BAKER RIVER WATERSHED ASSOCIATION

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Cover Page Photographs:
Top left: Baker River in Warren    Top right: Baker River in Wentworth
Middle: Baker River in Rumney    Bottom left: Baker River in Plymouth
Bottom right: Hall’s Brook entering the Baker River in Rumney
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EXECUTIVE SUMMARY

The Baker River watershed lies in the heart of New Hampshire, and covers 136,581 acres or 214 square miles. Its source is Mount Moosilauke in the White Mountain National Forest, just north of the town of Warren, with its confluence at the Pemigewasset River in Plymouth. Throughout the river’s 36.5-mile journey through Warren, Wentworth, Rumney, and Plymouth, residents and visitors enjoy the benefits and respect the hazards of such a powerful and beautiful river flowing through the watershed.

The Baker River Watershed Association is an informal group of interested citizens whose purpose is to promote educational, scientific, ecological, and protective objectives for the entire watershed. Members of the Association have recognized that viewing an ecosystem from a watershed perspective goes beyond that of political boundaries. The Association received a grant from the New Hampshire Department of Environmental Services Nonpoint Source Control Program in 2000. This Baker River Watershed Management Plan is the culmination of over 2 years of work by the Association working through its consultant Watershed to Wildlife, Inc., and will be available to municipalities, riparian landowners, and general public interested in the Baker River watershed.

The goals of this Baker River Watershed Management Plan are to:

1. Increase understanding of the natural processes in the Baker River Watershed and encourage public involvement

2. Minimize or control accelerated erosion along the Baker River and its tributaries

3. Continue to maintain and/or improve the current water quality throughout the Baker River watershed

4. Encourage recreation and tourism in a responsible manner throughout the Baker River watershed

5. Protect and provide diverse wildlife habitat for the abundant fish and wildlife species throughout the Baker River watershed

6. Include “watershed protection” as a component of the Master Plans for the four main stem towns: Warren, Wentworth, Rumney, and Plymouth

This Baker River Watershed Management Plan provides a history of the watershed; summarizes methods for researching components of the plan; reviews issues addressed at main stem town meetings and public meetings; summarizes economic, natural, and scenic resources throughout the watershed; makes recommendations to meet objectives established by the Baker River Watershed Association, the four main stem towns, and riparian landowners; and provides a schedule for implementation along with collaborative actions (refer to pages 37 to 49). This plan
presents ideas and actions for improving riparian habitat and erosion control, fish and wildlife habitat, maintaining water quality, and educating the general public. Input from each of the four main stem towns, riparian landowners, and the general public were used throughout the report (refer to pages 24 and 25). It is the intent of the Baker River Watershed Association that this plan becomes a reference for future work and implementation efforts throughout the watershed.
CHAPTER 1
INTRODUCTION

1.1 Introduction to the Baker River and the Baker River Watershed Association

The Baker River lies in the heart of New Hampshire. Its source is in Jobildunk Ravine on the east side of Mt. Moosilauke. It flows down through the towns of Warren, Wentworth, Rumney, and Plymouth, with several tributaries entering the river along the way. Currently, there are no dams on the Baker River, although there are remnants of an old dam at a USGS gauging station in the Town of Rumney. The Baker River joins the Pemigewasset River in the Town of Plymouth. Throughout the 36.5-mile journey of the main stem thousands of residents and visitors reap benefits and conflicts associated with the Baker River. The flooding of someone’s property or the undercutting of a bridge counteracts the pleasures of kayaking down the Baker River during spring runoff or cooling-off in a favorite swimming hole in the heat of July.

The Baker River starts out as a steep mountain stream along the eastern slopes of Mt. Moosilauke. The River drops nearly 400 feet every mile from the headwaters in Woodstock to the Benton/Warren town line. It flows southerly through the town of Warren, dropping an average of 150 feet every mile. It is joined by several other high gradient tributaries. The Baker River moves down through Wentworth where it drops over 20 feet every mile. Drainages from several tributaries enter the main stem throughout Wentworth, including the South Branch. In the town of Rumney, the Baker River turns easterly and the gradient flattens out even more (it drops nearly 4 feet every mile). Throughout Rumney, the Baker River meanders back and forth across a broad flood plain, which is 9 miles at the widest point. In Plymouth it continues to flatten to nearly a 0% grade as it enters the Pemigewasset River. There are over 360 miles of streams throughout the Baker River watershed.

The Baker River watershed covers 136,581 acres or 214 square miles. Approximately 18% or 25,000 acres of land is managed as part of the White Mountain National Forest. The State of New Hampshire owns approximately 1% of the property in the watershed. The Baker River is classified as a 4th order river (see Glossary in Appendix A) at its junction with Black Brook south of Warren village. When the South Branch enters the Baker River, it becomes a 5th order river.

The Baker River Watershed Association is a non-profit organization whose purpose is to promote educational, scientific, ecological, protective, and restorative objectives for the entire watershed. Members of the Association have recognized that viewing an ecosystem from a watershed perspective goes beyond that of political boundaries. The objectives for the Baker River Watershed Association include:

1. Promotion of educational and scientific aspects of watershed planning to include: native flora, fauna, forests, wetlands, soils; water quality of surface and ground waters; and soil conservation.
2. Preservation, conservation and improvement of the ecology of the Baker River watershed for the benefit of its residents and the general public, today and into the future.

3. Cooperation with other associations, organizations, towns, conservation commissions, and state and federal agencies to improve and conserve the watershed and promote the general welfare of its citizens and the public.

The Association was first formed in the late 1980’s with a primary goal of education and water quality testing, but interest and volunteerism later fell off. The Association was re-formed in 1998 and received 501(c)(3) nonprofit status. The development of this watershed management plan was funded by a grant (319) from the New Hampshire Department of Environmental Services Nonpoint Source Control Program. The Baker River Watershed Association with assistance from Watershed to Wildlife, Inc., developed this management plan with input from municipalities, riparian landowners, and the general public who live in or value the Baker River watershed natural resources.

Over time, the water quality of the Baker River has improved considerably. The River has also been the scene of transitional economies: from primarily an agricultural economy in the 1800s; to forestry; and more recently tourism and urbanization. Throughout these times many of the issues have remained the same. It is hoped that the creation of this Watershed Management Plan for the Baker River will not only address some of these issues, but also describe the means to alleviate some of the problems.

Before attempting to address issues related to streambank stabilization, it is important for us to understand the natural processes of rivers in general. Rivers are dynamic, changing, living entities that continuously reform the land that surrounds them. Each has its own unique features and parameters based on soils, bedrock, slopes, vegetative buffers, land use, and several other factors. The examination of historic and USGS topographic maps and aerial photographs illustrates that the natural tendency of the Baker River is to meander throughout a large area. Its course has continually changed over time, and will continue to do so. Where one stream bank is eroded and lost, another is built-up and enlarged. This is a natural process, which cannot easily, if at all, be altered. It is important for residents and visitors to the Baker River watershed to understand this natural process, and in some cases, accept it.
1.2 Goals

The goals of this Baker River Watershed Management Plan are to:

1. Increase understanding of the natural processes in the Baker River watershed and encourage public involvement

2. Minimize or control accelerated erosion along the Baker River and its tributaries

3. Continue to maintain and/or improve the current water quality throughout the Baker River watershed

4. Encourage recreation and tourism in a responsible manner throughout the Baker River watershed

5. Protect and provide diverse wildlife habitat for the abundant fish and wildlife species throughout the Baker River watershed

6. Include “watershed protection” as a component of the Master Plans for the four main stem towns: Warren, Wentworth, Rumney, and Plymouth
CHAPTER 2
HISTORY

This river was first called Asqamchumauke (salmon spawning place) by the Native Americans living here (State of New Hampshire, 1964). It was later renamed the Baker River by settlers as townships were incorporated in the 1760’s. Due to the fertile floodplains in lower Wentworth, Rumney and Plymouth, trees were cleared and agricultural practices began. Prime, deep, rich floodplain soils continue to be used agriculturally even today, though the acreage in production is greatly reduced.

