



WATERSHED RESTORATION PLAN FOR HODGSON BROOK
Portsmouth, New Hampshire 2004

Hodgson Brook Watershed
Restoration Plan
Portsmouth, New Hampshire
June 2004

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in cooperation with the
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Cover: A view of the ditched and straightened Hodgson Brook, looking northwest to Route I-95 and the Portsmouth Traffic Circle from Coakley Road. Mallards and a muskrat share the waterway. Photo by Steve Miller.

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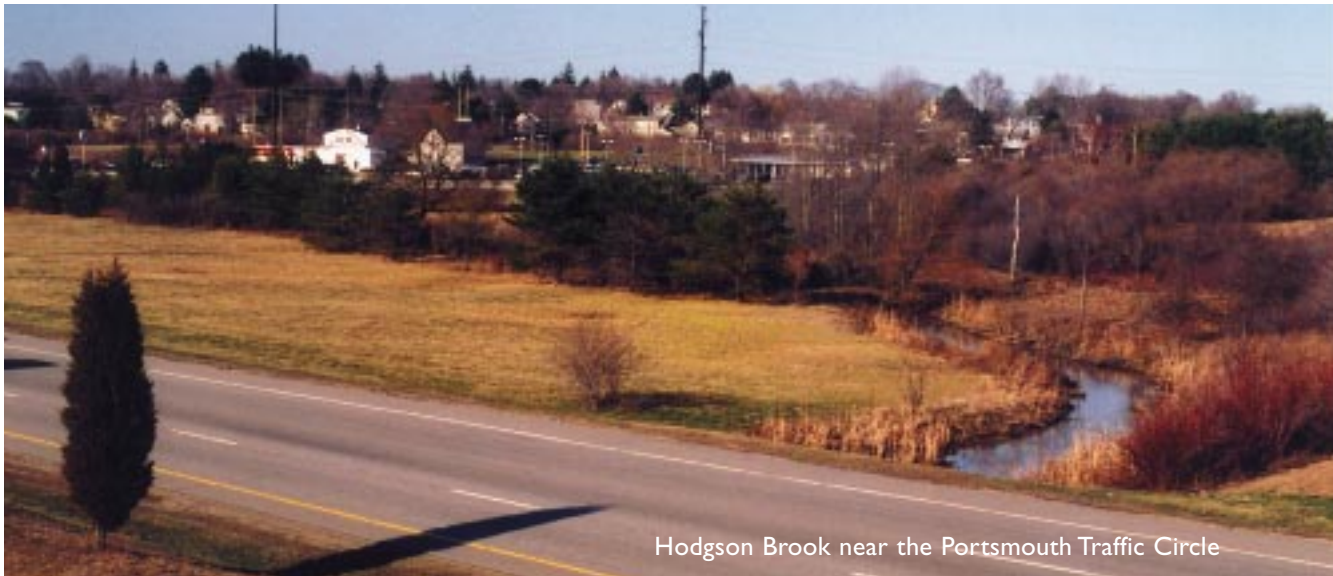
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Finally, we would like to thank the Environmental Protection Agency and the New Hampshire Department of Environmental Services for supporting watershed restoration for this and many other areas throughout the United States.



Steve Miller

Hodgson Brook near the Portsmouth Traffic Circle

EXECUTIVE SUMMARY

The purpose of the *Hodgson Brook Restoration Plan* is to describe the goals set by the community to restore and protect Hodgson Brook and the actions that are necessary to meet those goals. There are two companion documents, the *Hodgson Brook Monitoring Plan* and the *Hodgson Brook Restoration Implementation Plan*, that address the environmental monitoring needs and the framework for coordinating the restoration efforts, respectively. There is also a report that describes the environmental information for Hodgson Brook, namely the *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003). All of these reports were generated under the direction of the Hodgson Brook Local Advisory Committee with support from the Advocates for the North Mill Pond, the City of Portsmouth, the New Hampshire Department of Environmental Services, and the United States Environmental Protection Agency.

The Hodgson Brook watershed is located in the north-central part of Portsmouth, New Hampshire. It covers 2,135 acres, approximately 20% of the total area of Portsmouth. Over 55% of the watershed area (1,174 acres) is within the Pease International Tradeport. The Portsmouth Traffic Circle and the Route 95/Spaulding Turnpike Interchange cut through the middle of the watershed.

Hodgson Brook provides the major source of fresh water to the tidally influenced North Mill Pond. Regular water quality monitoring of Hodgson Brook at the Bartlett Street Bridge indicates the presence of pollutants such as fecal coliform, nutrients (primarily nitrogen and

phosphorus), and suspended sediments that cause turbidity (cloudiness). Blue mussels collected from North Mill Pond and sediment samples taken from the pond near the mouth of Hodgson Brook contained elevated levels of metals and organic chemicals related to petroleum contamination. It is estimated that 683 acres (32%) of the land area within the watershed is covered in impervious surfaces—roadways, pavement, and buildings. Stormwater runoff from these hard surfaces appears to be the largest source of pollution to the Brook. Other pollutant sources such as sewage from cross-connected storm drains and sewer pipes and solid waste (trash and debris) also contribute to the contamination of Hodgson Brook.

Though much of the watershed is urbanized, undeveloped wetlands and woodlands still cover part of the upper watershed especially in the area surrounding Borthwick Avenue and on the Pease Tradeport. Portsmouth zoning information indicates that 254 acres (12%) of the watershed are within the natural resource protection districts. Wetlands make up over 407 acres (19%) of the watershed. In addition, natural, permeable deposits of sand and gravel cover a large area in the western portion of the watershed. These deposits provide water for public water supply wells and, together with the wetlands, serve as a valuable source area for groundwater and surface water that feeds the Hodgson Brook/North Mill Pond system.

The health of the Brook is closely linked to the health of North Mill Pond. The Advocates for North Mill Pond (ANMP) conducted a comprehensive study of the water and environmental quality of the pond in

ANMP and Great Bay Coast Watch
Survey of the Watershed



Ann Reid

1998. Based on this study and the regular sampling of the Brook at the Bartlett Street Bridge, it became clear to the ANMP that in order for the environmental quality of the North Mill Pond to improve, the environmental quality of Hodgson Brook must be restored.

A group of local stakeholders called the Hodgson Brook Local Advisory Committee (LAC) was created in 2002. It is made up of Portsmouth residents, City of Portsmouth staff, businesses, and technical advisors from the University of New Hampshire and the environmental community. Since the formation of the LAC, the committee has worked to develop goals, objectives, and actions to address the restoration of Hodgson Brook.

During the summer and early fall of 2003, the LAC learned about the current environmental status of

Hodgson Brook and North Mill Pond through a series of presentations by other LAC committee members. Based on the information provided, goals were developed to address the environmental problems highlighted in these presentations. Four goals were developed to guide the restoration process:

- Improve the water quality of Hodgson Brook to meet New Hampshire State water quality standards through monitoring and pollutant source reduction and elimination by the year 2014.
- Improve stormwater quality and decrease stormwater runoff volume in an effort to protect water quality and reduce stormwater impacts.
- Gain community support for and understanding of the Hodgson Brook Restoration goals through education, outreach, and improved recreational opportunities.
- Enhance buffer, shoreline, and in-stream habitats to encourage more native and diverse plant and animal populations within the Hodgson Brook watershed.

Each goal includes a series of associated objectives. Specific action plans were developed to address one or more of these objectives. Those actions have been grouped by goal to guide the restoration process.

Implementation of the *Restoration Plan* will be based on an adaptive model. The available environmental data are limited and much additional study needs to be conducted to establish a complete baseline and determine sources of contamination. Therefore, the plan will be a fluid document and will be modified as more information is collected and as a better understanding of the Brook and the sources of degradation are developed.

TABLE OF CONTENTS

Acknowledgements		
Executive Summary		
Section 1		
Getting to Know Hodgson Brook	1	
Learning about the Hodgson Brook Watershed	1	
Hodgson Brook Ties to the North Mill Pond	4	
Brief History of the Hodgson Brook Area	5	
Subwatersheds of the Hodgson Brook Watershed	6	
Section 2		
Restoring the Brook: The Players and the Plan	9	
The Advocates for North Mill Pond	9	
The Hodgson Brook Local Advisory Committee	10	
Local Advisory Committee Accomplishments	11	
Working Together to Achieve Common Goals	12	
Section 3		
Current Watershed Conditions	14	
Water Quality, Sediment and Shellfish		
Contamination in Hodgson Brook	14	
Bacteria Data and Possible Sources	15	
Metals Data and Possible Sources	15	
Organic Chemicals Data and Possible Sources	16	
Nutrients and Dissolved Oxygen Data	17	
Turbidity Information and Possible Sources	17	
Significant Sources/Causes of Contamination		
in the Hodgson Brook Watershed	17	
Impervious Surfaces and Stormwater Runoff	17	
Storm Drainage Systems	18	
Dumpsters, Trashcans, and Illegal Dumping	18	
Commercial and Household Sources		
of Organic and Nutrient Contamination	18	
Atmospheric Deposition	19	
Wetlands and Stream Habitat Along Hodgson Brook	19	
Section 4		
Our Vision for Hodgson Brook	21	
Restoration and Protection Goals	21	
Exploring the Meaning of Urban Stream Restoration	21	
Examples of Watershed Restoration	21	
Benefits of Hodgson Brook Restoration to Citizens,		
Business, and the City	23	
Watershed Monitoring and its Connection to the		
<i>Restoration Plan</i>	23	
Section 5		
Watershed Goals, Objectives, and		
Summary of Actions	25	
Water Quality Restoration Goal	26	
Current Status of Hodgson Brook Water Quality	26	
Water Quality Objectives	26	
Water Quality Restoration Actions	26	
Water Quality Protection Goal	28	
Current status of Hodgson Brook	28	
Water Quality Protection	28	
Water Quality Objectives	28	
Water Quality Protection Actions	29	
Outreach and Education Goal	31	
Current status of Hodgson Brook		
Outreach and Education Efforts	31	
Outreach and Education Objectives	31	
Outreach and Education Actions	32	
Habitat and Wildlife Restoration Goal	35	
Current Status of Hodgson Brook		
Habitat and Wildlife Restoration	35	
Habitat and Wildlife Restoration Actions	35	
Section 6		
Summary of Recommended Actions	37	

Section 7			
Overview of Restoration Implementation	42	Figure 9	Hodgson Brook Local Advisory Committee members 11
References	43	Figure 10	Construction projects as a source of sediment runoff 16
Appendix A		Figure 11	Impervious surfaces in the watershed 17
Contaminant Threats, Sources, and Impacts	44	Figure 12	Storm drain on Hodgson Brook at the entrance to the North Mill Pond on Bartlett Street 18
Appendix B		Figure 13	North Mill Pond shoreline near Granite State Minerals 19
Action Plans	45	Figure 14	Candidate prime wetlands in the Hodgson Brook Watershed 20
Figures		Figure 15	Collecting water samples 24
Figure 1	1	Tables	
Figure 2	3	Table 1	Natural Resource and Zoning Designations in the Hodgson Brook Watershed 2
Figure 3	4	Table 2	Characteristics of the Hodgson Brook Subwatersheds 8
Figure 4	5	Table 3	Hodgson Brook Local Advisory Committee Members and Affiliations 10
Figure 5	6	Table 4	Matrix of Actions: Water Quality Restoration 37
Figure 6	6	Table 5	Matrix of Actions: Water Quality Protection 38
Figure 7	7	Table 6	Matrix of Actions: Outreach and Education 39
Figure 8	9	Table 7	Matrix of Actions: Habitat and Wildlife Restoration 41

SECTION I

Getting to Know Hodgson Brook

Hodgson Brook is located in Portsmouth, New Hampshire, an historic and scenic community with approximately 20,000 residents. The watershed of Hodgson Brook is primarily situated in Portsmouth; however a small area of its northernmost extent is within the Town of Newington. Hodgson Brook is composed of a seven-mile long drainage network that flows from the northwest corner of the Pease Tradeport through the Portsmouth Traffic Circle and into the North Mill Pond at Bartlett Street. Figure 1 provides an overview of the Hodgson Brook watershed.

Most residents of Portsmouth and Newington have not heard of Hodgson Brook and fewer can tell you where Hodgson Brook is. Over much of its course, it is not recognizable as our image of a Brook. Some sections of the Brook, like many urban waterways, have been ditched, straightened, piped through culverts or underground, and paved nearly to its edge in some areas. But other parts of the Brook flow through woods and wetlands and provide refuge for wildlife and natural communities. Where is Hodgson Brook, what threatens the Brook, who cares about it, and what can be done to improve it? These are some of the questions that the *Hodgson Brook Restoration Plan* hopes to answer.

Learning About the Hodgson Brook Watershed

A watershed is the total area of land that is drained by the network of streams and drainage features that make

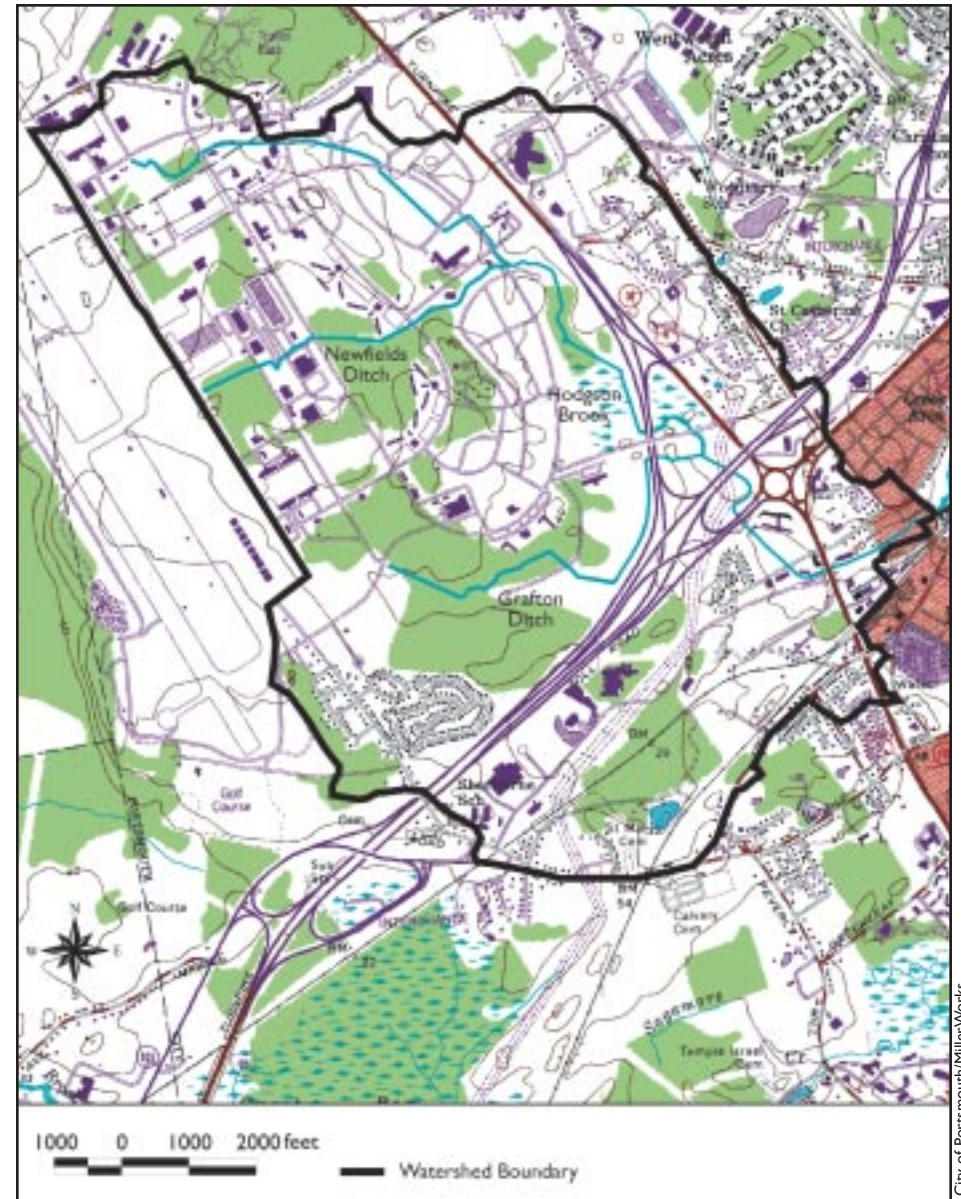


Figure 1 The Hodgson Brook Watershed.

up that stream. The total area of the City of Portsmouth is 10,764 acres (SPNHF, 2004) and the Hodgson Brook watershed takes up nearly 20% of that area, or 2,135 acres. Table 1 provides a summary of the natural resources and zoning designations in the watershed.

As illustrated in Figure 1, the Hodgson Brook watershed is located in north central Portsmouth. The watershed is roughly bounded by Gosling Road and Pease Boulevard to the north, Woodbury Avenue to the east, Islington Street and the railroad to the south, and Route 33 and the eastern edge of the Pease Tradeport runway to the west.

Much of the watershed (nearly 55%) is on the Pease International Tradeport (Figure 2). The main stem of the Brook begins near the New Hampshire Air National Guard Hangar. It is largely obscured until it reaches the

Redhook Brewery area where a stormwater detention pond serves as the drainage collector for the stream in that area.

Also on Pease, there are two drainage systems that feed into the Brook. One of these, Newfields Ditch, receives the majority of drainage from east of the aircraft parking apron, then joins the Brook just upstream of the wastewater treatment plant on the Pease Tradeport where it flows into a large wet meadow. The other drainage system, the Grafton Ditch, drains the southern portion of the Pease Tradeport. Much of this area of the Tradeport is being developed for commercial and industrial use. Grafton Ditch is also fed by the wetland near the ramp leading from the Spaulding Turnpike to Route 95 south. Water from the Grafton Ditch then flows through and underneath this highway

Table 1 Natural Resource and Zoning Designations in the Hodgson Brook Watershed.

	Acres	% of Watershed	Source of Information
Area of Watershed within the City of Portsmouth	2,135	na	SPNHF (2004)*
Impervious Surface Area	683	32%	Based on USGS (2002)
Natural Resources			
Wetland Area	407	19%	Based on Portsmouth GIS estimation, 2003
Permeable Sand and Gravel Aquifers	854	40%	Approximate based on DES Mapping
City Zoning			
Pease Tradeport Zone	1,174	55%	Based on Portsmouth GIS estimation, 2003
Industrial Zone	427	20%	Based on Portsmouth GIS estimation, 2003
Business/Municipal/Airport Zone	844	40%	Based on Portsmouth GIS estimation, 2003
Residential Zone	249	12%	Based on Portsmouth GIS estimation, 2003
Conservation Areas	266	12%	Based on Portsmouth GIS estimation, 2003
Transportation Network	348	16%	Remainder area (estimation)

*Note: According to SPNHF GIS data, the City of Portsmouth covers 10,764 acres.



Pease Development Authority

Figure 2 Pease International Tradeport.

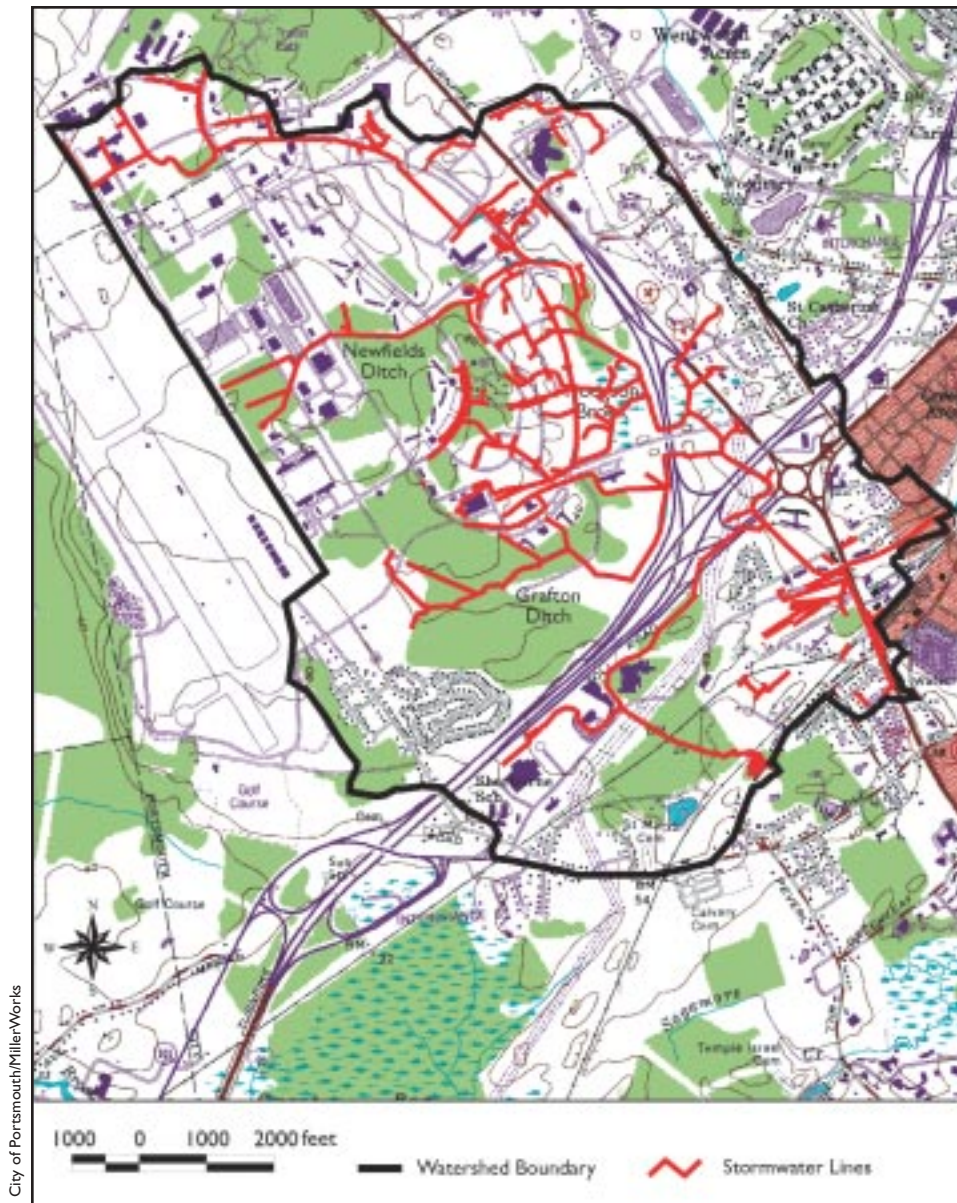


Figure 3 Stormwater drainage patterns in the Hodgson Brook watershed.

network, through culverts and ditches until it joins with the southern branch of the Brook southwest of the Portsmouth Traffic Circle.

