation initiatives with willing landowners on a voluntary basis.