The Baker River Valley was once occupied by an ancient lake formed from the melting of ice during the retreat of the last glaciers 10-12,000 years ago. Ancient lake waters ponded up the valley into Wentworth leaving behind large deposits of sand and gravel. Fertile, deep, sandy loams are found throughout much of the lower valley; while the upper valley (northern Wentworth and Warren) contains many large scattered boulders and coarse gravels with exposed ledge outcrops. The underlying base throughout the watershed is igneous and metamorphic rock, which range in age from the volcanic and meta-sedimentaries of Pre-Silurian, Silurian, and Devonian to the plutonics of Late Devonian (State of New Hampshire and Grafton County Soil Conservation District, 1963).

As has been the history of most rivers worldwide, settlement along the Baker River provided early settlers with transportation, food, and a nearby water supply. During early times it was common and acceptable for rivers to be used as a dumping ground for human waste, industrial by products, and other pollution. The Baker River was no exception. Fortunately, these types of negative impacts on our natural resources were recognized, and public awareness heightened to a level that brought reparations and the passage of the Clean Water Act in 1972. These efforts have greatly improved the water quality in the Baker River and continue today.

This mostly forested river valley has attracted the lumber industry, which has been a source of income and business for the area. The designation of 67,000 acres to the White Mountain National Forest established in 1878 with an additional 16,000 acres added in 1930, has guaranteed continual forest practices. Of the 136,581 acres containing the Baker River Watershed, current forested land is comprised of the following:

- 25,000 acres (18%) within the White Mountain National Forest
- 1,365 acres (1%) State of New Hampshire owned
- 84,265 acres (62%) owned by private landowners
- 26,000 acres (19%) of open land and surface waters

The above figures reflect a State-wide trend of historical land-use, which also occurred within the Baker River watershed, with the arrival and passing of the agricultural, industrial, and present eras (Numbers interpolated from State of New Hampshire, 1964 and State of New Hampshire and Grafton County Soil Conservation District, 1963.)

During the height of the Industrial Revolution, numerous sawmills, a chicken processing plant, dairy and beef cattle farms, produce truck farms, and a creamery were active along the banks of
the Baker River. The Ore Hill Mine, discovered in the 1830’s and located in Warren, was one of the largest mines in New Hampshire. Zinc, silver, copper and lead were mined. This mine was operated intermittently until the last recorded activity, extracting mica schist, in 1949. At that time the deepest shaft was estimated to be between 475 and 600 feet deep (T&N Associates, Inc. 2001).

Agriculture was at its height in 1860 with approximately 80% open land throughout the Baker River valley. This trend has slowly reversed to approximately 80% forest cover today due to increased recreational uses and the population becoming more transient (State of New Hampshire and Grafton County Soil Conservation District, 1963). With increasing numbers of people in the watershed, water quality issues began to arise causing concerns over pollution and its sources. Additional residential areas and subdivision of the land replaced acres of former forest and farmland especially along Route 25 and the Baker River.

Established in 1871, Plymouth Normal School became Plymouth Teacher’s College in 1939 and Plymouth State College in 1963. The college is a founding member of the University System of New Hampshire, and now serves New Hampshire and the New England region as a comprehensive institution of higher education. Today, Plymouth State College has 3,500 undergraduates (from 25 states and 16 countries) and 168 full time faculty members.

Recreational uses increased dramatically with the establishment of the Appalachian Trail and the Dartmouth Outing Club facilities in Warren. The spectacular views and differential elevations in combination with the White Mountain National Forest attract thousands of hikers to the area each year. The Baker River offers fishing, canoeing, kayaking and swimming. All of these activities have had increased use as additional people recreate in the area. Natural attractions include rock climbing at the Rumney Rocks and exploring the Polar Caves, formerly named the Devil’s Den, in the south section of Rattlesnake Mountain, Rumney (State of New Hampshire, 1964).

Flooding has been a predominant issue in the Baker River watershed since the first recorded flood of 1856 (State of New Hampshire, 1964), when a two-day rain totaling nine inches breached a dam in Orford (located on the western portion of the Baker River watershed) and caused destruction of several homes and a saw mill. Recorded floods in 1927, 1934, 1938, 1948, 1953, and 1973 have caused the loss of human lives, homes, businesses, and prime agricultural lands. A study by the Army Corps of Engineers (ACOE) in 1954 proposed 14 flood control structures along the Baker River and its major tributaries. Seven of these structures have been completed, some of which include large earthen dams impounding over 100 acres of water. Further recreational areas have been integrated with these impoundments attracting additional campers, hikers, and fishermen. Even with these relatively new flood control structures, there continues to be severe erosion, sediment, and flooding problems along the Baker River. Complex factors cause these problems, including: the abrupt elevation drops from the source at Mount Moosilauke through Warren; the sandy soils throughout Wentworth, Rumney and Plymouth; the sinuosity of the meandering Baker River; and the flash flood potential due to steep terrain throughout the watershed. Several projects involving re-channeling of the Baker River with riprap and gravel-sand-cobble sediments have been completed over recent years, most resulting in only temporary relief. As mentioned in the introduction, the meanderings of many rivers,
even though they cause problems for landowners along them, are natural processes. The continual change in the rivers’ courses was not considered a problem before white settlers began purchasing and developing the land.

Water quality has improved in the Baker River since its low point in degradation during the 1950’s when raw sewerage, chicken waste products and feces, sawdust and bark, and chemicals from plants such as the creamery, entered the river on a daily basis. At this point the lower Baker River was legislatively classified as a ‘D’ quality river (refer to Appendix A for definitions of river classifications). The passage of the federal Clean Water Act in 1972 and increased pollution control efforts at the state level resulted in significant improvements in water quality. Several entities played a part in documenting improved water quality. A partial list of studies and records done in the Baker River watershed include:

- State of NH, Water Pollution Commission, Hearing #17, March, 1949
- Army Corps of Engineers 1954 Flood Control Study
- **Staff report - Baker River Watershed** by NH Water Pollution Commission, October 1954
- **Work Plan for Watershed Protection and Flood Prevention - Baker River Watershed** by the Grafton County Soil Conservation District, NH, NH Water Resources Board, NH Dept. of Resources and Economic Development, NH Fish and Game, and Town the Plymouth, 1963
- **Interstate Route 93- Franconia Notch and Alternate Routes**, a study by VTN Consolidated, Inc, 1975 (which assessed the Baker River valley as a potential alternate route)
- Recorded E.coli bacteria data for 13 locations along the Baker River by the Baker River Watershed Association (continues today)
- United States Geological Survey (USGS) Baker River Gauging Station records
- Erosion Assessment by James A. Kennedy, consultant working through the Grafton County District Office (with assistance provided by the Baker River Watershed Association), 1999-00.

Today the Baker River is classified a class B river: swimmable, fishable, and potentially acceptable as a drinking water source after full treatment. Portions of the River within the WMNF are classified as “outstanding resource waters”. E. coli testing has demonstrated that fecal contamination is not a significant problem along the Baker River main stem. Drought conditions and increased recreational use and development could lead to potential problems with elevated E-coli levels, however.

Perhaps the largest long-term pollution source in the Baker River watershed is due to the mine tailings left from the Ore Hill Mine. This in the State of NH’s only acid mine contamination site. Heavy metals of concern (antimony, arsenic, cadmium, copper, lead, silver and zinc) have been found in Ore Hill Brook to its confluence with Black Brook, and diluted amounts to the confluence with the Baker River (T+N Associates, Inc., 2002). A brief history of efforts to reclaim this site follows:
1937- Part of the Ore Hill Mine was sold to the USFS.

1962- USFS planted red pines in an attempt to reclaim the mine and tailings.