The southern branch of Hodgson Brook originates in the Pannaway Manor neighborhood. It flows past the Sherburne School, then west of Borthwick Avenue until it joins with the other branches just south of the Portsmouth Traffic Circle. This main stem of the Brook crosses the Route 1 Bypass and is then diverted through culverts and straightened ditches paralleling Cottage Street. The Brook then flows behind Eldredge Park passing under a parking lot and Bartlett Street until it flows into North Mill Pond.

Stormwater collection systems (Figure 3) drain a large portion of the Pease Tradeport as well as the Meadowbrook area southwest of the Bypass. These stormwater systems then discharge into the Brook. Maps and a more detailed description of drainage systems is contained within *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003).

Hodgson Brook Ties to the North Mill Pond

The North Mill Pond is a 62-acre tidal pond fed by the tidal flow of the Piscataqua River, and by the freshwater flow of Hodgson Brook and other minor drainage features to the east and west of the pond. All of Hodgson Brook flows to North Mill Pond and it provides the largest single source of fresh water to the pond (ANMP website).

The neighborhoods that surround the pond and Hodgson Brook are a reflection of the diversity of Portsmouth, with a mixture of heavy industry, commercial development, and residential neighborhoods. A 1998

study by Advocates for North Mill Pond showed that the pond provides critical habitat necessary for fish and wildlife, and is an important stopover for migratory birds. Since Hodgson Brook provides the major source of fresh water to the pond, the health of the pond is closely tied to the health and water quality of Hodgson Brook.

A Brief History of the Hodgson Brook Area

Prior to the seventeenth-century settlement and development of Portsmouth, the Brook flowed unrestricted to the Piscataqua River. In the 1660s, Hodgson Brook was dammed near what is now the upper end of the North Mill Pond (near Bartlett Street) for water-powered sawmilling. In 1764, the mouth of North Mill Pond (also referred to as Islington Creek) was dammed for use as a tidal gristmill (Candee, 1992).

Though Hodgson Brook once flowed through farm fields, woodlands, and marshes before entering what is now known as North Mill Pond, its course was progressively channeled and diverted as this area of Portsmouth grew from rural outpost to a busy mill area and neighborhood.

By the early 1800s the area of the lower portion of Hodgson Brook, between what is now the Route 1 Bypass and Bartlett Street, became dominated by mills and mill housing. An 1850 map of North Mill Pond shows a hosiery mill on the Brook near Bartlett Street and the extensive impact of the construction of rail lines along the Pond shores (Figure 4). Further down Islington Street, the Morley Button Factory stretched for blocks. It is likely that much of this portion of the Brook was urbanized and straightened at that time.

The building of the Pease Air Force Base (now the Pease International Tradeport) and the construction of

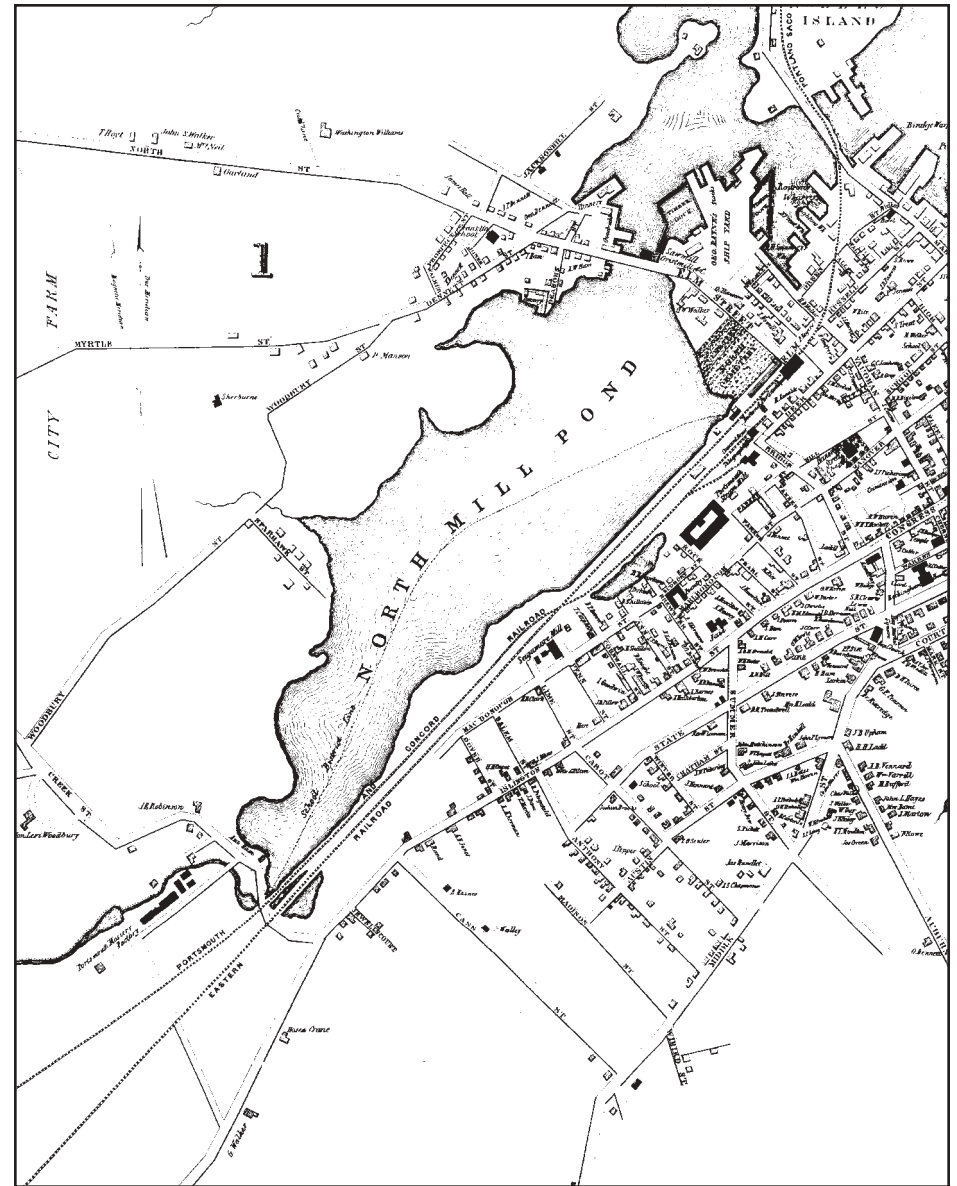


Figure 4 Map of the North Mill Pond, showing railroad and industrial development. From *Map of the City of Portsmouth*; C.W. Brewster, Publisher; 1850.



Figure 5 Aerial view showing Grafton Ditch.



Figure 6 Aerial view showing the flow of Hodgson Brook to the North Mill Pond and the Piscataqua River.

the highway system in the 1950s dramatically altered the natural course of the stream. On Pease it was ditched and diverted into what is now known as Newfields Ditch and Grafton Ditch (Figure 5) as part of the construction of the Pease Air Force Base. From the wet meadow just downstream of the Pease wastewater treatment plant, the Brook was straightened to flow southeast across the highway, just south of the traffic circle. Then taking a sharp bend to the northeast, the Brook was diverted under the Route 1 Bypass towards Bartlett Street (Figure 6). When Route 95 was constructed, drainage was further diverted into stormwater collection systems and newly straightened ditches.

Stormwater collection systems constructed over the last 100 years are the predominant drainage conveyances in the Woodbury, Pannaway, and North Mill Pond neighborhood areas. Wetlands made up a large portion of this area at one time. In the Borthwick Avenue area, several wetlands remain but are bordered and cut by roadways, railroad tracks, and parking lots. The commercialization of the Borthwick area in the 1950s and 1960s included storm drain diversion and ditching of this branch of Hodgson Brook.

Subwatersheds of the Hodgson Brook Watershed

Subwatersheds are smaller divisions of a whole watershed. Often watersheds are divided into smaller units especially if conditions are unique to a given portion of a watershed. The Hodgson Brook watershed has been divided into six subwatersheds as shown in Figure 7. Table 2 describes the characteristics of each subwatershed. References to these subwatersheds are made throughout the text.

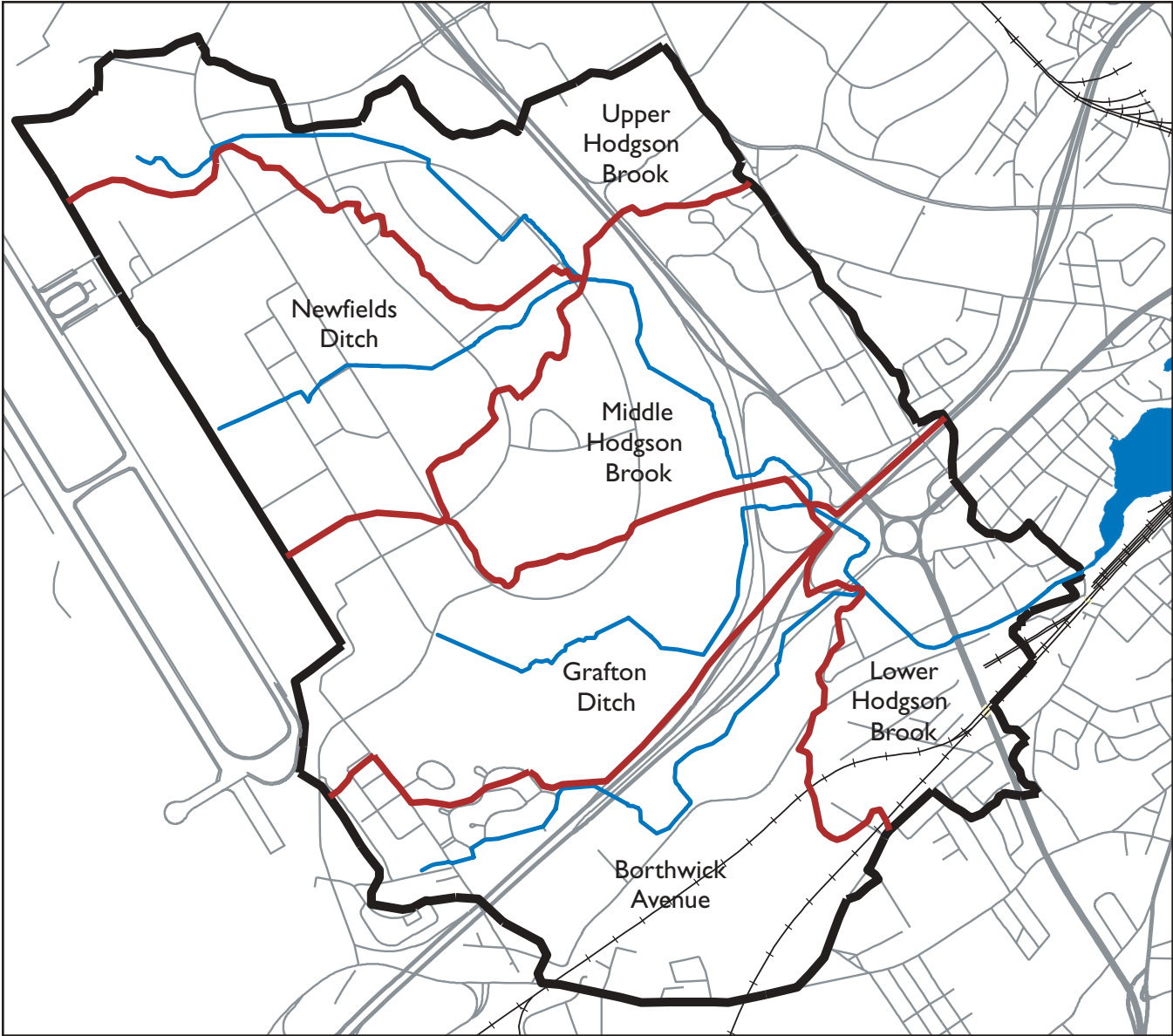


Figure 7 Hodgson Brook Subwatersheds.

Table 2 Characteristics of the Hodgson Brook Subwatersheds.

Subwatershed	Location	Area	Characteristics
Upper Hodgson Brook	Newington/ Portsmouth	Pease Tradeport and N. Woodbury Avenue	Commercial and industrial development cut by Spaulding Turnpike
Middle Hodgson Brook	Portsmouth	Pease Tradeport and S. Woodbury neighborhoods	Commercial, industrial, and residential develop- ment cut by Spaulding Turnpike
Lower Hodgson Brook	Portsmouth	Pease Tradeport and North Mill Pond Neighborhood	Commercial, industrial, and residential, includes Portsmouth Traffic Circle
Newfields Ditch	Portsmouth	Pease Tradeport	Area southeast of runway apron, commercial and industrial development, some woods and fields
Grafton Ditch	Portsmouth	Pease Tradeport	Commercial and industrial development; substantial wetlands and wooded area
Borthwick Avenue	Portsmouth	Pannaway Manor neighborhood, Western Islington Street and Borthwick areas	Commercial, industrial, residential, wetlands, field and woodlands

Facts and Figures

- The Hodgson Brook drainage system is made up of over 7 miles of waterways. Much of the Brook has been straightened and diverted through underground piping or drainage ditches.
- The Hodgson Brook watershed makes up nearly 20% (2,135 acres) of the total land area of Portsmouth (Morin and Jones, 2003).
- Hodgson Brook is the primary source of fresh water for North Mill Pond.
- Nearly 55% (1,174 acres) of the Hodgson Brook watershed is within the Pease International Tradeport (Morin and Jones, 2003).
- Over 19% (407 acres) of the watershed is made up of wetlands (Morin and Jones, 2003).
- Nearly 15% (266 acres) of the Hodgson Brook watershed is within areas designated for natural resource protection by the Pease Development Authority or the City of Portsmouth (City of Portsmouth, 2003).
- Impervious surfaces (pavement, buildings, roadways) cover nearly 32% (683 acres) of the watershed area (USGS, 2002).
- Over 40% (854 acres) of the watershed is underlain by very permeable sands and gravels that contain valuable groundwater resources (DES, 2002).
- Three public water supply wells are located within the watershed (DES, 2002).
- A 1998 study measured low flow of Hodgson Brook at 12 liters/seconds (l/s) and a peak flow of 1,670 l/s (ANMP, 1998).

SECTION 2

Restoring the Brook: The Players and the Plan

Many groups and organizations are involved in the restoration efforts on Hodgson Brook. The Advocates for North Mill Pond initiated the idea of Brook restoration and through their efforts, have engaged the cooperation of New Hampshire Department of Environmental Services (DES), the City of Portsmouth, and several other state and local agencies in the process. The group of stakeholders engaged in development of the restoration and implementation plan is known as the Hodgson Brook Local Advisory Committee (LAC). The following section describes each of these groups and their efforts to date.

The Advocates for North Mill Pond

The Advocates for the North Mill Pond (ANMP) is a neighborhood association formed in 1997 with the purpose of protecting, conserving, and enhancing the North Mill Pond and its surrounding neighborhoods. ANMP considers the pond to be an asset to the City of Portsmouth and includes in its mission:

- to encourage appropriate revitalization that will complement and encourage the stability of the tidal pond ecosystem while enabling the community to utilize appropriate surrounding areas,
- to foster an appreciation of the historical and cultural resources of the pond and the surrounding area,
- to encourage stewardship of the pond through activities such as community clean-ups, water quality monitoring, and remediation programs, and

- to provide a forum that will keep the neighborhoods informed of any and all issues that may impact the North Mill Pond and the surrounding area.

ANMP completed an important study of the North Mill Pond in 1998 (ANMP, 1998) that documented the environmental quality of the pond. At that time, ANMP and DES began to share information on water quality sampling and illicit discharge studies being conducted in Portsmouth to address some of the high bacteria (fecal



Figure 8 Hodgson Brook, looking west between Cate Street and Route 1 Bypass, and ANMP survey group.

coliform) readings measured at Bartlett Street Bridge and in the pond.

In order to learn more about the Hodgson Brook system, ANMP volunteers walked upstream from Bartlett Street towards the Route 1 Bypass. They identified multiple problem areas and noted that they could smell the petroleum residues (from oil and gas runoff) in Brook sediments (Miller, personal communication, 2004).

In 1999, and again in 2000, eelgrass was planted in several areas of the North Mill Pond. Eelgrass has been found to provide valuable near shore habitat for fish and shellfish. It helps to stabilize stream and pond bottoms and absorbs nutrients that will later be recirculated back into the marine life cycle. Even after several plantings, the grasses failed to take hold (Konisky, et al., 2000). It was feared that the poor water quality was one of the reasons

the eelgrass could not be established. It became clear to ANMP and DES that the quality of Hodgson Brook needed to be studied and improved in order to successfully clean up and restore habitats to North Mill Pond.

The ANMP concluded that the pollution sources from Hodgson Brook needed to be identified and a framework developed to restore the water quality and habitat value of the Brook. They believed that assembling a broader group of stakeholders would enhance the progress towards restoration of Hodgson Brook and, in turn, North Mill Pond. To that end the Hodgson Brook Local Advisory Committee (LAC) was formed in 2002.

The Hodgson Brook Local Advisory Committee

The Hodgson Brook LAC (Figure 9) is made up of representatives from the City of Portsmouth, residents of the

Table 3 Hodgson Brook Local Advisory Committee Members and Affiliations.

Name	Title	Agency/Organization
Matt Baillargeon	Service Manager	Coast Pontiac
Doug Bogen	NH Director	Clean Water Action
Peter Britz	Environmental Planner	City of Portsmouth
Dave Burdick	Research Assistant Professor	UNH Jackson Estuarine Lab
Doug DePorter	Assistant District Engineer	NH DOT
Gerald H. Dexter	Engineering and Management Consultant Formerly Director of Engineering, Pease	GHD Consulting, Pease Development Authority
Steve Jones	Research Associate Professor	UNH Jackson Estuarine Lab
Natalie Landry	Coastal Watershed Supervisor	DES
Barbara McMillan	Watershed Outreach Coordinator	DES
Steve Miller	Grant Coordinator	Advocates for the North Mill Pond
Julia Peterson	Extension Specialist	UNH Sea Grant & Cooperative Extension
Peter Rice	City Engineer	City of Portsmouth
Ann Smith	President	Advocates for the North Mill Pond
Sally Soule	Nonpoint Source Pollution Program Coordinator	NH Coastal Program

North Mill Pond neighborhood, local businesses, a representative from the Pease Tradeport, and several environmental professionals that live and work in the Portsmouth area. The list of members is included in Table 3.

The LAC began meeting in 2002 and immediately developed a mission statement: *to improve the water quality and natural habitat of the Hodgson Brook by creating and implementing a restoration plan that builds community support and stewardship through education.* The plan will include input from watershed residents and business owners and will utilize the best available science and technology.

The work of the LAC is made possible through a grant from DES through the Watershed Assistance Restoration Grants Program and matching funds provided through the participation of the community. The Grants Program is funded through the US Environmental Protection Agency pursuant to Section 319 of the Clean Water Act. The grant funded the work of the LAC and the preparation of the environmental status report, a monitoring plan, and the restoration and implementation plans.

Local Advisory Committee Accomplishments

Early LAC meetings were devoted to forming a representative working group and developing the mission statement, meeting goals, and schedule for completion of its work tasks. Since June 2003, the LAC has learned about the environmental quality of the Brook and has worked on developing goals and objectives for the restoration of Hodgson Brook. Also during that time the *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003) was prepared. This report was finalized in August 2003.