1979- National Park Service (NPS) purchased the remaining Ore Hill Mine property as part of the Appalachian Trail Corridor, and later opted to re-route the trail around this site.

1983- Sediment traps were constructed and hay bales were placed to curtail direct runoff of acidic seeps containing the abovementioned metals. (By 1984 most of the traps were filled beyond capacity.)

1984- The USFS implemented a large-scale reclamation plan to:
  - Reroute surface drainage away from tailings
  - Level the piles of tailings
  - Apply approximately 30 tons of lime to the tailings
  - Cap re-sloped tailings with 3-6 inches of topsoil
  - Add lime and fertilizer to topsoil and grasses with clover seed and mulch
  - Line East and West drainages with geo-fabric and limestone rock
  - Monitor results

1993- In a Memorandum of Understanding, the NPS transferred administrative responsibility to the USFS for the Ore Hill Mine site.

2000 to Present - The USFS contracts with private consultants to monitor and assess environmental impact status. Three main concerns for human health are arsenic, lead and copper in Ore Hill Brook. The Forest Service is developing plans to address the surface water leaving the site in cooperation with NH Department of Environmental Services.

The Warren Fish Hatchery and Wildlife Center established in 1915 has been both a public attraction and part of a long history of stocking programs and studies of fisheries in the Baker River watershed. Classified as a salmonoid river, much effort has gone into maintaining and improving water quality and cold-water conditions. Debate about species, and which species to focus on, has ensued over the years and continues today: brook trout vs. rainbow trout vs. brown trout vs. salmon.
Due to the sinuous pattern of the Baker River, 13 bridges have been built to cross the Baker River. Maintenance and upkeep have been a constant effort for all concerned. With increased traffic and safety issues, widening of most bridges is advantageous. The erosion from the Baker River during heavy rains and annual spring runoff threatens the abutments of the bridges in many areas. Though some of the bridges have been rebuilt or repaired, this large-scale problem continues today.
CHAPTER 3

METHODOLOGY

In 2001 the Baker River Watershed Association (BRWA) applied for and received a grant from the New Hampshire Department of Environmental Services - Nonpoint Source Control Program (319). The grant monies were to be used for the development of a watershed management plan for the main stem of the Baker River, as well as public education on riparian habitat protection and erosion control.

The Association compiled a list of riparian landowners along the Baker River from tax maps, town hall records, and personal experience. A list of Association members was also generated. These lists were entered into a MS EXCEL spreadsheet so mailing labels could be generated for mailouts. The BRWA, through a Request for Proposal venue, hired Watershed to Wildlife, Inc. (WTW) to assist them with the drafting of the watershed plan, among other tasks. WTW met with the Association periodically from January 2002, and will continue to meet throughout the end of the project in December 2003, for ongoing communications on progress and timelines focusing on goals.

3.1 Fieldwork, Town Meetings, and Public Meetings

The BRWA and WTW met with town officials (select boards, planning boards, conservation commissions, public works departments) to gather information on issues unique to each town, and to receive feedback on a draft of the watershed management plan. Two public meetings were advertised and the general public attended. Individual invitations were sent to Baker River riparian landowners and Association members. The purposes of these public meetings were: to solicit concerns facing local residents and visitors to the Baker River in the first meeting; and to hear feedback on a draft of the watershed management plan in the second meeting.

WTW, along with the BRWA Steering Committee members, conducted field work along the Baker River to survey the main stem first-hand. GPS data (using a Garmin III Plus handheld receiver) and digital photographs were collected at points of interest including random town boundaries, monuments, and bridges.

3.2 Collection of Existing Data and GIS Work

WTW obtained existing maps and pertinent shape files in ARCVIEW format for additional analysis of the Baker River. This information was acquired from NH GRANIT systems and the NH Department of Environmental Services. WTW examined data as another tool in developing the Watershed Management Plan for the Baker River. Maps produced for this report begin on page 54 and include the following:

- USGS Topographic map of the region
- Profile of the Baker River from its source to confluence with the Pemigewasset River
- Map showing 1st to 5th order rivers
- Erosion problem areas along the Baker River, identified in a previous grant
- Existing riparian habitat and offset buffer scenarios at 100 and 300 feet
- Water supply, potential water contamination sources, location of dams

Refer to Appendix B for a table that shows which maps were obtained, their scale, and the national mapping standard accuracy measure. Since many decisions are based on parcels as they relate to rivers, roads, trails, ponds, wetlands and other features, it is important to point out the working accuracies of these data sources. Combining these sources in various overlays provides an excellent overview and planning tool, but does not replace the need to perform site-specific investigations for many developmental requests.

Digitally offsetting 100 foot and 300-foot lines, equidistant from the centerline of the Baker River, generated desired and optimum riparian habitat buffers (100 foot and 300 foot, respectively). As a separate line color, existing vegetated riparian habitat was also digitized over the most current digital orthographic quadrant aerial photographs (DOQs), along the Baker River. By then overlaying the generated 100 and 300 foot desired or optimum buffers with the existing vegetative buffers, areas could be identified where sufficient or deficient buffers are located.

3.3 Discussion of Implementation and Future Studies

Based on results of integration of existing data, discussions with town officials, riparian landowners, BRWA members, and the general public, a list of recommended goals for the Baker River watershed was prepared. In addition, measures to meet the goals, partnering opportunities, and a schedule of implementation, were discussed. Recommendations were also made for more detailed inventory work, as well as future studies and GIS analyses for the data that has been collected.
4.1 Town of Warren (2002 population: 873)

Some of the issues and concerns emphasized in Warren included the following:

- Ore Hill Mine status and potential pollution.
- Major erosion issues with bridges and buildings – concern for public safety and property loss.
- High energy from runoff due to sharp vertical drop throughout the town.
- Numerous stumps and debris (even large boulders) moved and deposited.
- Numerous sites need river re-channeling (ACOE and NH Department of Environmental Services are reluctant to allow this).
  - Town wants to reconstruct some channels on an annual basis if necessary.

Most people felt that had the river not already eroded down to a relatively solid base of large boulders and ledge, the streambank erosion would be even worse and cause even more extensive damage. Most people in Warren feel that the urgency of large scale re-channeling is needed and that bioengineering of Baker riverbanks will not withstand the energy of the river, during storm events and spring runoff. It was suggested that buffers and plantings might be viable on tributaries as smaller projects.

The Town of Warren does not have a zoning ordinance and is not seeking to introduce one at this time.

4.2 Town of Wentworth (2002 population: 798)

Some of the issues and concerns emphasized in Wentworth included the following:

- Buffer enhancement in areas, using shrubs
- Erosion problems in river and local residents frustrated because they cannot do what needs to be done to help fix the problems because of State regulations.
- Many local residents experience trespassing problems.
Too many people crossing private land
Residents would like to see “resident only” beaches

- Junk cars in flood plains are seen as a potential threat to the river.
- One select board member discussed the possibility of the Baker River Watershed Association setting up a website to get information to and from the public. Included in this website would be the following:
  - Links to other sites
  - Means to allow the public 24 hour access to watershed education and updates with watershed management plans
  - E-mail for public input/discussion

Many of the town officials and residents emphasized the need to take proactive approaches to the management of the Baker River watershed, before decisions are made based on crisis or reactive situations. In addition, there is a constant conflict between encouraging tourism and helping the economy versus protecting the environment (water quality, erosion from recreation, loss of wildlife habitat, etc.)

The Town of Wentworth does not have a zoning ordinance and is not seeking to introduce one at this time.

### 4.3 Town of Rumney (2002 population: 1,480)

Some of the issues and concerns emphasized in Rumney included the following:

- Methyl Tertiary-Butyl Ether (MTBE) – town officials would like to eliminate it
- Emanuel Cemetery washing out – erosion concern
- Flood Plain insurance issue – town needs to generate updated maps of floodplains
- Recreation
  - Boaters and swimmers – trees in river causing obstacles and potential hazards
  - Assessing water quality for swimmers – posting E. coli testing results
  - Public access to the river – do not want trespassing on private land
    - Heritage Trail along River through private land. Landowners concerned with increased buffers and regulations along Heritage Trail through their property.
    - How to control recreation
The Baker River flowing through the Town of Rumney. Due to the sandy nature of the soils and steep slopes erosion is severe in places.

- Stocked with salmon for fishing - controversy over which species of fish to stock in the river
- Town officials suggest cutting mature hardwood trees to encourage sprouting from stumps.
- Encourage landowners to establish easements on their property (must be voluntary).
- Restrict use of land along river by voluntary action rather than regulatory

Historical Places along River
- There was a covered bridge in Quincy – the stone foundations are still there, but bridge fell in – 1954
- Plan should be for entire watershed including the tributaries feeding into it.

The Town of Rumney does not have zoning ordinances and is not seeking to introduce them at this time.

4.4 Town of Plymouth (2002 population: 5,892)

The most prevalent comments during the meeting with the Town of Plymouth Planning Board were the following:

- Development – is it sustainable at current rate?
  - Storm water plan needed (EPA Clean Water Act Phase II).
  - Need to address wildlife and wetland impacts due to development pressures.
  - The Town is currently very lenient in the construction of impervious surfaces – Development vs. Flooding controversy.
  - Development pressures are especially a potential problem where the Baker enters the Pemigewasset River.
- Erosion control – improvements on buffer establishment or enhancement
  - “Shrub your Buffer” event should be held annually.
- Tourism – as tourism increases the public is going to want river access and recreation facilities in the watershed.
  - Impacts of recreation on the River (swimming and canoeing) including E.coli and trash
- Is there a direct link between levels of water in the Baker River and the aquifer?
  - Does the level of the Baker or Pemi Rivers affect the aquifer?
  - Tenney Mountain Ski Area may expand its snowmaking which means more detention ponds or potential withdrawal from the Baker River.
    - What is the impact on the water level in the Baker?
From a tourism perspective, scenic values are decreasing as development increases along the river. Water quality issues – Plymouth has no ground water or aquifer regulations for drinking water protection. Junk cars in the flood plain are additional environmental concerns.

Flooding of the Baker River in Plymouth along the Tenny Mountain Highway (1976). Many residents fear that development throughout the floodplain will increase future flooding of the town.

As a proactive approach, Plymouth officials would like to see the Baker River Watershed Association tap into all community organizations (senior center, Plymouth State College, local high school, etc.), and also anticipate that the Watershed Management Plan will be incorporated into the next revised Master Plan.

The Town of Plymouth does have a zoning ordinance with emphasis to more critically review development within 500 feet of the Baker River. The Plymouth Village Water and Sewer District is proposing well-head protection, or GAA status, for its primary water supply.

The above picture illustrates the dynamics of the water cycle in humid regions, such as those found throughout New England. It displays the concept that groundwater flows into surface water bodies. Hydraulic pressure and gravity cause the water to move down into the ground and then flow as groundwater down slopes and into lakes, rivers and oceans.
Aquifer recharge occurs when water enters into the saturated zone and becomes groundwater. In humid regions, precipitation is responsible for most recharge. Some of the precipitation that infiltrates the ground surface will percolate downward through the unsaturated zone to the saturated zone or water table. The rest of the precipitation may be retained by clay minerals, or caught up by evaporation or plant transpiration and returned to the atmosphere. Most recharge throughout the Baker River watershed comes from rain and surface water flowing through the unsaturated zone of soil. The picture to the right shows a cross-section illustrating the relationship between ground water or water table levels and stream levels. In humid regions (a) such as those found throughout the Baker River watershed, ground water levels will recharge rivers and streams. The lower picture (b) shows what occurs when stream levels decrease due to the lowering of water tables.

4.5 Public Meeting on April 23, 2002 (includes e-mails from riparian landowners)

The primary concerns with the Baker River and its corridor identified through the public meeting were: flooding and erosion; trespassing and associated vandalism; trash; and water quality, particularly E. coli levels. One concern that particularly stood out was that of erosion. Many riparian landowners are losing property and need to know what options they have for minimizing their losses. One attendee at the public meeting stated that he had canoed down portions of the Baker River and noticed that dozens if not hundreds of culverts are improperly maintained along the river. Improper culvert maintenance will cause them to degrade and block, and will ultimately lead to additional erosion, undercutting, and localized flooding problems. Trespassing and associated issues of public misuse of private property were also discussed.

The primary uses and benefits of the Baker River include: scenic value, wildlife watching and “natural” habitat, fishing, canoeing and kayaking, swimming, walking, and public access. The scenic beauty of the area along with abundant wildlife habitat and rural nature are greatly valued by residents and visitors. Many people attending the public meeting understood that protecting riparian habitat will not only help to reduce erosion, but will also enhance wildlife habitat. It will benefit wildlife habitat by allowing for travel corridors along the river.

Most of the riparian landowners and general public would like to see continued good water quality, better flood control and flood management, better erosion control, retained scenic value, wildlife watching and “natural” habitat, fishing and fisheries habitat, and recreational use. It was also expressed that, in many cases, the tributaries should be addressed in the watershed management plan, as they can be major causes of erosion once they enter the Baker River. In fact, the South Branch is the largest tributary, and drains about 20% of the watershed. It enters
the Baker River from the south in the town of Wentworth west of Route 118 and about midway along its course.

The need to continually educate the public on riparian habitat and erosion minimization issues was also addressed by several people. One riparian landowner wrote a letter suggesting that the Baker River Watershed Association should develop an educational brochure for public distribution at key places throughout the four main stem towns.

Many of the issues are contradictory. For example, for recreation, there is a conflict between maintaining privacy for landowners versus enhancing tourism and providing access to the river. Another example: trees and vegetation leaning over or fallen into the Baker River offer excellent microhabitats for fish. However, they impede canoes and kayaks traveling along the river. How should these downed trees be managed? Yet another conflict is the fish stocking programs. Should the state be spending so much energy and money to stock rivers with non-native salmon, brown trout or brook trout?
## Table Summarizing Individual Concerns of the Four Main Stem Towns

<table>
<thead>
<tr>
<th>CONCERN</th>
<th>WARREN</th>
<th>WENTWORTH</th>
<th>RUMNEY</th>
<th>PLYMOUTH</th>
<th>PUBLIC</th>
<th>LOCATION WHERE CONCERNS ARE ADDRESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffers</td>
<td>Is buffer enhancement enough with large gradient drops</td>
<td>Is buffer enhancement enough with force from river</td>
<td>Cutting mature trees to encourage sprouting as an option</td>
<td>Concern with paving replacing vegetation buffers</td>
<td>Buffers needed on tributaries too</td>
<td>Goal 2, Recs. A, B, C, D (pages 37-40)</td>
</tr>
<tr>
<td>Development</td>
<td>Future Concerns</td>
<td>Future Concerns</td>
<td>Impervious Surfaces</td>
<td>Impervious Surfaces</td>
<td>Future Concerns</td>
<td>Goal 3, Recs. B, D, E Goal 6, Rec. B (pgs. 40-43)</td>
</tr>
<tr>
<td>Elevation drop</td>
<td>35feet/mile</td>
<td>20feet/mile</td>
<td>3feet/mile</td>
<td>&lt;1feet/mile</td>
<td>N/A</td>
<td>Page 8</td>
</tr>
<tr>
<td>Erosion¹ (number of sites with severe and low erosion classification)</td>
<td>24 severe 25 low 49 total sites</td>
<td>38 severe 25 low 63 total sites</td>
<td>72 severe 17 low 89 total sites</td>
<td>19 severe 12 low 31 total sites</td>
<td>Total sites: 153 severe 79 low 232 total sites</td>
<td>Goal 2, Rec. A, B, C, D (pages 37-40)</td>
</tr>
<tr>
<td>Potential Pollution Sources</td>
<td>Ore Hill Mine Drainage into tributaries</td>
<td>E.coli levels Garbage Junk cars in floodplain</td>
<td>Agriculture Junk vehicles and tires</td>
<td>Agriculture Campgrounds Junk cars in floodplain</td>
<td>Garbage E.coli</td>
<td>Goal 3, Recs. A, B, C, D, E (pages 40-43)</td>
</tr>
<tr>
<td>Property Loss from Flooding and Erosion</td>
<td>Very large</td>
<td>Very large</td>
<td>Large</td>
<td>Medium</td>
<td>A concern</td>
<td>Goal 2, Rec. A, B, C, D (pages 37-40)</td>
</tr>
</tbody>
</table>