Bill Truslow

Figure 9 Hodgson Brook Local Advisory Committee members. Left to right, front row: Natalie Landry, Peter Britz, Sally Soule, Ann Smith, Danna Truslow. Back row: Steve Miller, Julia Peterson, David Burdick, Doug DePorter, Doug Bogen. Missing: Barbara McMillan, Peter Rice, Steve Jones, Gerald Dexter, Matt Baillargeon.

The *Hodgson Brook Watershed Monitoring Plan* (Morin, et al., 2003) has also been completed. The LAC worked with the University of New Hampshire to complete these two documents.

Since October 2003, the LAC has worked on developing actions to address the initial goals and objectives. These goals, objectives, and their actions have been used to create this *Restoration Plan* and will be used as guidance for the *restoration Implementation Plan*. The final tasks of the LAC focused on completion of both *Plans* to assure a smooth transition to implementation.

Working Together to Achieve Common Goals

One of the primary goals of the LAC was to engage watershed residents, City of Portsmouth officials and staff, and local businesses, and encourage them to take a leadership and stewardship role in the clean up and protection of Hodgson Brook. Table 3 illustrates the diversity and expertise of the LAC membership. The process of developing the Restoration Plan has evolved over two years. All members have played an important role and bring their unique specialties to the project.

The ANMP was the lead organization for this endeavor. They hired a local facilitator to guide the development of the Restoration Plan and members of the ANMP were invaluable for their range of expertise and local knowledge. The ANMP's successes in outreach and community involvement also brought legitimacy to the process.

DES contributed funding and technical assistance to the project, awarding a Watershed Restoration Assistance Grant to the ANMP to support the development of the plan. Two staff members participated in the LAC, and DES hosts the Hodgson Brook website. In addition, prior to and over the course of the project they conducted water quality sampling and worked with the City of Portsmouth to eliminate illicit sewer and storm drain system cross connections and illicit discharges. Major gains have already been made in the quality of water that flows to the North Mill Pond.

The City of Portsmouth contributed funding toward the study and dedicated a large amount of time to the LAC with participation from the Planning and Public Works departments. They have also made a con-

certed effort to improve stormwater quality, eliminate illicit discharges, and decrease direct runoff in the area. They have cooperated with DES to repair cross connections and have worked to separate storm and sewer flow through combined sewer overflow separation projects. Three years ago, the city eliminated sand from its winter road treatment mix, helping to reduce sediment loads sent to storm systems and waterways. The City also recognized the efforts of the LAC in the City's Master Plan and through the *Portsmouth Listens* community visioning process.

Protection of wetlands within the City has been a gradual process. The City wetlands protection ordinance now includes a 100-foot buffer around all freshwater wetlands greater than 0.5 acres in size (excluding the wetlands on the Pease Tradeport). The City has also completed an inventory of wetlands within Portsmouth (CLD, 2003).

The Pease Development Authority (PDA), the governing body for Pease International Tradeport, has authorized the participation of a PDA engineer in the LAC process. Since the largest percentage of the watershed is on Pease and it is an important headwaters area for the Brook, the participation of PDA in the restoration and protection process is critical.

PDA is now considering further strengthening wetland protection on Pease after a study is conducted to determine the appropriate setbacks in various locations at Pease (Dexter, personal communication, 2004). The Pease Development Authority has also contributed to the improvement of the quality of stormwater runoff. Older facilities and stormwater infrastructure have been replaced during redevelopment that conforms to today's

more stringent stormwater design standards. PDA follows a strict policy of minimization and avoidance of wetland impacts, which has resulted in filling of less than 1 acre of wetland since redevelopment began in 1992. PDA also participated in a Grafton Ditch Restoration Project, providing a 40% match to secure a USEPA funded grant as part of the Non-Point Source Pollution Program. (Dexter, personal communication, 2004).

University of New Hampshire researchers and Cooperative Extension specialists provided a variety of expertise to the LAC and will continue to play an important role throughout restoration implementation. In addition to coordinating and providing technical assistance on North Mill Pond restoration, the UNH researchers wrote the *Environmental Characterization Report* (Morin and Jones, 2003) and *Monitoring Plan* (Morin, et al., 2003) for Hodgson Brook.

The New Hampshire Department of Transportation (DOT) has also provided representation for the LAC. Their cooperation is essential to the vitality of Hodgson Brook as runoff from the roadways that bisect the water-

shed provides a major potential source of contamination to the Brook. Plans to rehabilitate major roadways, including the Portsmouth traffic circle, will require good communication and cooperation with DOT.

Local businesses also played a key role in plan development by participating in the LAC and by providing financial support and in-kind services. The participation of businesses on the Pease Tradeport and in the commercial/industrial sections of Portsmouth will be important during the implementation of the *Hodgson Brook Restoration Plan*. They occupy a large portion of the watershed and their understanding of the *Plan*, stewardship of their own businesses and encouragement of employees to participate in the restoration will be a key to the success of the project.

The local expertise that is represented on the LAC is impressive. Experts in water quality, hydrology, wetland ecology, engineering, outreach and watershed assistance have been very valuable in crafting the ambitious goals, objectives, and actions associated with the *Watershed Restoration Plan for Hodgson Brook*.

SECTION 3

Current Watershed Conditions

A restoration program works to improve conditions in a watershed based on the current understanding of water quality and habitat and the stressors that impact the quality of these features. The following section provides an overview of current water, sediment, and biota quality conditions, as they are understood. Following this section is a description of the significant sources and causes of contamination to the Brook. A summary of the contaminants and pollution sources is provided in Appendix A. A complete description of current conditions and environmental data collected on the Brook to date is provided in *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003). This report was produced in preparation for developing the restoration plan and is available at the DES Pease field office or at www.des.state.nh.us/HodgsonBrook.

Several entities have conducted environmental monitoring in and around Hodgson Brook and the North Mill Pond. Great Bay Coast Watch, a UNH SeaGrant sponsored volunteer monitoring program, has conducted water quality sampling at the mouth of Hodgson Brook near Bartlett Street and at North Mill Pond at Maplewood Avenue since 1997. Water and sediment quality sampling were also conducted in the Hodgson Brook Watershed on Pease in the 1980s and 1990s as part of the U.S. Air Force Superfund Cleanup. Since 1992, the Pease Development Authority has been regularly sampling surface water as part of a National

Pollutant Discharge Elimination System (NPDES) permit for the Pease Tradeport. The NPDES permit requires monitoring of a broad spectrum of pollutants including turbidity, biological oxygen demand (BOD), Chemical Oxygen Demand (COD), oil and grease, total suspended solids (TSS), surfactants, lead, cadmium, nickel, zinc, polynuclear aromatic hydrocarbons (PAHs), pH, toxic chemicals, metals, and nutrients. NH Coastal Program and UNH conducted other short-term surveys of water and habitat quality on Hodgson Brook, but in general, comprehensive monitoring of the water quality of the Brook has not been conducted.

The following is a summary of what is currently known about conditions in the Brook and is based on the data and descriptions contained with the *EQC Report* (Morin and Jones, 2003). Appendix A shows a brief summary of the contaminants, sources, and impacts.

Water Quality, Sediment, and Shellfish Contamination in Hodgson Brook

DES determines if surface waters of the State meet certain uses based on available data from DES monitoring efforts and other organizations' data. DES separates Hodgson Brook into three distinct segments for determining if the six designated uses are met for the Brook. The designated uses are Aquatic Life, Drinking Water After Adequate Treatment, Fish Consumption, Primary

Contact Recreation, Secondary Contact Recreation, and Wildlife. The three segments of Hodgson Brook, also called assessment units, have not been assessed for the drinking water or wildlife uses. As is the case for all of the state's freshwater fish, consumption is impaired based on mercury contamination from atmospheric deposition. The main stem of Hodgson Brook is also impaired for primary and secondary contact recreation based on the presence of high bacteria levels. The other two segments, Lower Newfields Ditch and Lower Grafton Ditch, do not support aquatic life uses, in addition to the fish consumption impairment previously mentioned. For more information on the DES assessments, go to www.des.state.nh.us/wmb/swqa.

Water, sediment, and mussel tissue have been collected and analyzed to determine environmental quality of Hodgson Brook and North Mill Pond. Much of the data has been collected through the Great Bay Coast Watch and DES programs. The variety of indicators, sampling media, and sampling locations chosen by these groups were selected to illustrate the health of the Pond and Brook and to determine pollution sources. These indicators include bacteria, toxic metals, organic chemicals, nutrients, dissolved oxygen, and turbidity. Sampling of sediments and water on Pease was conducted as part of the Pease Air Force Base Superfund Cleanup Program and NPDES sampling. The following summary briefly describes the results of these sampling efforts and possible sources of these contaminants.

Bacteria Data and Possible Sources

Fecal borne microbes are generally measured using the indicator species fecal coliform. This indicator was

measured in Hodgson Brook at Bartlett Street and was reported to have the highest mean concentration of all sites on the Seacoast measured by Great Bay Coast Watch between 1997 and 2001. The highest concentration recorded to date was 6,600 counts (microbes) per 100 milliliters (ml) in 1999. The state standard for shellfish growing waters is 14 counts per 100 ml of water of fecal coliform.

Water samples have been collected during storm events (wet weather flow) and during dry weather and analyzed for bacterial indicators. It was found that concentrations of these microbes were highest during wet weather flows, suggesting that stormwater in this area contains a high concentration of bacteria. The presence of bacteria during dry weather is probably representative of multiple upstream pollutant sources, including illicit sewer connections that have not yet been identified.

Since the only long-term sampling location for bacteria on Hodgson Brook is near its discharge to North Mill Pond at Bartlett Street, little is known about the sources or distribution of bacterial contaminants in the watershed. More investigation of elevated levels was highly recommended in the *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003). The monitoring program, a key component of the *Restoration Plan*, includes gathering additional data along the Brook and improving the understanding of sources of this contaminant in the watershed.

Metals Data and Possible Sources

Most of the data collected on metals contamination in Hodgson Brook has been on the Pease Tradeport. Some

data have also been collected from shellfish tissue and sediments in North Mill Pond.

Sediments collected in the early 1990s on Pease detected a wide variety of metals. In comparison, water samples collected in 2000 from Grafton Ditch detected elevated levels of only arsenic and lead. Recent sediment samples from Grafton and Newfields ditches also contained arsenic and lead.

Elevated levels of mercury were detected in sediments near a Bartlett Street sampling location during a 1997 study of environmental conditions of the North Mill Pond. In 1998, silver, cadmium, copper, chromium, mercury, nickel, lead, and zinc were detected in blue mussel tissue sampled from a location in the Pond near the Maplewood Bridge (Jones and Landry, 2000). Recent data from 2000 showed elevated levels of lead in mussel tissue from North Mill Pond compared to other

sites in New Hampshire. Mercury in mussel tissue from North Mill Pond and other New Hampshire sites are also elevated compared to other areas in the United States (Jones, personal communication, 2004).

Organic Chemicals Data and Possible Sources

Toxic organic chemicals discussed in this section include polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides. Like the metals discussed above, these analyses were conducted as part of the Pease Air Force Superfund Cleanup and through mussel tissue and sediment sampling at North Mill Pond.

At Pease, historic sampling detected elevated PAH and pesticide levels in both Grafton and Newfields ditches. Recent sampling indicates that PAH and pesticide concentrations are still elevated in Grafton ditch. However, PAH levels have been shown to be on the decline.

The 1998 North Mill Pond sampling of mussel tissue indicated that PCB, DDT, and other pesticide levels were two to twelve times higher than other sampling locations in the Great Bay Estuary (Jones and Landry, 2000). However, the levels were far lower than what was measured in Boston Harbor the same year (Jones, et al., 2001). The sediment samples collected by the ANMP in 1997 did not indicate elevated concentrations for PCB or pesticides, however detection limits for these compounds were noted to be high for this sampling effort (ANMP, 1998). The 1997 study did show that PAH compounds were present in sediments, with one of the highest concentrations near the Bartlett Street Bridge. Dioxins and furans were also found in elevated concentrations at this location. Further results from sediment sampling in 2002 and 2003 will soon be available to confirm these measurements.



Steve Miller

Figure 10 Construction projects as a source of sediment runoff.

Nutrients and Dissolved Oxygen Data

Water samples collected between 1997 and 2000 show elevated nutrients and depleted dissolved oxygen at Bartlett Street and at an upstream location. More investigation of elevated nutrient levels was highly recommended in the *Environmental Quality Characterization for Hodgson Brook in Portsmouth, New Hampshire* (Morin and Jones, 2003).

Turbidity Information and Possible Sources

Turbidity measurements at the Bartlett Street location indicate an excess of suspended sediments during periods of high stormwater runoff. The State regulates construction projects to prevent the release of sediment into streams and wetlands. Enforcement records for the State's *Site Specific/Alteration of Terrain* permits, documented in Morin and Jones (2003), show citations and fines for non-compliance with erosion/sediment control requirements during building in the watershed.

Significant Sources/Causes of Contamination in the Hodgson Brook Watershed

The contaminants discussed above can come from a variety of sources. Some of the sources and causes of urban pollution in a stream are discussed below. For additional information, the publication *Best Management Practices to Control Nonpoint Source Pollution* (DES, 2004) covers many of these topics in more detail and provides valuable suggestions for minimizing these impacts. This publication may also be accessed online at www.des.state.nh.us/wmb/was. The following section describes the most significant sources of contamination to Hodgson Brook.

Impervious Surfaces and Stormwater Runoff

Hard surfaces where water cannot readily absorb into the soil are termed impervious surfaces. In urban areas this includes roadways, parking lots, sidewalks, and buildings. Nearly one third (32%) of the surface area of the Hodgson Brook watershed is covered by impervious surfaces (USGS, 2002).

Rainfall and snowmelt (collectively termed as stormwater) can penetrate into the ground in pervious areas allowing for groundwater recharge and slow discharge to surface waters. In addition, the quality of the water flowing through a groundwater system or wetland can be improved as it passes through these subsurface areas and is filtered and contaminants are modified in transport.

On impervious surfaces that same water flows rapidly over these hard surfaces and runs off towards storm



Figure 11 Impervious surfaces in the watershed. Foreground: Islington Street; top: Route 1 Bypass extending to the Portsmouth Traffic Circle.

drains or drainage ditches before entering a stream or other water body. The water washes over the material that has collected on these surfaces—leaks from automobiles, sand, silt, excess lawn/road treatment chemicals, pet wastes, air deposition, and solid waste causing many of the pollution problems discussed in the previous section. Storm runoff across impervious surfaces is not slowed down by absorption or interception by vegetation so it flows rapidly to drains, often exceeding the capacity for drains and ditches and causing flooding. This water also does not receive any water quality filtration as it passes through ditches and pipes and can often transport sediment and contaminated materials that have collected in these storm drains.

Storm Drainage Systems

Storm drains carry storm flow and road runoff from ditches and impervious surfaces to a receiving water body. As described in the previous sections, this storm flow can carry contaminants and sediment to the point of discharge of the storm drain and pollute the receive-

ing stream. Excess sediments (i.e., sand, silt, clay) in a stream cause turbidity or cloudiness.

If storm drains are flowing when there has not been recent rainfall, this can indicate that groundwater is discharging into the storm drain system or that there is an illicit discharge to the storm sewer. Portsmouth's Department of Public Works has made significant progress towards correcting illicit discharges and cross-connections between sanitary sewers and storm sewers. However, some of these connections remain. These can be a source of bacterial, metal, organic, and nutrient contamination.

Storm water from drains that discharge directly to surface water does not receive any natural treatment or filtration; the full load of sediment and contamination is discharged directly to the receiving water body. The influx of pollutants during a storm can impact the stream in several ways. This rapid discharge can cause acute toxic effects on sensitive species of fish, erode banks and streambeds, and cause siltation and clouding of streams, resulting in long-term habitat damage.

Dumpsters, Trashcans, and Illegal Dumping

In addition to being an eyesore, trash and debris on the ground or pavement and improperly covered dumpsters and trashcans, especially close to a stream or storm drain, can pollute stormwater and groundwater. Even yard waste dumped too close to surface water or storm drains can significantly impact the quality of stormwater runoff.

Commercial and Household Sources of Organic and Nutrient Contamination

Improper handling of refined petroleum and synthetic organic compounds can cause contamination of water



Steve Miller

Figure 12 Storm drain on Hodgson Brook at the entrance to the North Mill Pond on Bartlett Street.

bodies. Polynuclear aromatic hydrocarbons (PAHs) are usually derived from petroleum compounds. Their presence in water and sediment is generally from leaks or discharges of these compounds and road runoff. Most are not highly volatile so they tend to accumulate in sediment and animal tissue. The presence of pesticides and herbicides is a result of general household use for landscaping or pest control. For instance, pesticides were widely used at Pease to prevent infestations in base housing.

Nutrients are compounds that stimulate biological growth. Too many nutrients in a surface water system can cause unwanted algal and vegetation blooms which leads to eutrophication and depletion of oxygen in water. If there is little or no oxygen in a system, aquatic organisms will not be able to survive and the biological system will eventually become severely degraded. The most common nutrients are phosphorus and nitrogen and are derived from fertilizers applied to lawns and landscaped areas, sewage, pet waste, atmospheric deposition, and additives to detergents and cleaning products.

Atmospheric Deposition

Particulate matter, nitrogen and sulfur dioxide, metals, and some organic compounds (PCBs/dioxins in particular) are released by burning of fossil fuels and wastes. Mercury, arsenic, nitrate, and sulfate contamination have all been linked to atmospheric sources. Smokestack scrubbing and air quality controls have helped to reduce these emissions, but they are still a problem.

Wetlands and Stream Habitat Along Hodgson Brook

With the exception of wetland areas and some segments of the upper Grafton Ditch subwatershed, the habitat of



Figure 13 North Mill Pond shoreline near Granite State Minerals.

Hodgson Brook is severely compromised due to urbanization and development within the watershed. Floodplain areas have generally been destroyed as storm drains, piping, and regraded and straightened ditches have replaced many natural drainage features.

Little data have been collected on the existing habitat; however a recent wetland evaluation conducted for the City of Portsmouth characterized two of the wetlands within the Hodgson Brook system as Prime Wetland Candidates (CLD, 2003). Figure 14 illustrates the locations of these wetland areas. As is pointed out in this report, these wetlands can be valuable refuges for wildlife within an urban setting and can also provide valuable flood control, groundwater recharge, and water filtration capacity.

The wetland evaluation shows several areas in Pease that are underlain by Hydric A and B soils, which are usually associated with wetland conditions. Prime wetlands are those that meet the requirements for a wetland

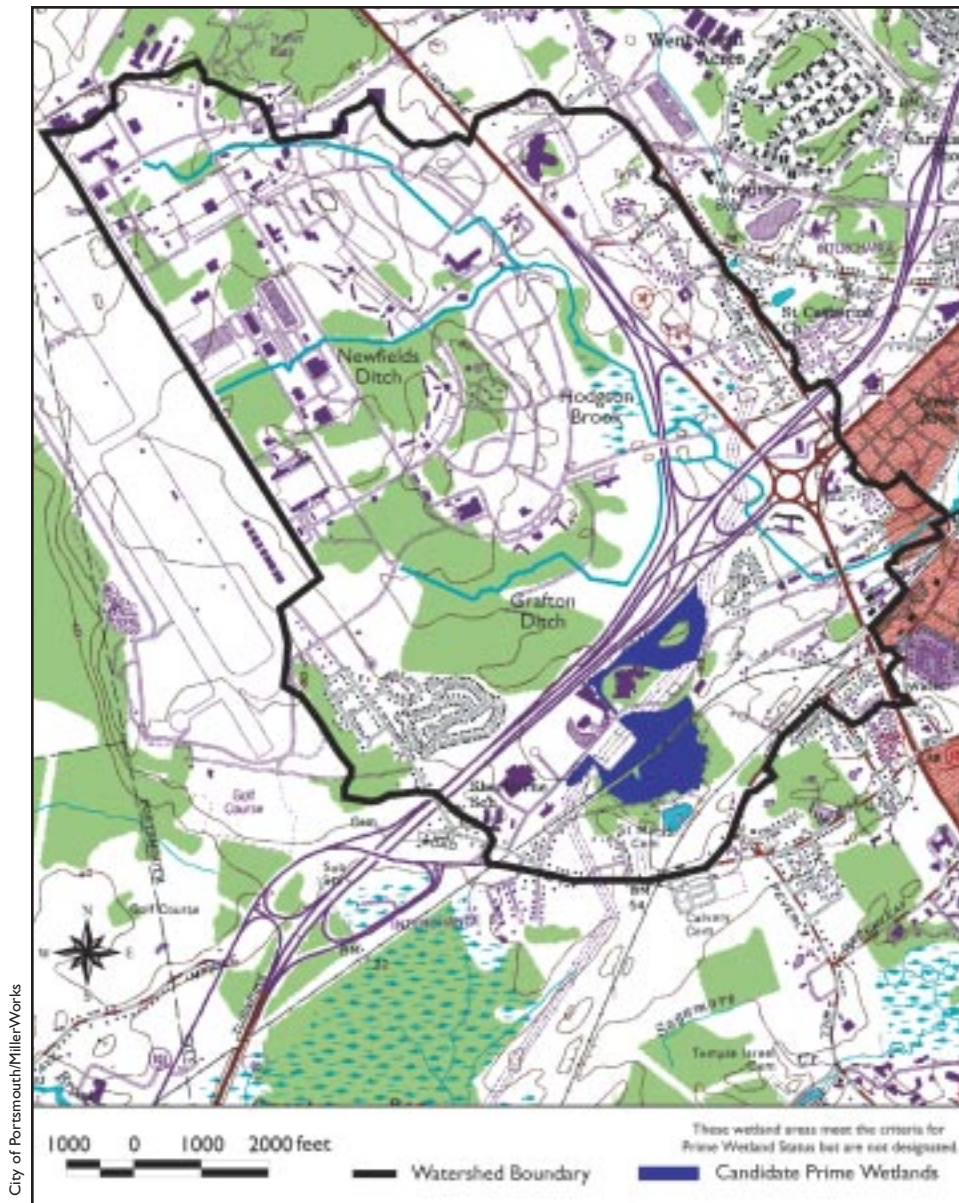


Figure 14 Candidate prime wetlands in the Hodgson Brook watershed.