¹ Data used from a 2000 inventory of the Baker River by James S. Kennedy, National Resource Conservation Service, and the Baker River Watershed Association. Note that the length of sites varies along the length of the river.
<table>
<thead>
<tr>
<th>CONCERN</th>
<th>WARREN</th>
<th>WENTWORTH</th>
<th>RUMNEY</th>
<th>PLYMOUTH</th>
<th>PUBLIC</th>
<th>LOCATION WHERE CONCERNS ARE ADDRESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation</td>
<td>WMNF Campsites</td>
<td>Conflict between increasing tourism and trespassing on private lands Campgrounds</td>
<td>Encourage recreation to bring tourism to the area</td>
<td>Campgrounds Scenic value decreasing with more development</td>
<td>Kayaking and canoeing conflicts with fish habitat in some cases</td>
<td>Goal 4, Recs. A, B, C, D (pages 42-43)</td>
</tr>
<tr>
<td>Tributaries</td>
<td>High gradient tributaries contribute to erosion</td>
<td>South Branch 20% of the Baker River Watershed</td>
<td>Tributaries add to erosion problems along sandy shoreline</td>
<td>Tributaries should be addressed in Management Plan too</td>
<td>Erosion problems in tributaries</td>
<td>Goal 2, Recs. A, B, C, D (pages 37-40)</td>
</tr>
<tr>
<td>Tourism</td>
<td>High potential for increased tourism due to WMNF</td>
<td>Conflict with increasing tourism and protecting natural resources</td>
<td>Encourage tourism in the area</td>
<td>Increased water use and aquifer levels</td>
<td>People want to increase tourism, but also want to retain rural nature</td>
<td>Goal 1, Rec. A Goal 6, Recs. A, B, C, D (pgs. 37, 44-45)</td>
</tr>
<tr>
<td>Legislative Water Quality Goal</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>N/A</td>
<td>Goal 3, Recs. A, B, C, D, E, F (pages 40-42)</td>
</tr>
<tr>
<td>Actual Water Quality</td>
<td>Meets B classification excluding Ore Hill Brook and Black Brook</td>
<td>Meets B classification with occasional E.coli problems</td>
<td>Meets B classification</td>
<td>Meets B classification</td>
<td>N/A</td>
<td>Goal 3, Recs. A, B, C, D, E, F (pages 40-42)</td>
</tr>
<tr>
<td>Wildlife and Fish Habitat</td>
<td>Fish Hatchery Wildlife Center Excellent</td>
<td>Excellent to Good</td>
<td>Good</td>
<td>Good</td>
<td>Improving riparian zones will improve wildlife habitat</td>
<td>Goal 5, Recs. A, B, C (pages 43-44)</td>
</tr>
</tbody>
</table>
CHAPTER 5
EXISTING CONDITIONS AND RESOURCE VALUES

5.1  Economic and Social Resources

Below is a table summarizing historical population levels and economic data for each of the four main stem towns along the Baker River and for the entire watershed².

<table>
<thead>
<tr>
<th></th>
<th>Warren</th>
<th>Wentworth</th>
<th>Rumney</th>
<th>Plymouth</th>
<th>Baker River Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>873</td>
<td>798</td>
<td>1,480</td>
<td>5,892</td>
<td>9,043</td>
</tr>
<tr>
<td>1990</td>
<td>820</td>
<td>630</td>
<td>1,446</td>
<td>5,811</td>
<td>8,707</td>
</tr>
<tr>
<td>1980</td>
<td>650</td>
<td>527</td>
<td>1,212</td>
<td>5,094</td>
<td>7,483</td>
</tr>
<tr>
<td>1970</td>
<td>539</td>
<td>376</td>
<td>870</td>
<td>4,225</td>
<td>6,010</td>
</tr>
<tr>
<td>1960</td>
<td>548</td>
<td>300</td>
<td>820</td>
<td>3,210</td>
<td>4,878</td>
</tr>
<tr>
<td>1950</td>
<td>581</td>
<td>413</td>
<td>859</td>
<td>3,039</td>
<td>4,892</td>
</tr>
<tr>
<td>1940</td>
<td>709</td>
<td>491</td>
<td>861</td>
<td>2,533</td>
<td>4,594</td>
</tr>
<tr>
<td>1930</td>
<td>651</td>
<td>459</td>
<td>858</td>
<td>2,470</td>
<td>4,438</td>
</tr>
<tr>
<td>1920</td>
<td>600</td>
<td>507</td>
<td>911</td>
<td>2,353</td>
<td>4,371</td>
</tr>
<tr>
<td>1910</td>
<td>701</td>
<td>595</td>
<td>850</td>
<td>2,200</td>
<td>4,346</td>
</tr>
<tr>
<td>1900</td>
<td>799</td>
<td>617</td>
<td>837</td>
<td>1,972</td>
<td>4,225</td>
</tr>
<tr>
<td>Income Per Capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median Household</td>
<td>$16,454</td>
<td>$18,258</td>
<td>$17,169</td>
<td>$14,766</td>
<td>$16,662</td>
</tr>
<tr>
<td></td>
<td>$34,432</td>
<td>$44,219</td>
<td>$38,125</td>
<td>$35,618</td>
<td>$38,098</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>8.7%</td>
<td>6.0%</td>
<td>6.8%</td>
<td>9.6%</td>
<td>7.8%</td>
</tr>
<tr>
<td>2000</td>
<td>2.2%</td>
<td>2.1%</td>
<td>1.5%</td>
<td>2.7%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Largest Employers</td>
<td>Kenneth E. Whitcher; Warren Village Market; GlenCliff Home for Elderly; Dept. of Transportation facility; State fish hatchery and wildlife center</td>
<td>King Lumber; Precision Lumber</td>
<td>Hawkenson Enterprises; Foreco/NCP; Kelly Manufacturing; Calico Cupboard; Cersosimo Lumber; Davis Welding and Fabrication; Baker Valley Lumber; Steve’s Restaurant; King Industries</td>
<td>Plymouth State College; Speare Memorial Hospital; NH Electric Cooperative; Shop ‘N Save; Wal*Mart; Plymouth Regional HS; Plymouth Elementary School; Pemigewasset National Bank; Town of Plymouth; Burger King</td>
<td>Forestry and forest products is a large industry. However, more and more tourism and recreation are being highlighted.</td>
</tr>
</tbody>
</table>

² Data obtained from Economic and Labor Market Information Bureau, NH Employment Security – 2000 census (website: http://www.state.nh.us/municipal/index.html) and the Baker River Watershed Association
## 5.2 Natural Resources

### WATER RESOURCES

The Baker River Watershed contains numerous water resources and a rather large floodplain and adjacent alluvial soils with a high water table and hyperheic zone that provides opportunities for shallow dug wells for drinking water. The natural filtration and relatively pristine water quality provides safe accessible drinking water not found in much of the United States.

These same features also provide coldwater habitat for trout and salmon stocking efforts as well as potential natural spawning and regeneration. Clean water that is attractive and safe for swimming, wading, and other recreational uses is a valued resource. The overall aesthetic qualities of a healthy environment also attract tourism opportunities for scenic viewing, hiking and camping along the Baker River and within its watershed.

Though there are no dams on the main stem of the Baker River, there are numerous impoundments, tributaries, wetlands, and ponds (including fire ponds) located throughout the Baker River watershed. The NH Dam Bureau has a total of 53 registered dams within the Baker River watershed ranging from dugout ponds to large impounds. Materials for these dams are mostly earthen, but run the gambit of timber, earth, concrete, and stone with several combinations of materials. A summary by towns follows:

<table>
<thead>
<tr>
<th>Town</th>
<th>Dams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren</td>
<td>14</td>
</tr>
<tr>
<td>Rumney</td>
<td>14 (10 on Stinson Brook)</td>
</tr>
<tr>
<td>Wentworth</td>
<td>19</td>
</tr>
<tr>
<td>Plymouth</td>
<td>6</td>
</tr>
</tbody>
</table>

### Average commute time to work

<table>
<thead>
<tr>
<th>Town</th>
<th>Commute Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren</td>
<td>28 min.</td>
</tr>
<tr>
<td>Not many residents work in Warren, but commute</td>
<td></td>
</tr>
<tr>
<td>Wentworth</td>
<td>21 min.</td>
</tr>
<tr>
<td>Rumney</td>
<td>19 min.</td>
</tr>
<tr>
<td>Plymouth</td>
<td>14 min.</td>
</tr>
</tbody>
</table>

People are more likely to commute farther to get to work as they live upstream.

### Recreational Facilities

<table>
<thead>
<tr>
<th>Town</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren</td>
<td>Parks; Swimming; Biking; Fishing; Hiking; Hunting</td>
</tr>
<tr>
<td>Rumney</td>
<td>Tourist attractions; Youth orgs.; Rock climbing</td>
</tr>
<tr>
<td>Plymouth</td>
<td>Parks; Swimming; Biking; Fishing; Hiking; Hunting</td>
</tr>
</tbody>
</table>

Baker River Watershed Management Plan - 25 -
WILDLIFE

The Baker River and surrounding watershed support a diverse habitat for a wide variety of wildlife species. The New Hampshire Fish and Game Department, U.S. Forest Service, Audubon Society of New Hampshire, New Hampshire Natural Heritage Inventory Program, and Plymouth State College have assembled inventories of existing species located within the watershed. Appendix F has a list of endangered species and rare plant communities found throughout each of the four towns along the Baker River main stem. The wood turtle, goldies fern, and ginseng are just a few species of concern in the Baker River watershed.

Over 60 species of land mammals, over 70 birds, nearly 20 reptiles, over 20 amphibians, and at least 16,000 insects have inhabited the region, most of these occurring regularly (as opposed to passing through the area during migration). The diversity of wildlife species attracts residents and visitors for hunting, viewing, and educational purposes. One of the largest threats to wildlife species is the loss of habitat. Thankfully, the Baker River watershed has abundant wildlife habitat at this time. This gives residents an opportunity to retain what they do have for diversity throughout their watershed rather than attempt to “fix” an area which has vanished because of development and associated habitat loss.

FISH

Excluding solely marine species, 65 types of fish have been found throughout all of New Hampshire. Of these, at least 20 are introduced species. Fish are important to the Baker River watershed, since sport fishing attracts many residents and visitors to the area, and is a large contributor to the economy. Almost all of the species sought by anglers are at or near the top of the food web. They therefore depend on the smaller species for their existence (NH Department of Fish and Game, 2002).

Fishing pressures often exceed the natural reproductive capacity of some species, and their populations are maintained by stocking with hatchery-raised fish. There is a State Fish Hatchery and Wildlife Center in Warren, which has been in existence since 1915. Experts argue that in some species, such as brook trout, the hatchery strains have lost much of the genetic diversity originally found in the native species.

Past and present introductions of both native and introduced species have altered fish communities. Atlantic salmon and lake trout are now found in several lakes throughout New Hampshire where historically they never occurred naturally. The rainbow trout, brown trout, and Coho salmon sought after by anglers, are all non-native species. Introduced species prey on and compete with native species and, in some cases, may even hybridize with them. Other threats to fish populations include: warming of water temperatures from loss of vegetative stream buffers; siltation of spawning beds due to runoff from farming and timber harvesting activities; pollution that removes oxygen from the water and/or lowers water quality; and acid precipitation, which is known to increase the release of toxic metal ions into the water (NH Department of Fish and Game, 2002). The toxic metal seepage into Ore Hill Brook for example, can cause dangerous levels of these metal ions to accumulate in fish. This is especially of concern as the species that anglers catch are at the top of the food chain where bioaccumulation is the greatest, and therefore the most dangerous for people.
FORESTS

Over 90% of the Baker River watershed is forested, with a large diversity of vegetation species. Since reverting to forest, after agriculture claimed 80% open land in the late 1800’s, there now exists an abundance of mature tree cover containing merchantable timber. Various hardwood and softwood species grow well in the soils of the valley. Prudent selective logging practices have maintained a mixed age of timber, thus minimizing erosion on steep slopes and assuring a continuation of cover for wildlife, good water quality, and future sustainable harvesting. With substantial acreages of red oak and white pine, the forest can provide wood products with significant economic value for landowners, reducing pressure to convert to development. High grade logging from past years has increased the amount of low-grade timber overall, and markets are continually being sought to improve the financial value of forestland in the Baker River watershed. It is also important to restate that 18% of the land is in the White Mountain National Forest and 1% is owned by the State of New Hampshire. Increased awareness of environmental impacts, the value of buffers and forests in relationship to water quality, and recreational uses reinforce the concept of managing forests with sustainable logging practices. Logging and timber will continue to provide a viable part of the local economy for the foreseeable future.

SOILS

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material, very poorly drained, or sandy, will affect the type of vegetation adapted to grow in those conditions. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area.

Soil information is critical in making sound land use decisions. By examining soil types and morphology many predictions are made regarding forest management, erosion potential, and development possibilities. For example, residential development should be located away from areas with unstable soil conditions, high water tables, and slow percolation rates due to constraints for building foundations and septic system placement.

Soil information is also an excellent indicator of critical resource areas such as wetlands, prime agricultural lands, forestlands, and wildlife habitat. In fact, examining the soils maps and classifying an area with poorly and very poorly drained soils is often sufficient to make wetland determinations without field verification. In descriptions of soil types, the NRCS (formerly the SCS) evaluates soil types according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat.

The NRCS has hardcopy maps and descriptions of all soils found through the Baker River Watershed. In addition, Arc View compatible shape files of NRCS soils map for the watershed are available digitally and are compatible with other GRANIT mapping data. This information can be obtained from the NRCS office in Woodsville, NH (see Appendix G for NRCS address and phone number). It is important to recognize that these delineations are limited in detail as they are Category II and III Levels derived from large grid fieldwork done in 1983 and USGS Quadrant maps at 1:24,000 scale. These soil delineations are also limited for site-specific use in that minimum area polygons are three acres in size and can contain up to 35% inclusions of various soils and slopes.
SAND AND GRAVEL PITS

The wide flood plains and adjoining slopes contain millions of yards of glacially deposited sands and gravels in the Baker River watershed, particularly in the towns of Wentworth, Rumney, and Plymouth. There are several active gravel pits where excavation of sand and gravel provide materials and aggregates for development and construction. Though this can be a lucrative business and is needed for economic purposes, careful consideration must be given to location and amounts extracted to avoid negative impacts to the watershed’s overall health. Most residential homes and some businesses along the Baker River rely on shallow dug wells to draw drinking water from the underlying aquifer. Alterations in the hyperheic zone can occur from unintentional pollution, either directly infused into the aquifer, or indirectly, since significant sand and gravel removal can cause low filtration rates, leading to degradation of this source of drinking water. Best management practices (BMPs) and well-sited pits, with ground water levels determined and monitored, are essential to the entire watershed planning.