(plants, hydrology, and soils) and are greater than 50% Hydric A or very poorly drained soils. The two wetlands eligible for Prime consideration within the Hodgson Brook watershed are located along Borthwick Avenue and are named for the purposes of this report Borthwick (No. 015) and Pine Island (No. 014). The Borthwick wetland is a 36-acre area predominated by cattails, rushes, and sedges with scattered small trees and shrubs. Of the 20 candidate sites citywide, it is rated 10th for ecological integrity. Pine Island, a 20-acre area, contains cattail and phragmites species and also surrounds an upland island occupied by tall white pines. It is rated 11th for ecological integrity.

In 2000, DES conducted a bio-monitoring program along portions of the Brook. Interpretation of bio-monitoring data can help to indicate the overall health of a stream habitat. The NH Coastal Program (NHCP) and Great Bay Coast Watch also conducted stream buffer and habitat surveys along Hodgson Brook in 2003. The shoreline was found to be generally degraded by sedimentation, refuse, and channel modification. Further information on these surveys can be obtained directly from Great Bay Coast Watch.

Similar investigations of stream habitat in Pease in the early 1990s indicated that, based on the distribution of species, the Grafton Ditch area demonstrated moderate water quality and habitat (Morin and Jones, 2003). Clearly, further monitoring, data analysis, and interpretation are needed in order to define the need for restoration of stream water quality and habitats within Hodgson Brook.

SECTION 4

Our Vision for Hodgson Brook

Restoration and Protection Goals

After many months of learning about the current conditions of Hodgson Brook and what is still not understood about the system, the LAC developed four goals for Hodgson Brook Restoration. The goals address water quality restoration, water quality protection, improvement of stream habitat, and outreach and public education. The goals are as follows:

- Improve the water quality of Hodgson Brook to meet New Hampshire State water quality standards through monitoring and source reduction and elimination by the year 2014.
- Improve stormwater quality and decrease stormwater runoff volume in an effort to protect water quality and reduce stormwater impacts.
- Gain community support for and understanding of the Hodgson Brook Restoration goals through education, outreach and improved recreational opportunities.
- Enhance buffer, shoreline, and in-stream habitats to encourage more native and diverse plant and animal populations within the Hodgson Brook watershed.

Exploring the Meaning of Urban Stream Restoration

Hodgson Brook has been highly urbanized but has great potential for restoration. The Borthwick, Middle Hodgson, and Grafton Ditch subwatersheds contain sev-

eral areas of somewhat intact habitat. In addition, momentum is building, due to the efforts of the City, to eliminate pollution discharges and maintain buffers around wetlands.

The Center for Watershed Protection has neatly summarized what urban watershed restoration can mean. For some watersheds, it is possible to partially restore native communities within the stream. However, where the stream acts as a conduit for storm water, it may only be possible to reduce contaminant loads to the surface water body. In some areas it may only be possible to manage additional pollutant loading to the stream corridor.

Hodgson Brook has potential for native community restoration and enhancement. The greatest potential lies in stream corridor restoration and management, and in reduction of pollutants to the Brook.

Examples of Watershed Restoration

The inspiration to restore Hodgson Brook comes from an appreciation of the potential of Hodgson Brook to be restored like many of our nation's urban waterways. The members of the LAC realize that it is possible to transform this area from a system of drainage ways to multifunctional habitat. Communities around the nation are rediscovering urban streams and working

hard to reconnect people to these waterways that flow under and through our cities. Several examples of successful urban stream restoration provide the know-how and inspiration for what Hodgson Brook could be. Following are brief summaries of two urban stream restoration projects.

The Big Rock Creek Watershed in central Tennessee is a much larger area than the Hodgson Brook watershed (67 versus 3.2 square miles), but through much of its length it is impacted by similar stressors. One of the restoration practices used in this watershed creates or re-establishes the vegetation along stream banks to prevent erosion and to establish an in-town greenway (CWP, 2003). This practice also provided valuable habitat for birds, invertebrates, and small mammals.

The Rouge River in Michigan is another urban watershed that is being transformed. This river has been impacted by agricultural runoff, urbanization, and intensive recreation. Impacts to the River are much like the impacts to the Hodgson Brook, but on a much larger scale. An ambitious program of investigation, retrofit demonstration areas, and outreach is effectively improving water quality, habitat, and awareness of the impacts of intensive use on the river. A website has been developed by the Rouge River Project Team to assist local communities along the Rouge with understanding the condition of the Rouge in their area and to help them implement change along their reach of the river (www.rougeriver.com). The website lists a remarkable breadth of projects that have been completed to address the multiple impacts to the watershed.

In both of the projects described above, a variety of methods were employed to accomplish restoration.

Three examples of these innovative approaches are presented below.

Stormwater retrofitting is a term describing a multitude of structures adapted to existing storm drainage systems at collection and discharge points. These structures are designed to filter pollutants, capture sediments, and reduce the rapid discharge of stormwater to a stream. The City of Portsmouth is currently working on the installation of several of these innovative structures in the City, including one near the southeast shore of North Mill Pond (Britz, personal communication, 2004).

A stormwater treatment practice that is gaining a lot of attention is the construction of bioretention areas. In places like parking lots and road centerline strips, raised landscaped areas can be converted to slightly depressed, vegetated areas that can catch and filter stormwater before it enters a stormwater system (DES, 2004).

Daylighting is another intriguing method to restore urbanized streams. With this method, a segment of stream that has been piped underground is exposed (to daylight) and a natural stream channel is recreated. Exposing a piped stream to the surface slows stormwater flow, encourages filtration and infiltration, and provides a more natural waterway that enhances the landscape. It also provides habitat for in-stream and shoreline dwellers. The practice of daylighting has been in use since the 1970s when it was used to restore a creek in Berkeley, California. Zurich, Switzerland has exposed more than nine miles of brooks and storm drains since 1988 (Pinkham, 2000). It is considered to be the most extreme restoration method, but provides a multitude of benefits for all aspects of watershed health.

Benefits of Hodgson Brook Restoration to Citizens, Business, and the City

The benefits of restoring Hodgson Brook for the citizens, businesses, and the City of Portsmouth are many. Over the past five years, ANMP played a major role in restoring the quality and reputation of the North Mill Pond as an aesthetically pleasing area and a recreational asset. Although some dumping still occurs along the Pond, the appearance of the shoreline is greatly improved. The LAC wishes to make Hodgson Brook a similar focus of attention so that the Brook will be recognized as an asset for habitat, recreation, and water quality protection. Some of the benefits to the community that will result from the restoration of Hodgson Brook are listed below.

1. Recreational potential will increase for residents of Portsmouth and the North Mill Pond area, and employees and visitors of the Pease International Tradeport, through establishment and improvement of walking and bike routes near the Brook.
2. Curb appeal of Portsmouth and Tradeport businesses will increase with improved stream corridor habitats.
3. Community involvement will increase with volunteer participation in the restoration and protection program.
4. Property values will increase as the Brook becomes a more aesthetically pleasing and functional natural feature.
5. Natural flood control will increase through increased infiltration capacity and improved stream buffers created through restoration.
6. Improved stormwater quality and Brook water quality will help to protect wetlands and the sand and gravel aquifers which will in turn help protect the quality of City water wells.
7. Water discharging from North Mill Pond will be cleaner and freer of sediment and contaminants, which will benefit the health of the Piscataqua River, related estuaries, and the Atlantic Ocean.
8. The cleanup and restoration of Hodgson Brook will improve public health by reducing exposure of residents to contamination within the Brook and North Mill Pond.
9. The City will reduce nonpoint source pollution with implementation of the Plan. The City has also developed a Stormwater Management Plan (SMP) as required by the Phase II NPDES regulations. This SMP along with the City's downtown sewer separation plan will help reduce nonpoint source pollution.
10. The implementation of this plan will provide a model for other similarly impacted watersheds to study and restore stream functions and values.
11. The habitat and water quality of North Mill Pond will be improved through the restoration of the water quality and habitat of Hodgson Brook.

Watershed Monitoring and its Connection to the Restoration Plan

The Hodgson Brook Watershed Monitoring Plan was developed to identify and fill the many data gaps that remain in our understanding of the water and habitat quality of Hodgson Brook. The Monitoring Plan also



Figure 15 Collecting water samples.

maps out a program to monitor the status and trends of selected environmental indicators. Monitoring and restoration will be closely linked. As a better understanding of the quality of and impacts to the Brook is gained, the restoration actions can be better tailored to address the sources of these impacts. The Monitoring Plan presents a comprehensive strategy to monitor water and sediment indicators, including physical, chemical, and biological parameters; biodiversity, and habitat quality from designated areas in the watershed. It will be used as a guide for the Hodgson Brook Watershed Coordinator to conduct a baseline assessment and to monitor changes in environmental indicators over time. The Plan describes the primary pollutants of concern, appropriate indicators and the rationale for choosing them, monitoring stations and the types of monitoring, and sampling frequency. The monitoring program will provide an integrated evaluation of the physical, chemical, and biological characteristics of the brook in relation to designated uses, and ecological and human health concerns within the watershed. The Monitoring Plan provides a basis for an effective

management plan that promotes the restoration of the Hodgson Brook watershed.

The monitoring information will help support and track the progress of restoration and, like the *Restoration Plan*, may be modified to reflect field conditions and information collected during the course of monitoring activities. Using specific environmental indicators such as amount of impervious cover, bacterial contaminant levels, and habitat quality, restoration success can be measured. When the threats and impacts on Brook water quality and habitat are better understood, actions can be added or refined within the *Restoration Plan*. The *Monitoring Plan* suggests the following activities:

- Water quality monitoring
- Stream flow monitoring
- Microbial (bacteria) source tracking from surface/drain water samples
- Sediment quality monitoring
- Programmatic indicators monitoring (e.g., wetlands violations, illicit discharge detection, water quality indicator exceedances, etc.)
- Rapid Stream Assessments (to assess in stream habitat)
- Impervious cover measurements
- Inventory and monitoring of in-stream and terrestrial habitat and invasive species
- Trash/debris surveys

The actions developed by the LAC and the monitoring activities will be carefully coordinated to achieve the goals of the *Watershed Restoration Plan for Hodgson Brook*. A complete copy of the *Monitoring Plan* is available online at www.des.nh.state.us/HodgsonBrook.

SECTION 5

Hodgson Brook Watershed Goals, Objectives, and Summary of Actions

The following sections list the four goals of Hodgson Brook restoration and the associated objectives for each goal. The actions that were developed to address the objectives are summarized below the objectives. Action plans are included in their entirety in Appendix B. A matrix of these actions is provided in the summary section that follows (Tables 4, 5, 6, and 7).

This *Restoration Plan* is adaptive and will therefore be modified as additional information is collected about water quality, habitat, sources of contamination, and the best means of addressing each one of the contaminant sources or impediments to habitat restoration. This plan provides the detail for how each action will be addressed. The details of restoration implementation are provided in the *Hodgson Brook Restoration Implementation*

Plan. Responsible parties are listed within the actions. The Hodgson Brook Watershed Coordinator, who will drive the activities, is abbreviated as HBWC.

Actions are slated for short, medium, and long-term completion. At this time, short term is assumed to be within the first three years of implementation, medium term is within six years, and long term is within ten years.

There is a separate goal for Outreach and Education, but it is understood that outreach and education will be essential in accomplishing all goals of the *Restoration Plan*. Where possible, outreach and education activities will be incorporated into actions to promote water quality restoration, water quality protection, and habitat restoration goals.

WATER QUALITY RESTORATION GOAL

Improve the water quality of Hodgson Brook to meet New Hampshire State water quality standards through monitoring and source reduction and elimination by the year 2014.

Current Status of Hodgson Brook Water Quality

Bacteria, toxic metals and organic compounds, nutrients, and sediment contamination have all been proven to be a problem in Hodgson Brook and its receiving water, North Mill Pond. In particular, the bacterial and nutrient pollution loads are all extremely high compared to other monitored locations in the Great Bay Estuary watershed.

Little is known about the distribution and source of contaminants in Hodgson Brook. Baseline sampling to determine problem areas and pollutant sources will be an essential first step to restoring the water quality in the Brook. Identification of the pollutant sources is the next step and will be followed by their reduction and/or elimination. These are all necessary steps in order to restore the water quality to New Hampshire Class B standards by 2014.

WATER QUALITY OBJECTIVES

Objective 1.1

Hodgson Brook will meet Class B water quality standards for bacteria, turbidity, temperature, and dissolved oxygen.

Objective 1.2

Hodgson Brook will meet Class B water quality standards for toxic contaminants.

Objective 1.3

Hodgson Brook will not have excess nutrients that result in algal blooms and nuisance aquatic plants.

Objective 1.4

Hodgson Brook and its banks will be free of trash and debris.

WATER QUALITY RESTORATION ACTIONS

The following actions were designed to meet the restoration objectives and ultimately achieve the restoration goal. These actions are identified by the acronym WQR. A complete description of these actions is included in Appendix B.

WQR-1 Monitor, identify, and reduce/remove sources of bacteria, turbidity, temperature, and dissolved oxygen.

This action addresses Objective 1.1 and involves water quality monitoring and follow-up remediation. It is multifaceted in terms of parameters and remediation efforts, and will require coordination with many programs and organizations. The primary responsibility for monitoring will rest with the HBWC, who will work with existing programs such as Great Bay Coast Watch and the Volunteer River Assessment Program (VRAP) to conduct the sampling. This action is closely tied to the Monitoring Plan (Morin, et al., 2003).

The first task will be the determination of location and severity of pollutant sources. Multiple parties may be identified to address source reduction. Once the contaminant sources are identified, monitoring will be

continued to assure pollution source reduction and compliance with water quality standards.

It is likely that compliance will be measured on a subwatershed level, also known as assessment units designated by DES.

WQR-2 Monitor, identify, and reduce/remove sources of toxic contaminants.

This action addresses Objective 1.2 and, like Objective 1.1, will be closely linked with the Monitoring Plan activities to measure its effectiveness. The HBWC will be primarily responsible for coordinating this action.

WQR-3 Monitor, identify, and reduce/remove sources of excess nutrients.

This action addresses Objective 1.3 and will be closely linked with the Monitoring Plan activities. Since the source of nutrients can be from residential, commercial, municipal, and atmospheric sources, this will be a particular challenge. Again, HBWC will coordinate this effort with the assistance of existing programs and volunteers.

WQR-4 Assess solid waste problems.

A trash and debris survey model created in California will be used to assess the solid waste problem within 50 feet of each side of the stream. As experienced on the North Mill Pond, the solid waste dumping cleanup will likely be an ongoing effort. It is expected that volunteers can accomplish most of the work on this action with coordination by the HBWC. This action will be conducted on a subwatershed level.

WQR-5 Reduce and eliminate sources of solid waste.

Cleanups will take place from the stream edge to at least 50 feet beyond each edge of the stream. The landowner will be identified and the HBWC will work with the health officer to encourage removal of trash and debris. Volunteer effort may be used for some of the cleanup work as well. It is hoped that with increased awareness and outreach efforts, the solid waste problems will decrease over time. Like WQR-4 this action will be conducted on a subwatershed level.

WATER QUALITY PROTECTION GOAL

Improve stormwater quality and decrease stormwater runoff volume in an effort to protect water quality and reduce stormwater impacts.

Current Status of Hodgson Brook Water Quality Protection

There are currently several programs underway to protect water quality in the Hodgson Brook watershed. Examples of such programs are as follows.

DES and the City of Portsmouth continue to investigate illicit discharges and cross connections to find ways to eliminate these discharges of wastewater into storm drain systems. Over three years ago, the city discontinued use of sand in road treatment for snow and ice.

The City is currently working on installing a stormwater collection device for treating runoff on the southeast side of North Mill Pond and will likely undertake other projects like these in the watershed. The results of the stream corridor survey will soon be published by NHCP and GBCW, which will provide a better understanding of these areas.

WATER QUALITY PROTECTION OBJECTIVES

This goal is one of the most far-reaching as it will be ongoing even after other restoration programs are complete.

Objective 2.1

Work with the community to create new stream buffers and protect existing buffers that promote infiltration of stormwater.

Objective 2.2

Protect priority lands for conservation and protection.

Objective 2.3

Identify pollution prevention actions and encourage residents and business owners to take action.

Objective 2.4

Encourage NH Department of Transportation, the City of Portsmouth Department of Public Works and local businesses to use structural and non-structural practices to treat stormwater runoff.

Objective 2.5

Encourage the City of Portsmouth Planning Board and Professional Planners to incorporate the Hodgson Brook Restoration and Implementation Plans into planning decisions.

Objective 2.6

Incorporate low impact development techniques into existing and new development through education and regulations.

WATER QUALITY PROTECTION ACTIONS

The following actions were designed to meet the water quality objectives and ultimately achieve the protection goal. These actions are identified by the acronym WQP. A complete description of these actions is included in Appendix B.

WQP-1 Protect stream buffers and create a demonstration stream buffer area.

This addresses Objectives 2.1 and 3.4. This action will involve planning and implementation of a stream buffer restoration program. The end result will be one or more demonstration areas that will demonstrate, through signage and educational activities as well as improved stream function, the benefits of streamside vegetated buffers. The HBWC will coordinate the effort and a contractor will carry out the restoration project. It will be a long-term project but development of the project will begin at implementation of the plan and continue until completion.

WQP-2 Promote transportation alternatives.

This action addresses Objective 2.3. The purpose of this objective is to promote ridesharing and use of public transportation with the result of reducing emissions from automobiles. One important component will be to provide ridesharing opportunities for all Hodgson Brook activities. This effort will be coordinated with existing PDA programs including ridesharing and use of transit buses. This action will be coordinated by the HBWC. It will be implemented in the short term but continued for the long term.

WQP-3 Promote infiltration and filtration stormwater practices.

Stormwater infiltration and filtration practices will be promoted by HBWC for use in development and re-development projects and for stormwater projects undertaken by either PDA or the City. Any work completed as part of this action will meet requirements for aquifer protection. The HBWC, PDA, and the City will be responsible for completing this action and will be implemented in the short and long term.

WQP-4 Install a bio-retention area.

This plan will address Objectives 2.4, 2.5, 2.6, and several outreach objectives. This will include identifying a candidate site and working with a developer or property owner to persuade them to use such a feature. After completion, the area will be monitored to ensure proper functioning, and signage will be erected to inform the public about bioretention areas. The City will identify candidate sites; HBWC will provide technical assistance and information and will conduct monitoring. A site will be identified in the short term and installation will take place in a mid-term timeframe.

WQP-5 Identify and correct regulations to better protect stream buffers.

This addresses Objectives 2.1 and 2.5. Existing regulations relative to stream buffers will be identified and recommendations will be made that strengthen certain ordinances. The Rockingham Planning Commission will be asked to review ordinances and provide support for these changes. This will be done over a mid to long-term basis and will be coordinated by the HBWC.

WQP-6 Work with the Pease Development Authority to strengthen buffer protection.

This will address Objective 2.1. The HBWC will work closely with the PDA to communicate the importance of wetland and riparian buffers along waterways and open drainage areas. Technical information will be provided to support this position. The action will be initiated in the short term and will be periodically reviewed by PDA and HBWC.

WQP-7 Protect priority areas through land conservation.

The HBWC will work with the Seacoast Land Trust to determine priority parcels within the watershed and to initiate a dialog with the owners of these properties. HBWC, the Portsmouth Conservation Commission and the Seacoast Land Trust will be involved in the project. It will be completed in the short to long-term timeframe.

WQP-8 Retrofit storm drainage to improve water quality.

This addresses Objective 2.4, 2.5, and 2.6. The process for identification and implementation of these practices developed by the Center for Watershed Protection will be followed for this action. The HBWC, the City, landowners, and a contractor will work together to complete this action. It will be implemented in the short term and installed in the mid-term timeframe.

WQP-9 Promote low impact development techniques.

This action addresses Objective 2.3 and 2.6 and will further enhance the ability of the watershed to filter and absorb stormwater and associated pollutants. The HBWC will encourage partnerships between several agencies to educate planners, planning boards, and boards of adjustment about low-impact development techniques. The coordinator will then seek funding for this effort and work with volunteers and agencies such as NHEP, NHCP, UNHCE, and NROC to present workshops and encourage boards and planners to incorporate these methods into their guidance and development requirements. Location of funding sources and partnership development will be conducted in the short term. Workshop development and presentation will be completed in the mid and long term with the goal to have these methodologies incorporated into development practices in the mid to long term.

OUTREACH AND EDUCATION GOAL

Gain community support for and understanding of the Hodgson Brook Restoration goals through education, outreach and improved recreational opportunities.

Current Status of Hodgson Brook Outreach and Education Efforts

The majority of the educational efforts in the watershed have occurred around North Mill Pond. The ANMP have initiated outreach efforts that raise awareness about the Pond and the environmental and social benefits of cleaning up pollution. These programs include:

North Mill Pond Cleanup Scheduled for the first Saturday in June, this annual cleanup day is an effective community stewardship event.

Paddle on the Pond This recreational boating event, which includes an educational component, is scheduled for the third weekend in September.

ANMP Newsletter This quarterly publication (*North Mill Pond Times*) is distributed to the 1,650 residents and businesses in the watershed.

ANMP Meetings These meetings are held monthly to plan events and projects. All meetings are open to the public and often feature a guest speaker on relevant topics.

Enrichment of School Programs Through the Student Advocates Program, students and teachers from local schools and the Seacoast Science Center participated in water and sediment sampling and restoration activities on the North Mill Pond.

Restoration Projects UNH researchers led several restoration projects on the Pond including eelgrass plantings, salt marsh grass plantings, mussel seeding, and shoreline stabilization, all of which included outreach components.

Website Development and Maintenance Information about Hodgson Brook, the *Monitoring Plan*, and the *Restoration and Implementation Plans* can be found at www.des.state.nh.us/Hodgson Brook.

OUTREACH AND EDUCATION OBJECTIVES

Make the *Restoration Plan* readily understandable and relevant to the resident and business community, and provide opportunities for involvement in the restoration process.

Objective 3.1

The residential and business community will know they live and work in the watershed.

Objective 3.2

The residential and business community will know about the Hodgson Brook Restoration and Implementation Plans.

Objective 3.3

The residential and business communities will know and understand the definition of nonpoint source pollution.

Objective 3.4

The residential and business community will participate in a stewardship role to help implement the restoration plan.

Objective 3.5

The residential and business community will learn about and take advantage of passive recreation and education opportunities throughout the Hodgson Brook Watershed.

OUTREACH AND EDUCATION ACTIONS

The following actions were designed to meet the outreach and education objectives and to ultimately achieve the outreach and education goal. These actions are identified by the acronym OE. A complete description of these actions is included in Appendix B. A total of 19 actions have been developed to address the objectives of the outreach and education goal. Many of these actions also address the objectives of the three other goals. These actions are summarized below.

O&E-1 Post Hodgson Brook Watershed road signs.

This action addresses Objective 3.1 and will provide a reminder to residents and others that travel within the watershed that Hodgson Brook exists and where the watershed boundaries are located. The HBWC will coordinate the effort and work with the City and volunteers to print and post signs. It is expected that this can happen within the short to mid-term time frame.

O&E-2 Publish promotion of project.

This action addresses all objectives of the Outreach and Education Goal. This action will involve identifying organizations and periodicals that will publish these news and events items, writing and distributing the articles, and tracking the number printed. This will largely be a voluntary effort coordinated by the HBWC and will continue throughout the life of the Restoration project.

O&E-3 Publicize restoration successes and events.

Like the previous action this action addresses all goals. It will be coordinated by HBWC and last throughout the life of the project.

O&E-4 Promote Hodgson Brook restoration activities through public presentations.

This action will address Objective 3.2. These presentations will be presented to a wide audience including Cable Channel 22, the Portsmouth City Council, the Pease Development Authority, local organizations, schools, and citizens groups. HBWC and volunteers will largely complete it. It will be developed in the short term and modified as needed for presentation over the life of the project.

O&E-5 Provide tours of the watershed.

This will address Objectives 3.1 and 3.5. A self-guided tour will be planned and marked within the Hodgson Brook watershed. A map will also be made to illustrate the tour. A guided tour of the area will also be offered. This will be carried out by the HBWC and will largely be a voluntary effort. This should be completed within the mid-term time frame.

O&E-6 Hold a watershed walk-a-thon fundraiser.

This action will address Objective 3.1. The fundraising effort will be coordinated by the HBWC but is thought to be a volunteer driven event. It will be completed within the mid- to long-term time frame.

O&E-7 Promote and update the Hodgson Brook Restoration Website.

This action addresses Objective 3.2. The Hodgson Brook website, www.des.state.nh.us/HodgsonBrook, is currently hosted by DES. Promotion and maintenance of the website will be completed by both DES and HBWC and will continue throughout the life of the project. Volunteers will be sought to update and provide success stories to post on the website.

O&E-8 Establish “Brook Keepers” volunteer corps.

This action addresses Objective 3.4. The steps to complete the action will involve developing the mission of the Brook Keepers, a volunteer force of Brook monitors and advocates. This action will include developing a training program, recruiting and training volunteers, utilizing the volunteers, and recognizing their contributions. The HBWC will coordinate the effort. The development, recruitment, and training will happen in the short term, and the corps will be used throughout the life of the project to implement a variety of actions that depend on volunteer efforts.

O&E-9 & O&E-10 Publicize activities through community radio.

Both actions will address Objectives 3.1, 3.2, and 3.3. These outreach programs will use community low power and Great Bay Radio to promote stewardship of Hodgson Brook. It will be coordinated by the HBWC and be conducted by volunteers. It will happen throughout the project.

O&E-11 Create watershed maps for outreach and education.

This action will address Objectives 3.1 and 3.2. Sets of large and small-scale maps will be created for a variety of purposes throughout the Outreach and Education program. The HBWC will coordinate the activities in collaboration with the City GIS staff. The maps will be created in the short term and used throughout the program.

O&E-12 Conduct storm drain stenciling.

This action will address Objective 3.3. The HBWC will work with the City of Portsmouth to identify high-visibility neighborhoods and storm drain locations. They will then develop a program and gather materials for the project. Volunteers will be recruited and trained to paint stenciled messages next to storm drain catch basins. Door hangers explaining the project will be distributed throughout the area to be stenciled before volunteers conduct the stenciling. HBWC will coordinate volunteers, sponsoring businesses, and organizations. The action will be carried out in the mid-term time frame.

O&E-13 and O&E-14 Promote responsible home and yard practices.

These actions address Objective 3.3. The HBWC will coordinate community and business workshops with assistance from local experts. This will be conducted short to mid-term.

O&E-15 Organize Hodgson Brook Shoreline Cleanup.

This action will address Objective 3.4. The HBWC will work with volunteers and use the results of the Trash and Debris surveys, conducted as part of the monitoring program, to target shoreline cleanup areas. Local businesses will be encouraged to sponsor and participate. This effort will be coordinated with the North Mill Pond annual cleanup and will be completed on a subwatershed basis.

O&E-16 Inventory recreational assets and opportunities.

This action will address Objective 3.5. The HBWC will work with volunteers to identify stream corridors, bike paths, walking trails, and owners in order to assess existing recreational potential along the Brook. This action will be carried out in the mid-term.

O&E-17 Incorporate the Hodgson Brook Restoration Plan into the Portsmouth Master Plan.

This action addresses Objective 2.5. Copies of the Plans will be provided to the City of Portsmouth for inclusion in the Master Plan. Follow-up phone calls and meetings will be conducted to answer questions and to further explain the program. This will be carried out by the HBWC in the short term.

O&E-18 Recognize good stewardship practices.

This action will address Objective 3.4. Citizens that conduct good stewardship practices will be recognized and provided with a locally solicited gift. This will be coordinated by the HBWC and will be an ongoing effort.

HABITAT AND WILDLIFE RESTORATION GOAL

Enhance buffer, shoreline, and in-stream habitats to encourage more native and diverse plant and animal populations within the Hodgson Brook watershed.

Current Status of Hodgson Brook Habitat and Wildlife Restoration

The Hodgson Brook stream habitat and wildlife community is severely compromised throughout the watershed, with a few exceptions. The following objectives and actions promote the restoration and protection of natural, healthy habitats in the watershed.

HABITAT AND WILDLIFE RESTORATION OBJECTIVES

Objective 4.1

Conduct research and inventories of aquatic and terrestrial species and habitats to evaluate the historic and present condition of animal populations and their habitats in the watershed.

Objective 4.2

Determine opportunities for restoring in-stream, active floodplain, and upland habitats.

Objective 4.3

Restore habitats and take other actions to encourage or enhance wildlife in the aquatic and terrestrial watershed environment.

HABITAT & WILDLIFE RESTORATION ACTIONS

The following actions were designed to meet the habitat and wildlife restoration objectives, and to ultimately achieve the outreach and education goal. These actions are identified by the acronym HW. A complete description of these actions is included in Appendix B.

HW-1 Inventory aquatic species and evaluate in-stream habitat.

HW-2 Survey terrestrial wildlife and habitat.

HW-3 Survey bird species and habitat.

HW-4 Evaluate historic and potential fish habitats and species.

Each of these actions addresses Objective 4.1 and a portion of Objective 4.2. Volunteers can carry out the actions with the assistance of the HBWC and other professionals. The habitat surveys will be carried out using the “Keeping Track” program. After the surveys are complete, the results will be interpreted to determine the potential for restoration. Recommendations will be made at that time for those areas and habitats with restoration potential. These actions are expected to occur mostly within

years 4-6 of implementation. Ongoing surveys may last through the long term to monitor trends if funding is available.

HW-5 Research and implement Hodgson Brook daylighting.

This action addresses Objective 4.2 and Objective 1.1. Daylighting a portion of the Brook will entail removing the stream from its underground piping and creating an open channel with associated buffer and habitat. In order to complete this project, stakeholders will first be identified and support will be built for the project. Funding will be secured for a feasibility study, and if found to be feasible, additional funding will be sought for project completion. The HBWC or other suitable project manager will manage the project. It is hoped that planning can be accomplished in the short term and construction will be completed in the mid- and long-term timeframe.

HW-6 Habitat Restoration Feasibility Study.

This action involves the evaluation of the Brook in various areas to determine the feasibility of restoring in-stream and floodplain areas for water quality protection and wildlife habitat enhancement. The parameters for the study will first be developed, and a contractor will then be chosen to carry out the study. After completion of the study, grants will be sought to complete the restoration. It is hoped that this assessment project can be completed within the mid term.

HW-7 Habitat Restoration.

Based on the results of Actions HW-1 through HW-6, grant funding will be sought and qualified contractors will be chosen for projects in the areas that have been identified for restoration. Restoration will be undertaken in the identified areas. This action will take place in the long term.

SECTION 6

Summary of Recommended Actions

Tables 4, 5, 6 and 7 provide a summary of the actions, the subwatershed(s) where the action will occur, the responsible parties, and a schedule.

Table 4 Matrix of Actions: Water Quality Restoration.

Action Number	Action Title	Subwatershed	Responsible Parties			Schedule		
			HBWC	City of Portsmouth	Other	Short Term	Mid Term	Long Term
WQR-1	Monitor, identify, and reduce/remove sources of bacteria, turbidity, temperature, and dissolved oxygen.	All subwatersheds	Coordination	Source reduction and/or removal	GBCW, VRAP, UNH, consultants	Baseline monitoring and source identification	Source reduction, monitoring	Maintenance monitoring
WQR-2	Monitor, identify, and reduce/remove sources of toxic contaminants.	All subwatersheds	Coordination	Source reduction and/or removal	GBCW, VRAP, UNH, consultants	Baseline monitoring and source identification	Source reduction, monitoring	Maintenance monitoring
WQR-3	Monitor, identify, and reduce/remove sources of excess nutrients.	All subwatersheds	Coordination	Source reduction and/or removal	GBCW, VRAP, UNH, consultants	Baseline monitoring and source identification	Source reduction, monitoring	Maintenance monitoring
WQR-4	Assess solid waste problems.	All subwatersheds	Coordination	—	Volunteers, residents	Survey on rotating schedule	Survey on rotating schedule	Maintenance monitoring
WQR-5	Reduce and eliminate sources of solid waste.	All subwatersheds	Coordination	Assistance with landowner compliance	Volunteers, residents	Cleanup based on surveys	Cleanup based on surveys	Cleanup of remaining sites

Table 5 Matrix of Actions: Water Quality Protection.

Action Number	Action Title	Subwatershed	Responsible Parties			Schedule		
			HBWC	City of Portsmouth	Other	Short Term	Mid Term	Long Term
WQP-1	Protect stream buffers and create a demonstration stream buffer area.	All subwatersheds	Coordination	Contracting with restoration consultant	DES, Volunteers	Planning and outreach	Contracting and outreach	Buffer restoration and outreach
WQP-2	Promote transportation alternatives.	All subwatersheds	Coordination	Assistance with transportation options	PDA, NHDOT	Implement	Ongoing	Ongoing
WQP-3	Promote infiltration and filtration stormwater practices.	All subwatersheds	Coordination	Planning Department and Planning/Zoning Boards	PDA, NHDOT	Incorporate practices	Ongoing	Ongoing
WQP-4	Install a bio-retention area.	All subwatersheds	Coordination	Contracting and/or construction	Businesses, Residents	Evaluation and outreach	Contracting and construction, outreach	Outreach
WQP-5	Identify and correct regulations to better protect stream buffers.	Non-PDA subwatersheds	Coordination	Planning Department and Planning/Zoning Boards	Businesses, Residents	—	Conduct review with contractor	Continue cooperation, adopt ordinances
WQP-6	Work with the Pease Development Authority to strengthen buffer protection.	PDA Sub-watersheds	Coordination	Planning Department and Planning/Zoning Boards	PDA	Initiate meeting	Continue cooperation	Continue cooperation
WQP-7	Protect priority areas through land conservation.	All subwatersheds	Coordination	Planning Department	Seacoast Land Trust	Research land use and ownership	Contact and maintain dialog with landowners	Complete projects
WQP-8	Retrofit storm drainage to improve water quality.	All subwatersheds	Coordination	Department of Public Works, Planning Department	NHDOT, DES, businesses and residents	Identify sites	Contracting and Construction	Outreach
WQP-9	Promote low impact development techniques.	All subwatersheds	Coordination	Planning Department and Planning/Zoning Boards	PDA, RPC NHDOT, Developers	Develop partnerships, write grants	Coordinate with PB and ZBA on implementation	Coordinate with PB and ZBA

Table 6 Matrix of Actions: Outreach and Education.

Action Number	Action Title	Subwatershed	Responsible Parties			Schedule		
			HBWC	City of Portsmouth	Other	Short Term	Mid Term	Long Term
O&E-1	Post Hodgson Brook Watershed road signs.	All subwatersheds	Coordination	Produce Signs	Volunteers, Residents	Design, print, post	Post	—
O&E-2	Publish promotion of project.	NA	Coordination	—	Outreach Committee	Ongoing	Ongoing	Ongoing
O&E-3	Publicize restoration successes and events.							
O&E-4	Promote Hodgson Brook restoration activities through public presentations.	NA	Coordination	—	Volunteers, Consultants	Create & Present	Present	Present
O&E-5	Provide tours of the watershed.	All subwatersheds	Coordination	Obtain Permission for access	Volunteers, Residents	—	Design and offer tours	—
O&E-6	Hold a watershed walk-a-thon fundraiser.	All subwatersheds	Coordination	Permit to conduct event	Volunteers, Residents	—	Plan	Hold event
O&E-7	Promote and update the Hodgson Brook Restoration Website.	All subwatersheds	Coordination	—	Volunteers, DES	Ongoing	Ongoing	Ongoing
O&E-8	Establish “Brook Keepers” volunteer corps.	All subwatersheds	Coordination	—	Volunteers, Residents, United Way	Develop training program	Recruit and train volunteers. Volunteer activities.	Volunteer activities
O&E-9	Publicize activities through community radio.	All subwatersheds	Coordination	—	Volunteers	Ongoing	Ongoing	Ongoing
O&E-10	Publicize activities on Great Bay Area Radio.							
O&E-11	Create watershed maps for outreach and education.	All subwatersheds	Coordination	Mapping Assistance	RPC	Create maps	Ongoing	Ongoing
O&E-12	Conduct storm drain stenciling.	All subwatersheds	Coordination	Protection	Volunteers, Brook Keepers	—	Implement stenciling projects	—

continued

Table 6 Matrix of Actions: Outreach and Education (continued)

Action Number	Action Title	Subwatershed	Responsible Parties			Schedule		
			HBWC	City of Portsmouth	Other	Short Term	Mid Term	Long Term
O&E-13	Promote responsible home and yard practices.	All subwatersheds	Coordination	Mailing	Volunteers, Brook Keepers	—	Workshops	Workshops
O&E-14	Promote responsible home and yard practices through home and garden businesses.	All subwatersheds	Coordination	Mailing	Volunteers, Brook Keepers	—	—	Provide info to target audiences
O&E-15 WQR-5	Organize Hodgson Brook Shoreline Cleanup. Reduce and eliminate sources of solid waste.	All subwatersheds	Coordination	Obtain Permission for access	Volunteers, Brook Keepers	Ongoing	Ongoing	Ongoing
O&E-16	Inventory recreational assets and opportunities.	All subwatersheds	Coordination	Property ownership information	Volunteers	—	Survey and create maps	—
O&E-17	Incorporate the <i>Hodgson Brook Restoration Plan</i> into the Portsmouth Master Plan.	All subwatersheds	Coordination	Implementation	—	Work with City	—	—
O&E-18	Recognition of good stewardship practices.	All subwatersheds	Coordination	—	Volunteers	Ongoing	Ongoing	Ongoing

Table 7 Matrix of Actions: Habitat and Wildlife Restoration.

Action Number	Action Title	Subwatershed	Responsible Parties			Schedule		
			HBWC	City of Portsmouth	Other	Short Term	Mid Term	Long Term
HW-1	Inventory aquatic species and evaluate instream habitat.	All subwatersheds	Coordination	—	Volunteers, NHFG, UNH		Inventories and evaluations	Ongoing volunteer monitoring, propose restoration areas
HW-2	Survey terrestrial wildlife and habitat.							
HW-3	Survey bird species and habitat.							
HW-4	Evaluate historic and potential fish habitats and species.							
HW-5	Research and Implement Hodgson Brook Daylighting.	Middle Hodgson Brook	Coordination	Contracting	PDA, Contractor	Planning	Contracting and implementation	Maintenance
HW-6	Habitat Restoration Feasibility Study.	All subwatersheds	Coordination	—	Volunteers, NHFG, UNH	—	Conduct study Apply for funding	Secure grants
HW-7	Habitat Restoration.	All subwatersheds	Coordination	—	Volunteers, NHFG, UNH	—	—	Restoration

SECTION 7

Overview of Restoration Implementation

The *Hodgson Brook Restoration Implementation Plan*, a separate document, provides a thorough description of the structure, schedule, and projected costs of implementing the actions described in this *Restoration Plan*. The actions described in the *Restoration Plan* are prioritized within the *Implementation Plan* and the framework to carry out the *Restoration Plan* is described.

In summary, the *Hodgson Brook Restoration Plan* actions will be implemented by a Hodgson Brook Watershed Coordinator with assistance from a host organization and guidance from the Hodgson Brook Advisory Committee. The Advisory Committee (AC) will be made up of community members, state and local policy makers, and watershed restoration experts. The Implementation Plan provides a job description for the Watershed Coordinator and details on the implementation actions for years 1 and 2. Once hired, the Coordinator will prepare a tracking and review system in coordination with the AC. The Coordinator will also

develop and follow an annual work plan based on the prioritized actions and interest from the community. The Advisory Committee will review the progress of the work plan on a quarterly basis. Since the *Restoration Plan* is an adaptive plan, adjustments will be recommended by the AC and the Coordinator during quarterly meetings and changes will be agreed to prior to implementation.

Much of the funding for the program will come from a USEPA grant administered by the DES during years 1 and 2. Matching funds will be sought from a variety of commercial and individual donors. Volunteers will also be an integral part of the implementation process and will provide the “staff” for the restoration process.

Development of partnerships with agencies and organizations will be encouraged to most efficiently carry out the goals of the *Restoration Plan*. The Coordinator will be housed and administratively supported by the host. Refer to the *Hodgson Brook Restoration Implementation Plan* for more details.