AGRICULTURE

After peaking in 1860, agriculture has steadily declined in the Baker River watershed. The dominant agricultural practice was dairy farming, and at one point a creamery was built in Plymouth to accommodate the numerous farms and volumes of milk production. Corn, hay, pasture browse, and oats were grown as feed for dairy cattle. The number of dairy farms decreased dramatically statewide from 1,295 in 1954, to 441 in 1974. There are at least two remaining dairy farms in the watershed (Warren and Plymouth) with a few smaller farms that raise replacement heifers. There is also an array of small farms raising beef cattle, poultry, and/or goats.

The Baker River watershed contains approximately 2100 acres of prime, unique farmland that is of National importance, 900 acres of State importance, and 8700 acres of local importance based on soil inventory information supplied by the USDA. A few produce truck farms, nurseries, ornamental tree, and Christmas tree farms exist today.

SCENIC RESOURCES

The Baker River watershed’s location throughout rural New Hampshire, along with the general hilly topography of the area, provides residents and tourists with unique scenic resources. Scenic vistas abound throughout the Baker River corridor, both from the river itself and from the roads and trails along the river valley and watershed. The proximity of the White Mountain National Forest to the east and the north of the main stem enhances the scenic value throughout the watershed with additional trails and picnic areas. In recent years, population growth throughout the state and region has made people appreciate the natural scenery rural New Hampshire has to offer.

The following list is some of the scenic resources that the Baker River watershed has to offer:

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3 The volume of saturated sediment beneath and beside streams and rivers where groundwater and surface water mix

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Baker River Watershed Management Plan - 28 -
5.3 Ore Hill Mine

The 10-acre Ore Hill Mine Site within the Baker River watershed is on the White Mountain National Forest near the town of Warren. This mine was one of the largest mines in the State. It was intermittently mined approximately between 1910 and 1934 for silver, lead, copper, and zinc. A small amount of mica was also mined during World War II.

The Ore Hill deposit was a 48-foot wide massive sulfide-type vein at the surface, dipping steeply to the east, which was discovered by True Merrill. The ore was initially shipped to England for silver, but the operation was non-economic. Subsequent operations were also generally failures. A custom smelter was imported from Belgium after 1900, but the venture failed by 1910, and the smelter was dismantled and shipped to Pennsylvania in the 1930’s. The deepest shaft was more than 450 feet deep.

The Forest Service acquired part of the site in 1937. The remainder of the site was acquired by the National Park Service as part of the Appalachian Trail corridor in 1979. Subsequently, the
Park Service ceded the Appalachian Trail control and responsibility to the Forest Service through a memorandum of understanding (MOU) in the 1980’s.

There are approximately four acres of tailings and waste rock at the Ore Hill Mine Site that result in extremely poor surface water quality. In 1984, the Forest Service re-routed the surface water and re-graded and capped the tailings, filling in the former small stream channel that flowed through the site. Downstream surface water quality improved following this effort, but major problems remain. Tailings and waste rock piles are seasonally saturated by water, and seeps from the piles are toxic. Currently, one mile of stream is essentially dead due to zinc and other metals; 4 total miles of stream are impacted. The soil cap on the tailings is also failing. The table below conveys the degree of surface water contamination (USDA Forest Service, 2002).

### Approximate Surface Water Metals (micrograms/liter)

#### Spring High Flow – 2001

<table>
<thead>
<tr>
<th>Metal</th>
<th>Seep Measurement</th>
<th>Background Measurement</th>
<th>1 Mile Downstream</th>
<th>NH Acute Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>30,000</td>
<td>101</td>
<td>117</td>
<td>750</td>
</tr>
<tr>
<td>Cadmium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>1550</td>
<td>7</td>
<td>11.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Iron</td>
<td>11,000</td>
<td>165</td>
<td>34</td>
<td>Chronic standard = 1000</td>
</tr>
<tr>
<td>Lead</td>
<td>1950</td>
<td>2.1</td>
<td>8.7</td>
<td>14</td>
</tr>
<tr>
<td>Zinc</td>
<td>118,000</td>
<td>26</td>
<td>520</td>
<td>36.2</td>
</tr>
<tr>
<td>pH</td>
<td>3.3</td>
<td>5.89</td>
<td>6.13</td>
<td>6.9</td>
</tr>
</tbody>
</table>

Dissolved metals (zinc, copper, and cadmium) in surface water downstream of the site are the main environmental concerns. Zinc in seeps on site is 3+ orders of magnitude above the acute state water quality standard. One mile downstream of the tailings, zinc was measured at more than an order of magnitude above the acute standard in the spring of 2001. Macro-invertebrate data suggest metals persist beyond the confluence with Black Brook, 2.5 miles downstream. Impacts to the Baker River (4 miles downstream) are unknown but believed to be minor.

The tailings at the site average more than 15,000 parts per million (ppm) lead, and soils adjacent to the tailings typically have several hundred to several thousand ppm lead. The calculated, risk-based guideline for lead for the site is 2700 ppm. From the human health impact viewpoint, the site is not considered a significant risk for occasional site visitors.

---

4 Metals and their values in bold type highlight those above the acute standard
The USFS continues to monitor water quality and contamination levels in water bodies at and near the Ore Hill Mine Site.

The Forest Service is currently working with the community of Warren and the NH Department of Environmental Services on the site restoration activities under the Forest Service Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority. A Preliminary Assessment (PA) and a Potentially Responsible Party (PRP) search were completed in 2000; however, no viable PRP’s were located. Site characterization and sampling was completed in 2000 and 2001.

An October 2002 draft Engineering Evaluation/Cost Analysis (EE/CA) evaluated several options for contamination source control, including: 1) moving waste rock onto tailings and capping, and constructing a diversion to cut off surface and subsurface water inflow; and 2) hauling the material off-site for disposal. The EE/CA recommended a third option; to move and stabilize the material in a new on-site repository, although locating the repository on the historic site may require extensive cultural resource inventory, research, and testing. The approximate estimated cost for option 1 or 3 is two million dollars, and the cost for option 2 is approximately four million dollars.

To meet the fiscal year 2004-06 funding timeline, stabilization and treatability testing and cultural resources work are planned for early fiscal year 2003. The technology of phosphate-based stabilization appears promising and could change the preferred alternative; testing will
include this approach. On the ground clean-up activities are anticipated to be completed by the summer of 2007.

5.4 Experimental River Bank Restoration Projects

An interesting bioengineering project designed by the NRCS, Grafton County District Office, on the Mack property in Wentworth is worth mentioning. The design includes bendway weirs, riprap, and plantings on this property. The results are promising, but inconclusive, pending long term assessment. A similar project, done privately in Wentworth, was completed in the summer of 2002 at the King Sawmill. This project incorporated ‘J’ weirs, modest re-channeling, and riprap to protect kilns and buildings. It is hoped that either or both of the above projects will serve as models for future riverbank erosion control in similar situations.
CHAPTER 6
CURRENT STATUS IN MEETING NH WATER QUALITY STANDARDS

6.1 Current Status

Federal and State agencies, working with local residents and industry, have successfully reduced pollution sources throughout the watershed. The lower section of the Baker River was reclassified by the NH legislature in 1967 from a ‘D’ water quality to a ‘B’ classification, meaning that all waters in the Baker River watershed now have a ‘fishable and swimmable’ goal established.

Presently there are key components in place to maintain and protect water quality in the watershed. Many of these components are listed below.