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APPENDIX A

Contaminant Threats, Sources and Impacts

Contaminant	Threat	Status and Trends	Sources	Impacts
Bacteria	Diseases to humans from contaminated water and shellfish.	Mouth of Hodgson Brook has consistently high levels relative to other Great Bay Estuary sites, although decreased since 2000.	Stormwater runoff, impervious surfaces, storm drains, wastewater treatment facility, pet waste, birds and wildlife.	State swimming standards exceeded in North Mill Pond. North Mill Pond is closed to shellfish harvesting.
Toxics	Elevated levels can produce adverse physiological effects in aquatic organisms and their predators, including humans.	Toxic organic chemicals in North Mill Pond mussels are highest in the New Hampshire seacoast. Mercury in North Mill Pond and arsenic and lead in Grafton Ditch exceeded state sediment standards. PAH concentrations are decreasing in Grafton Ditch.	Former Pease Air Force Base, atmospheric deposition, stormwater runoff, illicit connections.	Freshwater fish consumption advisory based on mercury. Ocean fish and shellfish consumption based on PCB's and mercury. Lobster tomally consumption advisory based on PCB's and dioxins.
Nutrients	Increased incidence of phytoplankton blooms and nuisance species. Decreased DO in water column.	High nitrogen loading from Hodgson Brook to North Mill Pond. Episodic DO levels less than 75% saturation.	Stormwater runoff, sewage, atmospheric deposition, fertilizer, residential greywater.	Change of aquatic plant and organisms that can survive under stressful conditions.
Suspended Sediments	Vector and sink for contaminants, smothers organisms and alters habitat.	Limited data. Occasional permit violations at construction sites.	Stormwater runoff and drains, construction sites and road sanding.	Potential to smother habitat for fish eggs, aquatic biota, vegetation, pass contaminants through foodweb, contaminant vector, increased turbidity, light limitation.
Solid Waste	Degrades natural habitat, aesthetic.	Annual North Mill Pond cleanups remove trash from banks of Pond, although dumping continues.	Litter, illegal dumping, dumpsters, yard waste and trash.	Aesthetic. Degrades natural habitat for animals and aquatic organisms.

APPENDIX B

Action Plans

Action Plan WQR-I Monitor, identify, and reduce/remove sources of bacteria, turbidity, temperature, and dissolved oxygen.

Associated Goal

Water Quality Restoration Goal

Improve the water quality of Hodgson Brook through monitoring and source reduction or elimination by the year 2014.

Associated Objective

I.1 Hodgson Brook will meet Class B water quality standards for bacteria, turbidity, temperature, and dissolved oxygen.

Description of Action

Conduct baseline monitoring, identify hot spots, and determine causes of violations for bacteria, turbidity, temperature, and dissolved oxygen. Identify who can address the situation; determine the management, structures or practices to remediate the situation; implement the strategy, and monitor to measure success.

Steps Needed to Complete the Action

1. Assess when and where Brook does not meet NH water quality standards through a program of regular water quality monitoring.
2. For locations where exceedences/anomalies are noted, identify causes of condition.
3. Identify who can/should address the condition.
4. Determine and design management, structures, or practices that can reduce sources.
5. Implement management, structure or practice.
6. Monitor water quality to determine if improvement has occurred in water quality standards.
7. If no improvement is detected, determine where failure occurred and why. Redesign management, structures, or practices that can reduce the sources and implement new designs. Monitor to determine if any changes occur.

Who is Responsible

Monitoring and Assessment: LAC
Source Control: Various, identified parties
Refer to *Hodgson Brook Watershed Monitoring Plan* to determine appropriate monitoring protocols and responsible parties. For source control design and implementation, parties will include but are not limited to the ANMP, the City of Portsmouth, UNH, and possibly private consultants.

Location of Action

All subwatersheds for monitoring; specific subwatersheds for implementation of actions

Expected Benefits

- State Water Quality Standards will be met for the various water quality indicators.
- The in-stream environment will be more effective in supporting aquatic life and recreational uses.

Timetable

Short term: Implement monitoring program and source identification

Mid term: Continue/Begin source reduction

Long term: Maintenance monitoring

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- ✓ Infrastructure Change
- ✓ Voluntary

Action Plan WQR-2 Monitor, identify, and reduce/remove sources of toxic contaminants.

Associated Goal:**Water Quality Restoration Goal**

Improve the water and sediment quality of Hodgson Brook through monitoring and source reduction or elimination by the year 2014.

Associated Objectives

1.2 Hodgson Brook will meet Class B water quality standards for toxic contaminants.

Description of Action

Conduct baseline monitoring, identify hot spots, and determine causes of violations of toxic contaminants. Identify who can address the situation, determine the management, structures or practices to remediate the situation, and then implement the strategies and monitor to measure success.

Steps Needed to Complete the Action

1. Assess when and where Brook does not meet N.H. water and sediment quality standards or other standards for toxic contaminants through a program of regular water quality monitoring.
2. For locations where exceedences/anomalies are noted, identify causes of condition.
3. Identify who can/should address the condition.
4. Determine and design management, structures or practices that can reduce sources.
5. Implement management, structure or practice.
6. Monitor water quality, implementation strategy, structure or practice to determine if improvement has occurred in water quality standards.
7. If no improvement is detected, determine where failure occurred and why. Redesign management, structures, or practices that can reduce the sources and implement new designs. Monitor to determine if any changes occur.
8. Conduct annual review of Superfund site cleanup documentation within watershed and include in annual monitoring results.

Who is Responsible

Monitoring and Assessment: LAC
Source control: Various, identified parties
Refer to *Hodgson Brook Watershed Monitoring Plan* to determine appropriate monitoring protocols and responsible parties. For source control design and implementation, parties will include but are not limited to the ANMP, the City of Portsmouth, UNH voluntary monitoring programs, and possibly private consultants.

Location of Action

All subwatersheds for monitoring, specific subwatersheds for implementation of actions.

Expected Benefits

- State water and sediment quality standards will be met for the various water quality indicators.
- In-stream environment will better support aquatic life and recreational uses.
- Toxic constituents will not further contaminate sediments.

Timetable

Short term: Implement monitoring program and source identification.

Mid term: Continue/begin source reduction. Review cleanup progress yearly.

Long term: Maintenance monitoring

Type of Action

(choose one or more):

- Regulatory
- ✓ Research
- ✓ Infrastructure Change
- ✓ Voluntary

Action Plan WQR-3 Monitor, identify, and reduce/remove sources of excess nutrients.

Associated Goal:**Water Quality Restoration Goal**

Improve the water quality of Hodgson Brook through monitoring and source reduction or elimination by the year 2014.

Associated Objectives

- 1.3 Hodgson Brook will not have excess nutrients that result in algal blooms and nuisance aquatic plants.

Description of Action

Conduct baseline monitoring, identify hot spots, and determine causes of nutrient loading. Identify who can address the situation, determine the management, structures or practices to remediate the situation, then implement the strategies and monitor to measure success.

Steps Needed to Complete the Action

1. Assess when and where Brook shows anomalies or increased levels of nutrients through a program of regular water quality monitoring.
2. For locations where anomalies or elevated concentrations are noted, identify causes of condition.
3. Identify who can/should address the condition.
4. Determine and design management, structures or practices that can reduce sources.
5. Implement management, structure or practice.
6. Monitor water quality, implementation strategy, structure or practice to determine if improvement has occurred in water quality.
7. If no improvement is detected, determine where failure occurred and why. Re-design management, structures or practices that can reduce the sources and implement new designs. Monitor to determine if any changes occur.

Who is Responsible

Monitoring and Assessment: LAC

Source control: Various, identified parties

Refer to *Hodgson Brook Watershed Monitoring Plan* to determine appropriate monitoring protocols and responsible parties. For source control design and implementation, parties will include but are not limited to the ANMP, the City of Portsmouth, UNH voluntary monitoring programs and possibly private consultants.

Location of Action

All subwatersheds for monitoring, specific subwatersheds for implementation of actions.

Expected Benefits

- The in-stream environment will better support aquatic life and recreational uses.
- Algal blooms and other side effects will be reduced, thereby improving the aesthetic quality of Hodgson Brook and North Mill Pond.

Timetable

Short term: Implement monitoring program and source identification

Mid term: begin source reduction. Review progress yearly.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- ✓ Infrastructure Change
- ✓ Voluntary

Action Plan WQR-4 Assess solid waste problems.

Associated Goal:

Water Quality Restoration Goal

Improve the water quality of Hodgson Brook through monitoring and source reduction or elimination by the year 2014.

Associated Objectives

1.4 Hodgson Brook and its banks will be free of debris.

Description of Action

Conduct solid waste surveys as part of baseline monitoring and long-term monitoring.

Steps Needed to Complete the Action

1. Using the California trash survey or similar model, design, and conduct a survey to assess the solid waste problem in the Hodgson Brook watershed.
2. Identify causes of the solid waste condition.
3. Identify who can/should address the condition.

Who is Responsible

ANMP and other volunteers

Location of Action

Up to 50 feet from each side stream channel.

Expected Benefits

- Volunteer efforts will help increase awareness of solid waste problem in watershed.
- City will be more aware of solid waste problem in the watershed.

Timetable

Short term: Implement monitoring program on two subwatersheds per year: Three years to complete all watersheds. Repeat cycle as necessary.

Type of Action (choose one or more)

- ✓ Regulatory
- ✓ Research
- Infrastructure Change
- ✓ Voluntary

Action Plan WQR-5 Reduce and eliminate sources of solid waste.

Associated Goal:**Water Quality Restoration Goal**

Improve the water quality of Hodgson Brook through monitoring and source reduction or elimination by the year 2014.

Associated Objectives

I.4 Hodgson Brook and its banks will be free of trash and debris

Description of Action

Identify who can address the solid waste situation, determine the management, structures or practices to remediate the situation, then implement the strategy and monitor to measure success.

Steps Needed to Complete the Action

1. Use outreach tools such as newsletter, website to promote proper waste disposal.
2. Use results of trash survey to target cleanup activities.
3. Use volunteers and enlist the DPW to conduct trash cleanups.
4. Endorse an "adopt-a-highway" program for highway cleanup.
5. Work with City Code Enforcement to enforce solid waste rules.
6. Monitor implementation strategy to determine if improvement has occurred.
7. If no improvement is detected, determine where failure occurred and why. Re-design management, structures or practices that can reduce the sources and implement new designs.

Who is Responsible

Volunteers, City, citizens, and businesses in watershed.

Location of Action

Up to 50 from each side stream channel.

Expected Benefits

- Volunteer solid waste cleanup efforts will help increase awareness of watershed residents and pride in watershed.
- The in-stream environment will better support aquatic life and recreational uses. Removal of solid waste will improve the aesthetic quality of Hodgson Brook and North Mill Pond and increase recreational potential.

Timetable

Implement cleanup program on two subwatersheds per year. Three years to complete all watersheds. Repeat cycle as necessary. Review cleanup progress yearly.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan WQP-I Protect stream buffers and create a demonstration stream buffer area.

Associated Goal

Water Quality Protection Goal and Education/Outreach Goal

Associated Objectives

- 2.1 Work with the community to create new buffers and protect existing buffers that promote infiltration of stormwater runoff.
- 3.4 The residential and business community will participate in a stewardship role to help implement the restoration plan.

Description of Action

Educate residents and business owners who have property along the Brook about the importance of buffers and how they can take steps to protect this resource. Identify and create a demonstration stream buffer area.

Steps Needed to Complete the Action

1. Form an ad hoc group to develop a guide for residents and business owners that provides steps for stream buffer protection. Ad hoc group should provide expertise on content, format, and distribution. Research other guides and generate findings of useful formats and information.
2. Using the input from the ad hoc group and the research, draft a guide for owners of stream-front property.
3. Develop plan for disseminating guide.
4. Work with a graphic designer to design guide, request bids from printing companies, produce and print guide, distribute according to plan.
5. Identify funding source for buffer demonstration project.
6. Identify an area where a "natural" stream buffer exists or could be restored.
7. Identify an area where an "urban" stream buffer exists or could be restored.
8. Approach and obtain permission from landowner(s) to develop a demonstration area.
9. Design a stream buffer area for both the natural and urban setting if one does not already exist.
10. Restore buffer area to demonstration design standards.
11. Prepare signage for plots.
12. Complete outreach to inform residents and bike/footpath users about demonstration areas.

Who is Responsible

The outreach committee will be responsible for all steps. Contractors will be hired for Step 4.

Location of Action

The entire Hodgson Brook watershed.

Expected Benefits

- Improved protection for buffers and the adjacent surface waters.

Timetable

Short term: Convene ad hoc group and develop dissemination plan.

Mid term: Publish guide and implement dissemination plan. Choose contractor.

Long term: Create buffer demonstration areas.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan WQP-2 Promote transportation alternatives.

Associated Goal

Water Quality Protection Goal

Associated Objectives

2.3 Identify pollution prevention actions and encourage residents and business owners to take action.

Description of Action

Support other organizations' ride-sharing efforts through Hodgson Brook outreach tools (e.g., newsletter; web page) and commit to promoting ride sharing for Hodgson Brook activities.

Steps Needed to Complete the Action

1. Identify those organizations that provide ride-sharing services in the watershed.
2. Promote ridesharing efforts through the newsletter; web page and other outreach venues.
3. Provide ride sharing or alternative transportation for all Hodgson Brook activities.

Who is Responsible

Education and Outreach subcommittee and events planner.

Location of Action

Throughout Hodgson Brook watershed.

Expected Benefits

- Reduce increase of impervious surfaces.
- Reduce stormwater runoff.
- Improve air quality, water quality and surface street congestion.
- Change mindset regarding ride sharing.

Timetable

Short term: Incorporate promotion of ride share options through education and activity planning.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan WQP-3 Promote infiltration and filtration stormwater practices.

Associated Goal

Water Quality Protection Goal

Associated Objectives

- 2.4 Encourage NH DOT, the City of Portsmouth Dept. of Public Works, and local businesses to use structural and nonstructural practices to treat stormwater runoff.
- 2.5 Encourage the City of Portsmouth Planning Board and professional planners to incorporate the *Hodgson Brook Restoration and Implementation Plan* into planning decisions.
- 2.6 Incorporate low impact development techniques into existing and new development through education and regulations.

Description of Action

Work with the Pease Development Authority and the City of Portsmouth to promote infiltration and filtration practices through site plan review and Phase II Stormwater regulations.

The relatively new federal Phase II Stormwater Regulations require the City of Portsmouth to comply with a series of new stormwater management rules. The Small Municipal Separate Storm Sewer System (MS4) General Permit, under Phase II, requires that operators of small MS4s develop a Storm Water Management Program that uses appropriate Best Management Practices (BMPs) for each of the six minimum control measures. Portsmouth is an operator of a small MS4. This action encourages the City to incorporate filtration and infiltration stormwater practices when designing best management practices on new and redeveloping City property and roadways.

Steps Needed to Complete the Action

1. Provide educational information (e.g., presentation, pamphlets) to the Pease Development Authority (PDA) Board of Directors regarding filtration and infiltration practices and how these practices fit into a corporate aesthetic.
2. Provide educational information to the City of Portsmouth Planning Board, Site Plan Review Board, and the Department of Public Works regarding filtration and infiltration practices and how these practices protect water quality.
3. Encourage consistent stormwater management standards for both the City and the Pease International Tradeport. Encourage City to incorporate these practices into site plan requirements.

Who is Responsible

Education and Outreach subcommittee, PDA Board of Directors, and City of Portsmouth Department of Public Works and Planning Department

Location of Action

Throughout the Hodgson Brook watershed.

Expected Benefits

- City departments and the PDA will adopt policies for use of stormwater filtration and infiltration practices.
- Less stormwater will impact Hodgson Brook.

Timetable

Short term: Incorporate policies into DPW Stormwater Management Program.

Long term: Incorporate policies into Planning and PDA site plan review.

Type of Action (choose one or more)

- ✓ Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan WQP-4 Install a bio-retention area.

Associated Goal

Water Quality Protection Goal

Associated Objectives

- 2.4 Encourage NH Dept. of Transportation, the City of Portsmouth Dept. of Public Works, and local businesses to use structural and nonstructural practices to treat stormwater runoff.
- 2.5 Encourage the City of Portsmouth Planning Board and Professional Planners to incorporate the Hodgson Brook Restoration and Implementation Plan into planning decisions.
- 2.6 Incorporate Low Impact Development techniques into existing and new development through education and regulations.

Description of Action

Install a bio-retention area (landscaping feature adapted to treat storm water runoff on a development site) in a parking lot as a demonstration project.

Steps Needed to Complete the Action

1. Review site plans for proposed development or re-development in the watershed to identify potential sites for a bio-retention area. *Potential sites include sites with open areas at least five to ten percent of the size of the contributing drainage area which are known to be free and clear of underground utilities. The gradient should also have a slope less than five percent to work best.*
2. When a potential site is identified, encourage the developer to consider designing a bio-retention area. *Incentives can be used to promote the idea of treating the stormwater runoff. Bio-retention areas can be used as snow storage areas, if they are planted with salt-tolerant and non-woody plant species. Snow storage may be a need for the site. Encourage developer to incorporate bio-retention area construction and maintenance into the project's business plan.*
3. Provide technical information links to the developer, such as where to obtain specification and cost information.
4. When developer constructs bio-retention area, create a maintenance agreement (which can be completed by the landscaping contractor), that includes semi-annual monitoring for the first year and after major storm events, to ensure proper function and performance.
5. Create signage to explain the function and benefits of the bio-retention area.

Who is Responsible

The City of Portsmouth Planning Board would be responsible for identifying potential candidates for bio-retention areas. The Hodgson Brook organization would be responsible for providing links to technical assistance and informational materials for bio-retention area specifications, and for producing the signage.

Location of Action

The primary subwatersheds for this action would be Upper Hodgson Brook, Newfields Ditch, and Middle Hodgson Brook since new development at the Pease Tradeport is still occurring there. However, the potential for development exists in the Borthwick Avenue subwatershed, too.

Expected Benefits

- A demonstration site for showing the community what a bio-retention area looks like.
- An opportunity to teach about the functions of this system.

Timetable

Short term: During year one, the City should identify potential candidates for bio-retention area construction.

Mid term: By the end of year three, the bio-retention area should be installed and the signage should be erected.

Type of Action (choose one or more)

- ✓ Regulatory
- Research
- ✓ Infrastructure Change
- Voluntary

Action Plan WQP-5 Identify and correct regulations to better protect stream buffers.

Associated Goal

Water Quality Protection Goal

Associated Objectives

- 2.1 Work with the community to protect existing wetland/stream buffers and create new buffers where appropriate.

Description of Action

Review subdivision, site planning, land use, and wetlands regulations and policies and identify protective measures and regulations that could be improved to better protect the functions and values of stream buffers.

Steps Needed to Complete the Action

1. Audit regulations to identify protective measures, lack of protection and areas that could be improved through changes in the ordinances and policies.
2. Recommend strengthening selected ordinances to protect buffers or enforce existing regulations.
3. Promote the review findings and work with the local boards by providing technical information to support changes.

Who is Responsible

The Regional Planning Commission is a likely choice for the review and report of findings. The organization could form a relationship with the local boards and work with members to strengthen existing regulations and enact new regulations, where appropriate.

Location of Action

The entire Hodgson Brook watershed.

Expected Benefits

- Better protection for buffers and the adjacent surface waters.

Timetable

Mid term: Hire RPC or other contractor to conduct review and publish report.

Long term: By the end of year nine promote the long-term adoption of ordinances.

Type of Action (choose one or more)

- ✓ Regulatory
- ✓ Research
- Infrastructure Change
- Voluntary

Action Plan WQP-6 Work with the Pease Development Authority to strengthen buffer protection.

Associated Goal

Water Quality Protection Goal

Associated Objective

2.1 Work with the community to protect existing wetland/stream buffers and create new buffers where appropriate.

Description of Action

Initiate and maintain a dialog with the Pease Development Authority Board of Directors regarding riparian and wetland buffers. Provide scientifically supported information about the benefits of wetland and riparian buffer setbacks to the Pease Development Authority. Accomplish this through a presentation to the PDA Board of Directors, possibly by adding to the presentation described in the Outreach/Education Action O&E-4.

Steps Needed to Complete the Action

1. Write a letter to the Pease Development Authority Executive Director and Engineering Director introducing the organization and requesting a meeting to discuss buffers.
2. Prepare subwatershed maps that include the wetlands and show Hodgson Brook for the discussion.
3. Meet with Executive Director and Engineering Director to listen to PDA policy on buffers and direction for regulating the wetland and stream buffer setbacks.
4. Provide supportive materials to encourage setbacks that are protective of the wetlands and Brook values and functions.
5. Prepare a presentation that suggests wetland and riparian setbacks that are based on the sensitivity of particular streams and wetlands in the watershed.
6. Provide supporting materials to the PDA BOD and Executive Director upon request.

Who is Responsible

HBWC

Location of Action

Pease International Tradeport

Expected Benefits

- Increase in buffer setbacks for wetlands and the Brook in the Pease International Tradeport.

Timetable

Short term: Initiate dialog with PDA, ongoing thereafter.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan WQP-7 Protect priority areas through land conservation.

Associated Goal

Water Quality Protection Goal

Associated Objective

2.2 Protect priority lands for conservation/protection.

Description of Action

Contract with the local Seacoast Land Trust to determine potential for land conservation on watershed parcels. Begin dialog with property owners regarding land protection measures with the goal of protecting water quality.

Steps Needed to Complete the Action

1. Determine lands that have some measure of protection (e.g., Natural Resource Protection Zone).
2. Create an inventory of potential lands to protect by researching city owned land and lands with some measure of protection.
3. Work with Seacoast Land Trust to continue research into potential conservation lands, to produce maps that identify these parcels, and to conduct research into the status of the parcels (e.g., permits for development). Use "linkage" of protected parcels as a priority for assessing lands to protect.
4. Contract with the Seacoast Land Trust to contact property owners of targeted parcels from Step 3.

Who is Responsible

HBWC, Portsmouth Conservation Commission, Seacoast Land Trust

Location of Action

Entire watershed area

Expected Benefits

- Identification of parcels that could provide protection to water quality and wildlife if placed in conservation.

Timetable

Ongoing throughout.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- Infrastructure Change
- Voluntary

Action Plan WQP-8 Retrofit storm drainage to improve water quality.

Associated Goal

Water Quality Protection Goal

Associated Objectives

- 2.4 Encourage NH Dept. of Transportation, the City of Portsmouth Dept. of Public Works, and local businesses to use structural and nonstructural practices to treat stormwater runoff.
- 2.5 Encourage the City of Portsmouth Planning Board and professional planners to incorporate the Hodgson Brook Restoration and Implementation Plan into planning decisions.
- 2.6 Incorporate Low Impact Development techniques into existing and new development through education and regulations.

Description of Action

The Center for Watershed Protection has developed a step-by-step approach to stormwater retrofitting. The approach is summarized in an eight-step process. The steps are listed below. The details for conducting this inventory and analysis are reprinted from a Center of Watershed Protection publication, available at www.cwp.org.

- 1. Preliminary Watershed Retrofit Inventory
- 2. Field Assessment of Potential Retrofit Sites
- 3. Prioritize Sites for Implementation
- 4. Public Involvement Process
- 5. Retrofit Design
- 6. Permitting
- 7. Construction Inspections
- 8. Maintenance Plan

Steps Needed to Complete the Action

Step 1: Watershed Retrofit Inventory

The first step: locating and identifying where it is feasible and appropriate to put the retrofit. This involves a process of identifying as many potential sites as rapidly as possible. The best retrofit sites fit easily into the existing landscape, are located at or near major drainage or stormwater control facilities, and are easily accessible. For example, almost every urban area has some type of existing pond or other existing feature adaptable for retrofitting. In many newer neighborhoods, dry

stormwater detention facilities were constructed for flood control. In older neighborhoods there are often aesthetic ponds or other water features that can make suitable retrofits. The table below lists some of the most likely spots for locating facilities, some common applications, and an applicable case study.

Usually the first step is completed in the office using available topographic mapping (a 5' contour interval is quite satisfactory), low altitude aerial photographs (where available), storm drain master plans (Portsmouth has storm drain infrastructure maps), and land use maps (zoning or tax maps are best).

Recommended Locations for Stormwater Retrofits		
Location	Type of Retrofit	Case Study
Existing stormwater detention facilities	Usually retrofitted as a wet pond or stormwater wetland capable of multiple storm frequency management	Wheaton Branch, Sligo Creek, Wheaton MD —multi-cell wet pond with extended detention
Immediately upstream of existing road culverts	Often a wet pond, wetland, or extended detention facility capable of multiple storm frequency management	Epsilon Pond, Redland MD —dry extended detention facility
Immediately below or adjacent to existing storm drain outfalls	Usually water quality only practices, such as sand filters, vegetative filters or other small storm treatment facilities	Long Quarter Branch, Towson, MD —gravel based wetland filter
Directly within urban drainage and flood control channels	Usually small scale weirs or other flow attenuation devices to facilitate settling of solids within open channels	Indian Creek, College Park MD —instream concrete weir flow attenuation device
Highway rights-of-way and cloverleaves	Can be a variety of practices, but usually ponds or wetlands	Bear Gutter Creek, Route 22 Armonk, NY —combination wet pond and stormwater wetland
Within large open spaces, such as golf courses and parks.	Can be a variety of practices, but usually ponds or wetlands capable of multiple storm frequency management	Meisner Avenue Retrofit, Staten Island, New York City —micro-pool extended detention facility
Within or adjacent to large parking lots	Usually water quality only facilities such as sand filters or other organic media filters (e.g., bioretention)	Kettering Subdivision, Prince Georges, Co., MD —Bioretention practices

Scouting for potential candidate sites should follow the guidance discussed in the table. Two important tasks need to be undertaken before venturing into the field. First, the drainage area to each retrofit should be delineated and second, the potential surface area of the facility measured. The drainage area is used to compute a capture ratio. This is the percentage of the overall watershed that is being managed by all retrofit projects. The surface area is used to compute a preliminary storage volume of the facility. A shortcut storage volume can be computed by multiplying two-thirds of the facility surface area times an estimated depth. These two bits of information can be used as a quick screening tool. In general, an effective retrofitting strategy must capture at least 50% of the watershed and a minimum target storage volume for each retrofit is approximately one half inch per impervious acre.

Step 2: Field Verification of Candidate Sites

Candidate retrofit sites from Step 1 are investigated in the field to verify that they are feasible. This field investigation involves a careful assessment of site specific information such as presence of sensitive environmental features, location of existing utilities, type of adjacent land uses, condition of receiving waters, construction and maintenance access opportunities, and most importantly, whether or not the contemplated retrofit will actually work in the specified location. Usually a conceptual sketch is prepared and photographs are taken.

Step 3: Prioritize Sites for Implementation

Once sites have been located and determined to be feasible and practical the next step is to set up a plan for future implementation. Even the best stormwater

retrofitting programs have limited capital budgets for individual project design and construction. Therefore it is prudent to have an implementation strategy based on a prescribe set of objectives. For example, in some watersheds, implementation may be based on a strategy of reducing pollutant loads to receiving waters where the priority of retrofitting might be to go after the "dirtiest" land uses first. Whereas if the strategy is oriented more towards restoring stream channel morphology, priority retrofits are targeted to capture the largest drainage areas and provide the most storage. Whatever the restoration focus, it is useful to provide a scoring system that can be used to rank each retrofit site based on a uniform criteria. A typical scoring system might include a score for the following items:

- Pollutant removal capability (storage provided and type of BMP)
- Stream channel protection capability (ability to control subbankful flow events)
- Cost of facility (design, construction, and maintenance costs)
- Ability to implement the project (land ownership, construction access, permits)
- Potential for public benefit (education, location within a priority watershed, visible amenity, supports other public involvement initiatives)

Step 4: Public Involvement Process

This aspect of the process is critical if a project is ever to be constructed. A successful project must involve the immediate neighbors who will be affected by the changed conditions. Nearly all retrofits require significant modifications to the existing environment. A dry detention pond, for example, is for some a very desirable area in the community. It is a place to

walk the dog and only rarely is there any water in the facility. A wet pond or stormwater wetland retrofit, on the other hand, may have large expanses of water and may have highly variable water fluctuations. Adjacent owners may resist these changes. In order to gain citizen acceptance of retrofits they must be involved in the process from the start and throughout the planning, design, and implementation process. Citizens who are informed about the need for, and benefits of, retrofitting are more likely to accept projects.

Still, some citizens and citizen organizations will never support a particular project. This is why it is mandatory that there is an overall planning process, which identifies projects early and allows citizen input before costly field surveys and engineering are performed. Projects that cannot satisfy citizen concerns may need to be dropped from further consideration.

A good retrofit program must also incorporate a good public relations plan. Slide shows or field trips to existing projects can be powerful persuasions to skeptical citizens. Every site that goes forward to final design and permitting should be presented at least once to the public.

Step 5: Retrofit Design

Design of retrofit projects incorporate the same elements as any other BMP project including adequate hydrologic and hydraulic modeling, detailed topographic mapping, property line establishment, site grading, structural design, geotechnical investigations, erosion and sediment control design, construction phasing, and staging, to name a few. But there is one very big difference. Normal BMP design usually follows a prescribed design criteria (e.g., control of the

2 year storm or sizing for a specified water quality volume), retrofit designers must work backwards from a set of existing site constraints to arrive at an acceptable stormwater control obtainable.

The key to successful retrofit design is the ability to balance the desire to maximize pollutant removal and channel erosion protection while limiting the impacts to adjacent infrastructure, residents or other properties. Designers must consider issues like avoiding relocations of existing utilities, minimizing existing wetland and forest impacts, maintaining existing floodplain elevations, complying with dam safety and dam hazard classification criteria, avoiding maintenance nuisance situations, and providing adequate construction and maintenance access to the site.

Step 6: Permitting

Perhaps the difficult permitting issues for retrofit projects involve impacts to wetlands, forests, and floodplain alterations. Many of these impacts are either unavoidable or necessary to achieve reasonable storage targets. The primary issues that the permitting agencies are looking for is to ensure that the impacts have been minimized to the maximum extent practicable and that the benefits of the proposed project are clearly recognizable.

Step 7: Construction Inspections

Like any major design project, proper construction inspection and administration is integral to a success-

ful facility. For retrofit projects, this is even more so. Retrofitting often involves construction of unique or unusual elements, such as flow splitters, underground sand filters, or stream diversions. Many of these practices are unfamiliar to many contractors. Most publicly funded projects are awarded to the low bidder who may be qualified to do the work, but have never constructed projects of this nature before. Therefore, it is almost a necessity to retain the original retrofit designer or other qualified professional to answer contractor questions, approve shop drawings, conduct regular inspections, hold regular progress meetings, conduct construction testing, and maintain construction records.

Step 8: Maintenance Plan

Always the last element to be discussed and often the least practiced component of a stormwater management program, maintenance is doubly important in retrofit situations. The reasons are simple. Most retrofits are undersized when compared to their new development counterparts and space is at a premium in urban areas where many maintenance provisions such as access roads, stockpiling or staging areas are either absent or woefully undersized.

Designers again must balance maintenance access and storage volumes (for fore bays, catch basins, and debris trapping areas) with water quality, flood control, and the other constraints discussed above.

Who is Responsible:

Advisory Committee, HBWC, Portsmouth Department of Public Works, and contractor(s)
A potential partner is the New Hampshire Technical College located at the Pease International Tradeport.

Location of Action

The entire Hodgson Brook watershed.

Expected Benefits

Timetable

Short term: Conduct inventory and identify sites.

Mid term: Install BMPs at priority sites.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- ✓ Infrastructure Change
- Voluntary

Action Plan WQP-9 Promote low impact development techniques.

Associated Goal

Water Quality Protection Goal

Associated Objective

- 2.2 Protect priority lands for conservation and protection.
- 2.3 Identify pollution prevention actions and encourage residents and business owners to take action.
- 2.4 Encourage NH Department of Transportation, the City of Portsmouth Department of Public Works, and local businesses to use structural and non-structural practices to treat stormwater runoff.
- 2.6 Incorporate Low Impact Development techniques into existing and new development through education and regulations.

Description of Action:

Incorporate Low Impact Development techniques into existing and new developments. This would include reducing impervious cover, maintaining the water cycle, limit disturbance of natural areas, protection of critical areas, site design conservation subdivision, and LID stormwater management and location of developments in watershed.

Steps Needed to Complete the Action

- 1. Seek funding for work.
- 2. Develop partnerships with cooperating agencies, organizations and City of Portsmouth.
- 3. Develop presentation on LID.
- 4. Give presentation to public and board.
- 5. Work with partners to schedule workshops.
- 6. Hold workshops.
- 7. Evaluate effectiveness of workshops and develop next steps.

Who is Responsible

HBWC and volunteers

Location of Action

(particular subwatershed or site):

Watershed wide

Expected Benefits

- Decrease runoff.
- Decrease loss of habitat and contamination associated with land development.

Timetable

Short term: Write grants, develop partnerships.

Mid to Long term: Implement plan.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan O&E-I Post Hodgson Brook Watershed road signs.

Associated Goal

Outreach and Education Goal

Associated Objective

3.1 The residential and business community will know they live and work in the watershed.

Description of Action

Design, print, and post Hodgson Brook Watershed signs at all roads entering and exiting the watershed.

Steps Needed to Complete the Action

1. Determine who has to give permission (City/NHDOT) for each road and get permission to post.
2. Determine how many signs would be needed (possibly 25-50 for enter and exit).
3. Develop Hodgson Brook Watershed logo.
4. Decide on wording and layout for signs; consider placing name of adjacent watershed on the opposite side of the sign.
5. Print signs.
6. Post signs.

Who is Responsible

Advisory Committee and HBWC

Location of Action

All sub-watersheds, signs are for all roads in and out of watershed.

Expected Benefits

- Everyone who drives in and out of the watershed will learn the limits of the watershed boundary.

Timetable

Short to Mid term

Type of Action (choose one or more)

- Regulatory
- Research
- ✓ Infrastructure Change
- Voluntary

Action Plan O&E-2 Publish promotion of project.

Associated Goal

Outreach and Education Goal

Associated Objectives

- 3.1 The residential and business community will know they live and work in the watershed.
- 3.2 The residential and business community will know about the *Hodgson Brook Watershed Restoration and Implementation Plans*.
- 3.3 The residential and business community will know and understand the definition of non-point source pollution (runoff).
- 3.4 The residential and business community will participate in a stewardship role to help implement the restoration plan.

Description of Action

Continue to publish articles about Hodgson Brook restoration events and successes.

Steps Needed to Complete the Action

1. Find suitable newsletter to publish information about Hodgson Brook (consider the ANMP's *North Mill Pond Times*).
2. Secure any needed funding for implementing this Action. (See budget and funding source below)
3. Create a recognizable permanent Hodgson Brook Watershed Study "Spotlight" or "Corner" in a newsletter.
4. Create a mailing list of organizations that might print articles in their newsletters, i.e., neighborhood associations, science centers, and businesses.
5. Write the articles or updates. Always put contact info and the website at the end of the articles and try to give the audiences something to do.
6. Put the articles in the newsletter.
7. Send the articles to other organizations/businesses within the watershed so they may print them in their newsletters. (See O&E-2b).
8. Track number of articles printed and any requests for more information related to articles where possible.

Who is Responsible

Advisory Committee, HBWC and volunteers

Location of Action

Watershed wide

Expected Benefits

- Utilize and build upon the work of the ANMP newsletter.
- Keep watershed occupants informed and engaged on watershed issues.
- Build membership.
- Recruit volunteers for other actions.
- Assist with many other goals promoting outreach, education, and events.

Timetable

Short term and throughout restoration implementation.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-3 Publicize restoration successes and events.

Associated Goal

Outreach and Education Goal

Associated Objective

3.2 The residential and business community will know about the *Hodgson Brook Restoration and Implementation Plans*.

Description of Action

Use existing newsletter articles from O&E-2 and write additional “success story” or “highlight” type articles for press releases.

Steps Needed to Complete the Action

1. Secure funding for project (see budget and funding source below). Compile a mailing list of press and organizations that may print articles
2. Write the articles, updates, and success stories or hot topic stories. Always put contact info and the website at the end of the articles.
3. Send the articles out as press releases to mailing list.
4. Track number of press releases printed.
5. Place printed press releases on Hodgson Brook Website (see O&E-7)

Who is Responsible

The HBWC, Advisory Committee members and associated organizations would write the articles and mail out as press releases.

Location of Action

Watershed wide

Expected Benefits

- Familiarity with the *Watershed Restoration Plan for Hodgson Brook*.
- Contact information available as a constant reminder.

Timetable

Ongoing

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-4 Promote Hodgson Brook restoration activities through public presentations.

Associated Goal

Outreach and Education Goal

Associated Objective

3.2 The residential and business community will know about the *Hodgson Brook Watershed Restoration and Implementation Plans*.

Description of Action

Create and present several versions of a presentation about the Hodgson Brook restoration project that addresses the following audiences:
Channel 22 – general public residents of Portsmouth
Portsmouth City Council – Decision makers
Pease Tenant Association
Pease Development Authority
Rotary and Chamber of Commerce
Schools and classrooms

Steps Needed to Complete the Action

1. Secure funding for project.
2. Outline content of presentations. Consider giving organizations or audience something to do at the end of the presentation, i.e., discuss possible partnership or participation in the study or restoration plan, volunteer opportunities.
3. Develop poster for promotion.
4. Contact the above organizations/audience to address the steps to presenting.
5. Hire or appoint someone to create the four versions of the presentations and surveys or evaluations.
6. Run drafts by a review committee.
7. Present to above organizations.
8. Review survey or evaluation after each presentation.

Who is Responsible

HBWC for writing presentation outline, contacting organizations to host the presentations, and giving presentations. Hired staff to prepare the presentations.

Location of Action

See above organizations/ audiences

Funding Source

Seek funding sources through grant programs.

Expected Benefits

- Community awareness and familiarity with the *Watershed Restoration Plan for Hodgson Brook*.
- Opportunities to relate people to the project and to encourage participation.

Timetable

Ongoing

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-5 Provide tours of the watershed.

Associated Goal

Outreach and Education Goal

Associated Objective

3.1 The residential and business community will know they live and work in the watershed.

Description of Action

Offer watershed tours designed for both the business and residential communities, targeting the work force in Pease, the general public, and recreationalists. These should be designed as self-guided tours but can also serve the base for a guided tour.

Steps Needed to Complete the Action

1. Develop different tours to highlight watershed features, offering a variety of lengths of tours, which can be started at many locations (loops). Also allow for walking, biking, and car trips.
2. Develop self-guided maps for each tour type indicating routes and including interpretative information on features.
3. Print maps.
4. Schedule, advertise, and offer tours.

Who is Responsible

The Hodgson Brook Watershed Coordinator, Advisory Committee, and volunteers

Location of Action

Watershed-wide (but routes depend on safety and access)

Expected Benefits

People enjoying the watershed for recreation will have an increased awareness of watershed and environmental issues.

Timetable

Mid term

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-6 Hold a watershed walk-a-thon fundraiser.

Associated Goal

Outreach and Education Goal

Associated Objective

3.1 The residential and business community will know they live and work in the watershed.

Description of Action

Develop and organize a walk-a-thon in the watershed as a fundraiser and community event.

Steps Needed to Complete the Action

1. Seek out partners in the watershed to build a group to work on the event.
2. Develop route.
3. Recruit and organize work force (volunteers).
4. Set up race infrastructure, find sponsors.
5. Advertise event.
6. Get supplies .
7. Run event.

Caution: The Local Advisory Committee that reviewed this action cautioned that this activity would be a major undertaking and could possibly cost money instead of generating funds. Extensive partnering and a solid plan for carrying out the event will be necessary.

Who is Responsible

Advisory Committee, HBWC, and volunteers

Location of Action

Watershed (location should be safe for pedestrians or arrangements made for safe walking conditions)

Expected Benefits

- Build awareness of watershed.
- Raise money.

Timetable

Mid to Long term

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-7 Promote and update the Hodgson Brook Restoration website.

Associated Goal

Outreach and Education Goal

Associated Objective

3.2 The residential and business community will know about the *Hodgson Brook Watershed Restoration and Implementation Plans*.

Description of Action

Currently NH DES hosts a Hodgson Brook website at www.des.state.nh.us/hodgsonbrook. This action would involve working with NH DES to keep the website information current and accurate.

Steps Needed to Complete the Action

1. Identify website host, site is now within DES but the group may want own site.
2. Review website contents and gather new information as it becomes available.
3. Approve website contents.
4. Put new information (or new website) up on the web.
5. Track number of hits to website and any inquiries made to contact information.
6. Maintain website as restoration successes occur.

Who is Responsible

The Hodgson Brook Watershed Coordinator and DES.

Location of Action

Watershed (and beyond)

Expected Benefits

An opportunity to provide information in a timely and efficient manner while providing an avenue to refer people to for more information.

Timetable

Ongoing.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-8 Establish “Brook Keepers” volunteer corps.

Associated Goal

Outreach and Education Goal

Associated Objective

3.4 The residential and business community will participate in a stewardship role to help implement the restoration plan.

Description of Action

Establish a volunteer corps of Brook Keepers to participate in stewardship activities.

Steps Needed to Complete the Action

1. Develop the mission of the Brook Keepers (a volunteer work force interested/living in/near the Hodgson Brook watershed).
2. Develop training program that includes environmental quality (water; wildlife, etc.) education and overview of various activities that they could participate in (e.g. enhancing vegetative buffers, creating signage, clean ups).
3. Recruit volunteers.
4. Train volunteers.
5. Use Brook Keepers on restoration actions.
6. Provide awards/recognition to volunteers.

Who is Responsible

HBWC and volunteers

Location of Action

Watershed wide

Expected Benefits

- A volunteer corps that will supply workforce for actions, build watershed awareness and community, build community support for projects, and improve water quality.

Timetable

Short term: Develop training program near term.

Mid term: Recruit and train volunteers.

Long term: Volunteer activities.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-9 Publicize activities through community radio.

Associated Goal

Outreach and Education Goal

Associated Objective

3.2 The residential and business community will know about the *Hodgson Brook Watershed Restoration Plan* and the *Implementation Plan*.

Description of Action

Create radio public service announcements (PSAs) and/or arrange interviews on the Hodgson Brook restoration events/successes to be used on local low-powered community radio in Portsmouth.

Steps Needed to Complete the Action

PSAs

1. Outline information to be provided in PSAs.
2. Contact local radio stations and explore options.
3. Send out request for proposals to marketing companies to draft PSAs.
4. Hire company to draft PSA.
5. Draft and review PSAs.
6. Place on local radio.

Interview

1. Contact radio station to arrange interview.
2. Draft interview outline and content.
3. Participate in interview.
4. Release press relating to interview.

Who is Responsible

The Hodgson Brook Watershed Coordinator and marketing organization.

Location of Action

Watershed and seacoast community

Expected Benefits

- The Hodgson Brook Watershed will become familiar to the community.

Timetable

Ongoing

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-10 Publicize activities on Great Bay Area Radio.

Associated Goal

Outreach and Education Goal

Associated Objective

3.3 The residential and business community will know and understand the definition of non-point source pollution (runoff).

Description of Action

Use Great Bay Area Radio to reach audiences traveling through the Hodgson Brook vicinity with information about nonpoint source pollution, the Brook, the Plan, and related events and opportunities.

Steps Needed to Complete the Action

1. Plan a series of spots to be broadcast at regular intervals over GBAR.
2. Write spots to coincide with *Restoration Plan* outreach objectives.
 - Identify the location of Hodgson Brook and its relationship to Great Bay and coastal waters.
 - Provide information about restoration activities including where to find more information.
 - Describe NPSP and its significance in the coastal watershed.
 - Offer ideas of how locals can participate in Hodgson Brook stewardship.
 - Inform listeners of recreational opportunities in the corridor.
 - Notify listeners of incorporation of the Brook's protection in Portsmouth's Master Plan.
3. Write spots related to significant items of interest or opportunities for stewardship.
4. Inform Sea Grant and request inclusion of the information into upcoming GBAR broadcasts.

Who is Responsible

Outreach staff for GBAR and Advisory Committee to provide information

Location

Watershed and beyond

Expected Benefits

- Greater awareness of Hodgson Brook, the plans, NPSP, stewardship opportunities, recreational access points, and Hodgson Brook's place in Portsmouth Master Plan among regular GBAR listeners.
- Possibility of tracking listener response through GBAR on-line survey.

Timetable

Ongoing

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-I I Create watershed maps for outreach and education.

Associated Goal

Outreach and Education Goal

Associated Objective

3.1 The residential and business community will know they live and work in the watershed.

Description of Action

Create a set of maps for use in outreach and marketing materials, and many of the actions.

Steps Needed to Complete the Action

1. Determine audience(s) and how the maps will be used (tours, newsletters, trainings, presentations, etc.).
2. Refer to *Hodgson Brook Environmental Quality Characterization Report* and the City of Portsmouth Planning and Public Works departments for existing data layers, aerial photographs and maps.
3. Create a base map.
4. Determine features and landmarks to highlight.
5. Design various maps for the specific needs in other action plans.
6. Store the maps in a useable format.
7. Print or use digitally as needed.
8. Update maps as new data become available.

Who is Responsible

HBWC, City of Portsmouth

Location of Action

Watershed wide

Expected Benefits

- Connect people to the watershed.
- Increase stewardship.
- Increase recreation use.

Timetable

Short term: Create maps and update as necessary.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-12 Conduct storm drain stenciling.

Associated Goal

Outreach and Education goal

Associated Objective

3.3 The residential and business community will know and understand the definition of nonpoint source pollution (runoff).

Description of Action

Conduct storm drain stenciling projects and associated outreach in high visibility Hodgson Brook watershed neighborhoods.

Steps Needed to Complete the Action

1. Locate funding to support SDS project: supplies, labor; associated outreach materials, etc.
2. Work with Portsmouth DPW to locate target watershed neighborhoods with high visibility, safe traffic and appropriate storm drains for projects. Use the City's storm drain system maps to identify storm drain locations and numbers, and to determine specific local information about correct disposal of house and yard waste for associated outreach.
3. Recruit volunteers for selected neighborhoods.
4. Select time, place, and scope of project.
5. Investigate potential for business partners for stenciling projects.
6. Purchase and locate supplies: paint, stencils, brooms, safety vests, safety cones, etc.
7. Train volunteers on NPSP basics. (PPT, enviroscape, etc.)
8. Produce printed materials (doorhangers) for target neighborhoods.
9. Contact media about stenciling days.
10. Conduct stenciling projects.
11. Tally results.

Who is Responsible

HBWC, volunteers, sponsoring organization, and DPW.

Location

To be determined, with DPW recommendations.

Expected Benefits

- Greater awareness by neighborhood residents of storm water destinations.
- Greater awareness of runoff as a source of water pollution.
- Municipal involvement in stormwater outreach.
- Volunteer involvement in municipal stormwater issues.
- Media coverage of storm water issues.

Timetable

Mid term: Stenciling is only possible during dry, mild weather. May take several months per project from recruitment to implementation.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-I3 Promote responsible home and yard practices.

Associated Goal

Outreach and Education Goal

Associated Objective

3.3 The residential and business community will know and understand the definition of non-point source pollution (runoff).

Description of Action

Conduct workshops and distribute educational materials that provide home and business owners with practical ways to reduce potential polluted runoff sources. This action could possibly be tied into the City's efforts to comply with the Stormwater Phase II regulations.

Steps Needed to Complete the Action

1. Review existing educational materials and presentations about household pollution prevention to determine assets and needs.
2. Refine presentation, workshop or educational materials.
3. Recruit workshop participants through neighborhood associations, businesses, garden clubs, watershed organizations, etc.
4. Conduct *20 Tips for a Better Backyard* or similar workshop to a minimum of four audiences per year: Include practice for a self-assessment for participants to do at home.
5. Secure commitment of workshop participants to adopt at least two "new" practices.
6. Promote practices through other venues such as the brochures that are included with electric and telephone bills.

Who is Responsible

Outreach staff and committee members, workshop participants

Location

Any gathering place in the watershed.

Expected Benefits

- Participants will receive educational information about "better backyards", as well as information about soil testing for correct fertilizer application, native plant and grass recommendations, pest management, home stormwater management, household hazardous material alternatives, etc.
- Participants will adopt new practices to reduce NPSP from the home landscape.
- Contact information from willing participants will be gathered for future invitation to events.

Timetable

Mid and Long term: Conduct workshops and provide information.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan O&E-14 Promote responsible home and yard practices through home and garden businesses.

Associated Goal

Outreach and Education Goal

Associated Objective

3.3 The residential and business community will know and understand the definition of non-point source pollution (runoff).

Description of Action

Conduct a volunteer survey of home and garden businesses to identify practices that could result in nonpoint source pollution and provide display information about reducing NPSP through better home and lawn care practices where people are at the point of making decisions about home and yard care products and practices.

Steps Needed to Complete the Action

1. Research successes and failures of similar programs in other states and locales. Consider using a survey similar to the survey used in Seabrook, New Hampshire that identified pollution prevention and remediation practices at businesses in the Cains Brook watershed.
2. Notify businesses about the survey, conduct survey at willing businesses, send follow up letters and recognize businesses that participated.
3. Identify practices to be targeted for change at home and garden centers by customers (e.g., fertilizer application, plant seeding, pesticide use, etc.).
4. Identify potential business partners (e.g., hardware stores, nurseries, etc.).
5. Determine appropriate recognition for participating business partners (e.g., emblem, publicized list, etc.).
6. Develop marketing materials: shelf talkers, displays, fact sheets, etc.
7. Develop evaluation tool to track changes: change in sales, self-reporting, etc.
8. Work with businesses to display education materials.
9. Conduct campaign.
10. Regularly check on status of educational pieces on site.
11. Recognize partners.
12. Evaluate.

Who is Responsible

Outreach staff, business partners, and possible professional marketer

Location

Watershed home and yard care businesses.

Expected Benefits

- Greater awareness of specific products or practices that affect water quality by residential users.
- Greater behavioral commitment by watershed residents to consider water quality protection in their application of house and yard products.
- Greater awareness of specific products or practices that affect water quality by commercial providers.
- Availability of business partners for water quality protection projects.
- Media coverage of campaign.

Timetable

Long term: Multi-year project due to need for research, partners, additional funding, as well as product development and evaluation.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-15 Organize Hodgson Brook Shoreline Cleanup.

Associated Goal

Outreach and Education Goal

Associated Objective

3.4 The residential and business community will participate in a stewardship role to help implement the restoration plan.

Description of Action

Organize and implement regular cleanup of the Hodgson Brook shoreline. Participants will remove debris from the shores of Hodgson Brook and have it hauled to an appropriate waste facility.

Steps Needed to Complete the Action

1. Using the results of the Trash and Debris Survey (refer to the Monitoring Plan), target shoreline areas for clean up.
2. Publicize date and time of cleanup in local newspapers and area newsletters.
3. Encourage businesses to organize teams of employees and look to the Police Department for community service opportunities.
4. Obtain containers for the collection of refuse and choose central area for container placement.
5. Solicit area businesses for contribution of supplies.
6. Choose areas for registration tables with supplies ie. gloves, bags, maps etc.
7. Post signs at registration indicating contributors.
8. When finished, write and send in to local newspapers the results of cleanup, the list of contributors toward event and business "teams" who participated.

Who is Responsible

To be determined

Location of Action

Cleanup target areas will be located along the corridor of the Brook as determined by the Trash and Debris Survey results.

Expected Benefits

- Community awareness of the need for appropriate waste disposal and effective stewardship of the Brook.
- A cleaner area.
- Increased awareness and familiarity in the community with the Brook and its watershed.

Timetable

Ongoing in conjunction with ANMP's annual Cleanup of the North Mill Pond.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-16 Inventory recreational assets and opportunities.

Associated Goal

Outreach and Education Goal

Associated Objective

3.5 Increase access to Hodgson Brook corridor for passive and active recreational activities, and educate the users of the bike/footpaths about the ecosystem

Description of Action

Conduct an inventory of brook corridor access points, trails, and associated ownership.

Steps Needed to Complete the Action

1. Define stream corridor study area throughout the watershed
2. Identify bike paths and walking trails in corridor
3. Identify ownership of trail areas and determine "publicly available" trail areas.
4. Provide information to Outreach mapping group (see O&E-11) to place trails on existing map with other attributes such as roadways and landmarks.

Who is Responsible

to be determined

Location of Action

Entire watershed

Expected Benefits

- Increased awareness of brook and brook attributes through increase in recreational use.

Timetable

Mid term

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- Infrastructure Change
- ✓ Voluntary

Action Plan O&E-17 Incorporate the *Watershed Restoration Plan for Hodgson Brook* into the Portsmouth Master Plan.

Associated Goal

Water Quality Protection Goal

Associated Objective

2.5 Encourage the City of Portsmouth Planning Board and Professional Planners to incorporate the Hodgson Brook Restoration and Implementation Plan into planning decisions.

Description of Action

Ensure that the *Hodgson Brook Restoration Plan* is incorporated into the Portsmouth Master Plan.

Steps Needed to Complete the Action

1. Write a letter to the Portsmouth Planning Department requesting that the *Hodgson Brook Restoration Plan* be included in the City Master Plan by reference or formal incorporation. Provide a copy of the Plan in electronic format.
2. Conduct follow-up through phone calls and meetings, if necessary. Respond to request for information by the City.

Who is Responsible

Advisory Committee, HBWC, and City of Portsmouth

Location of Action

N/A

Expected Benefits

- Decisions made by the City will reflect and promote the goals of the *Watershed Restoration Plan for Hodgson Brook*.

Timetable

Short term

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan O&E-18 Recognition of good stewardship practices.

Associated Goal

Outreach and Education Goal

Associated Objective

3.4 The residential and business community will participate in a stewardship role to help implement the restoration plan

Description of Action

Acknowledge a watershed resident for their good stewardship practices of Hodgson Brook.

Steps Needed to Complete the Action

1. On a schedule to be determined by the coordinator, select a person living or working in the watershed that has contributed to the protection or restoration of the Brook. The award/recognition nomination could be generated in several different ways, such as
 - identify a partner who has volunteered time or expertise to an action plan;
 - request applications for nominations, or
 - invite members involved in the Brook restoration to nominate a peer.
2. Solicit area businesses for gift certificates that could be added to the award recognition.
3. Present award certificate to the person.
4. Submit press releases to area newspapers and newsletters, being sure to mention which business made contributions.

Who is Responsible

HBWC, Advisory Committee and volunteers

Location of Action

Watershed

Expected Benefits

- An incentive to continue good stewardship.
- A method of spreading the news about good practices.
- An encouragement to others to do the same.

Timetable**Ongoing****Type of Action (choose one or more)**

- Regulatory
- Research
- Infrastructure Change
- ✓ Voluntary

Action Plan HW-I Inventory aquatic species and evaluate instream habitat.

Associated Goal

Habitat and Wildlife Restoration Goal

Associated Objective

- 4.1 Conduct research and inventories of aquatic and terrestrial species and habitats to evaluate the historic and present condition of animal populations and their habitat in the watershed.

Description of Action

Conduct a habitat survey to evaluate the Brook's ability to support aquatic life.

Steps Needed to Complete the Action

1. Recruit volunteers to assist with survey.
2. Develop a database to contain survey results.
3. Determine survey schedule and logistics.
4. Notify landowners.
5. Conduct survey using the methodology described in the *Hodgson Brook Watershed Monitoring Plan* (Section 4.6 Habitat Assessment Survey).
6. Enter information into the database.
7. Analyze and interpret results.
8. Prioritize areas for restoration and propose recommendations for further action based on survey findings.

Who is Responsible

HBWC and volunteers

Location of Action

Hodgson Brook (see description of specific sites as described in Section 4.6 of the *Monitoring Plan*.) Sites for restoration will be identified and prioritized once the survey is finished.

Expected Benefits

- Aquatic habitats will be characterized.
- Potential habitat restoration sites will be identified.

Timetable

Mid term: Surveys.

Long term: Propose restoration recommendations.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan HW-2 Survey terrestrial wildlife and habitat.

Associated Goal

Habitat and Wildlife Restoration Goal

Associated Objective

- 4.1 Conduct research and inventories of aquatic and terrestrial species and habitats to evaluate the historic and present condition of animal populations and their habitat in the watershed.

Description of Action

Inventory terrestrial habitat and wildlife; monitor wildlife through the "Keeping Track" program.

Steps Needed to Complete the Action

1. Secure funding for the program.
2. Recruit volunteers for the Keeping Track program.
3. Conduct Keeping Track training program.
4. Determine the study area and Keeping Track transects (see www.keepingtrackinc.org/article/articleview/3332/1/390/).
5. Set up database for inventory and monitoring information.
6. Begin inventories and monitoring.
7. Enter information into the database.
8. Analyze and interpret results.
9. Provide periodic reports and updates of findings.

Who is Responsible

HBWC and volunteers, schools, conservation commission, etc.

Location of Action

Various locations in the Hodgson Brook watershed; specific sites to be determined during Steps 2 and 3.

Expected Benefits

- Baseline data.
- Community involvement.

Timetable

Short term: Set up program.

Long term: Implement program.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan HW-3 Survey bird species and habitat.

Associated Goal

Wildlife and Habitat Restoration Goal

Associated Objective

- 4.1 Conduct research and inventories of aquatic and terrestrial species and habitats to evaluate the historic and present condition of animal populations and their habitat in the watershed.

Description of Action

Utilize existing bird inventory techniques to evaluate habitat and inventory the bird species that utilize the watershed.

Steps Needed to Complete the Action

1. Recruit volunteers to assist with survey.
2. Develop a database to contain survey results.
3. Determine survey schedule and logistics.
4. Notify landowners.
5. Conduct survey using the methodology chosen.
6. Enter information into the database.
7. Analyze and interpret results.
8. Prioritize areas for restoration and propose recommendations for further action based on survey findings.

Who is Responsible

HBWC and volunteers

Location of Action

Hodgson Brook Watershed

Expected Benefits

- An evaluation of the present species in the watershed.
- An outline of the habitats being used.
- Data to support implementation of Objective 4.2.

Timetable

Mid term: Conduct surveys.

Long term: Propose recommendations.

Type of Action (choose one or more)

- Regulatory
- Research
- Infrastructure Change
- Voluntary

Action Plan HW-4 Evaluate historic and potential fish habitats and species.

Associated Goal

Habitat and Wildlife Restoration Goal

Associated Objective

- 4.1 Conduct research and inventories of aquatic and terrestrial species and habitats to evaluate the historic and present condition of animal populations and their habitat in the watershed.

Description of Action

Research the historic fish species that inhabited Hodgson Brook and conduct a survey to determine present fish species and habitats.

Steps Needed to Complete the Action

1. Consult with a fisheries biologist to determine how to evaluate historic fish species.
2. Contract with an expert to research the historic fish runs in the brook. And, have contractor provide a report and presentation to the community about the historic use of the brook by fish and anglers.
3. Develop a plan to conduct fish and habitat surveys of the brook to determine present fish species and the condition of the fish habitat.
4. Conduct surveys and produce a report that details findings of fish and habitat condition surveys.
5. Using the research study and the surveys, determine potential and suitability for restoring fish runs to the brook.
6. Determine the steps necessary to restore the brook for supporting health fish populations. Work with the NH Fish & Game Department and local, state, and national organizations whose missions include fish restoration. Produce a report that describes the actions, players and costs that would be required to restore the brook.

Who is Responsible

HBWC, volunteers and NH Fish & Game Department

Location of Action

All subwatersheds

Expected Benefits

- Benefit habitat of North Mill Pond and estuary.
- Indicate health of Hodgson Brook.

Timetable

Mid term: Conduct surveys.

Long term: Report on possible restoration activities.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- Infrastructure Change
- ✓ Voluntary

Action Plan HW-5 Research and implement Hodgson Brook daylighting.

Associated Goal

Habitat and Wildlife Restoration Goal
Water Quality Restoration Goal

Associated Objective

4.2 Determine opportunities for restoring instream, active floodplain, and upland habitats, and Objective 1.1

Description of Action

Conduct a feasibility study to determine whether or not it is possible to daylight Hodgson Brook to improve aquatic habitat and water quality, and implement daylighting projects.

Steps Needed to Complete the Action

1. Identify stakeholders.
2. Meet with stakeholders to discuss the idea and the plan; build support for the plan.
3. Work with stakeholders to determine main elements of the study (e.g. physical and community concerns, permitting, funding, site access and landowner relations, maintenance and monitoring, economic issues, etc.).
4. Secure funding for the study.
5. Choose a contractor to conduct the study.
6. Conduct feasibility study to determine whether or not it is possible from a physical and community perspective to daylight the brook.
7. Follow up on study outcomes and recommendations (See www.rmi.org/sitepages/pid172.php and scroll to "Daylighting: New Life for Buried Streams" for more information and ideas).
8. Conduct daylighting projects if feasible.

Who is Responsible

HBWC, Pease Development Authority, developers, City officials and stakeholders

Location of Action

Grafton Ditch, Corporate Drive to Goosebay Drive. (According to the EQC Report, the Brook is piped underground at Corporate Drive and flows under the site of the former Air Force residences and then daylights from a pipe at Goosebay Drive.)

Expected Benefits

- Community support for daylighting the brook and a plan of action.

Timetable

Short term: Conduct study.

Mid and Long term: Contracting and implementation.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- Infrastructure Change
- ✓ Voluntary

Action Plan HW-6 Habitat Restoration Feasibility Study.

Associated Goal

Habitat and Wildlife Restoration Goal

Associated Objective

4.2 Determine opportunities for restoring instream, active floodplain, and upland habitats.

Description of Action

Conduct research to determine opportunities for restoration of instream, active floodplain, and upland habitats.

Steps Needed to Complete the Action

1. Determine parameters for study, write RFP.
2. Secure funding for the study.
3. Choose a contractor to conduct the study.
4. Complete study.
5. Utilize study to apply for grants for restoration.

Who is Responsible

HBWC, NH Fish & Game Department, volunteers, and stakeholders

Location of Action

Hodgson Brook Watershed

Expected Benefits

- Determine where restoration is possible.

Timetable

Mid term: Conduct study.

Long term: Secure grants.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- ✓ Infrastructure Change
- ✓ Voluntary

Action Plan HW-7 Habitat Restoration.

Associated Goal

Wildlife and Habitat & Water Quality

Associated Objective

4.3 Restore habitats and take other actions to encourage or enhance wildlife in the aquatic and terrestrial watershed environment.

Description of Action

Apply for grants to conduct restoration in areas that opportunities have been identified, and contract out restoration.

Steps Needed to Complete the Action

1. Prioritize restoration areas.
2. Apply for restoration grants.
3. Identify contractors and prepare bid.
4. Choose contractor.
5. Implement restoration.

Who is Responsible

HBWC, NH Fish & Game Department, volunteers, and stakeholders

Location of Action

Hodgson Brook Watershed

Expected Benefits

- Improve recreation potential, aesthetics, and long-term health of watershed habitat.

Timetable

Long term: Restore habitats.

Type of Action (choose one or more)

- Regulatory
- ✓ Research
- Infrastructure Change
- ✓ Voluntary