- A long-term water quality monitoring program is in place with baseline data and testing dating back over 50 years (NH-DES Watershed Management Bureau).
- The USGS Rumney Gauging Station continues to provide flow data for the Baker River, and has been in place for nearly 50 years.
- BMPs are enforced for logging throughout the watershed.
- NH-DES enforces the Comprehensive Shoreland Protection Act, which is applicable throughout much of the Baker River watershed. (Refer to Appendix A for a description of the Comprehensive Shoreland Protection Act, and Appendix C for more information).
- Raw sewage no longer routinely enters the river or tributaries, with compliance monitored through NH-DES, the Baker River Watershed Association, local Conservation Commissions, and Health Officers.
- NH-DES subsurface sewage disposal system requirements apply to the entire watershed area.
- NH-DES Wetlands Bureau application and permitting procedures are in place, facilitated by Conservation Commissions in 3 of the 4 towns (Wentworth, Rumney, and Plymouth).
- Plymouth State College and Plymouth Area High School students annually conduct studies throughout the watershed related to water quality.
- Maintenance of riparian buffers and installation of new or expanded buffers are promoted through public education.
- Riverbank erosion controls have been installed in some critical areas for demonstration purposes.
- An Erosion Assessment has been conducted in the watershed along the Baker River (James Kennedy, Grafton County Conservation District, and the Baker River Watershed Association, 1999-00).
- The Baker River Watershed Association provides assistance and education throughout the watershed.
6.2 Current Concerns in Maintaining NH Water Quality Standards

Most of the surface waters within the Baker River watershed currently meet NH Water Quality Standards for their A or B legislative classification. However, existing problems and threats include:

- Drainage from the Ore Hill Mine Site continues to be a potential concern, especially from Ore Hill Brook to Black Brook.
- Riverbank erosion and sedimentation continues to be significant, especially along the Baker River main stem.
- Summer low flow and drought conditions jeopardize maintaining water quality parameters and recreational use.
- Storm water drainage and poor runoff controls produce localized water quality impacts, especially in developing areas where increased impervious surfaces are allowed.
CHAPTER 7
GOALS, RECOMMENDATIONS AND MEASURES TO IMPLEMENT

Goal 1: Increase Public Education and Involvement Throughout the Baker River Watershed

Throughout the creation of the Baker River Watershed Management Plan, the need for public education and involvement has been stressed continually. In fact, one task under the DES grant awarded to the Baker River Watershed Association included an event called “Shrub Your Buffer.” This event offered riparian landowners and the general public an opportunity to gain hands-on experience planting shrubs and small trees to help minimize the erosion problems along the shores of the Baker River. State and federal agencies, were involved and offered educational materials, demonstrations, and plant materials.

Continued education and stakeholder involvement are crucial for the implementation of this Watershed Management Plan. Means to implement an increase in public and riparian landowner education and involvement include the following:

RECOMMENDATION A

Through educational brochures and outreach programs, the Baker River Watershed Association, along with each of the four main stem towns, can illustrate to residents and visitors the importance of proper waste disposal to maintain good water quality, for now and future generations.

Measures to Implement

1. Continually update the brochures and distribute at least annually.
2. Provide the brochures to Association members and riparian landowners, as well as be available at public locations in each of the four main stem towns along the Baker River.
3. Example brochures include:
   a. Descriptions of the symptoms of water quality degradation.
   c. Detailed steps to report hazardous spills, including emergency telephone numbers.

RECOMMENDATION B

Events such as a “Shrub Your Buffer” or “Clean Your Stream” events should be held regularly.
Measure to Implement

1. Offer shrubs and trees at discount rates so riparian landowners will attend events and take plants home.
2. Have scheduled days to get residents and visitors to clean garbage from the river, along with a collection and disposal day.
3. Have educational workshops onsite so people can learn hands-on how to plant vegetation or clean the river. It will also give people the opportunity to see some work that has been done in past years. It also presents people a chance to learn from others successes and failures.

RECOMMENDATION C

Place signs with stream names at stream and road crossings to increase public awareness of the watershed and a sense of ‘place’ within the watershed.

Goal 2: Minimize or Control Accelerated Erosion along the Baker River and its Tributaries

Bank erosion along the Baker River and some of its tributaries has been, and will continue to be, one of the most significant problems for many riparian landowners, residents and visitors to the watershed. Bridges are continually at risk of being destroyed by the forces of the river, especially during high flow times. Moreover, many riparian landowners are repeatedly watching the number of acres on their property decrease as the course of the river continually changes.

By examining the historic meandering of the Baker River and recognizing the strong forces of water flowing from Mount Moosilauke, it will be nearly impossible for people to expect that it will maintain a constant channel in the future. Rivers of this type naturally migrate within the floodplain. However, there are ways to help minimize and somewhat control riverbank erosion.

The following recommendations address areas with minor and moderate erosion problems. However, tackling areas where erosion is severe (several such areas can be found throughout the Baker River) is beyond the scope of this watershed management plan. Typically the Army Corps of Engineers, New Hampshire DES, and private engineering consultants are required to address severe erosion problems involving Major Impact permitting. Refer to Appendix F for a list of contact organizations, institutions, and resources which can help design solutions to minimize or mitigate areas with severe erosion problems.

Recommendation A

Protect existing riparian buffers.
The diagram to the left shows the benefit of increasing buffer width on rivers and streams for flood control and wildlife habitat corridors. Diagram courtesy of the Connecticut River Joint Commissions, 1999.

**Measures to Implement**

1. Quantify what currently exists for riparian buffers.

2. Determine ways to protect or expand the riparian habitat along the river.

3. Enforce the Comprehensive Shoreland Protection Act within the four towns along the main stem to help protect the buffers along the river. Local ordinances could include setbacks for building within riparian habitat, and provide for enforcement of the Shoreland Protection Act for 4th order and greater streams.

4. Encourage landowners to voluntarily put all or some of their property into a conservation easement to protect it from future development.

**RECOMMENDATION B**

Develop ways to improve buffer habitat along the Baker River and its tributaries.

**Measures to Implement**

1. Encourage riparian landowners to re-vegetate along the shoreline of the Baker River and its tributaries.

2. Hold regular educational events similar to the “Shrub Your Buffer” event on May 3, 2003 to give people hands-on experience planting trees and shrubs along the shoreline. Encourage local nurseries to offer discounts on appropriate plants for riparian landowners.

3. Monitor projects such as the NRCS bendway weir work in Wentworth to determine the effectiveness both on-site and downstream. Depending on the success of this particular project, institute similar projects in areas identified as high priority.

4. Work closely with the DES Wetlands Bureau to keep them updated on problem areas and need for remediation, especially in instances where public safety is at risk.
RECOMMENDATION C

Install and properly maintain all culverts throughout the Baker River watershed. Where applicable, encourage installation of culverts deep enough to ensure fish passage.

Measures to Implement

1. Inventory and document all culverts, especially at stream crossings

2. Clean out culverts on a yearly basis – DOT or municipalities depending on jurisdiction.

3. Strive to install all culverts with a minimum slope of 3% (to prevent sedimentation and clogging) and a maximum slope of 8% (to avoid downstream erosion problems) to encourage proper drainage. Match slope to stream if associated with one. Do not allow culverts to drop off at the outflow.

4. File five (5) year culvert maintenance and replacement plans with DES Wetlands Bureau to ensure compliance with State regulations. Note: a permit with the Wetlands Bureau is good for five years, so planning ahead will save time in the long run. Obviously this does not include emergency situations. Rulemaking has been initiated by NH DES to allow routine culvert and maintenance work to commence upon notification to DES, provided that NH DOT’s Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire are followed. The proposed rules are applicable to DOT, town road agents, private roads and railroads.
**RECOMMENDATION D**

Encourage foresters and loggers to follow Best Management Practices (BMPs) as defined in the *State of NH Good Forestry in the Granite State* publication (see references).

*Measures to Implement*

1. Layout skid trails and logging roads along existing contours. Minimize the number of skid roads.

2. Construct sufficient water bars.

3. Re-vegetate all roads and log landings as soon as possible upon completion of cut.

4. Properly contain all fuels and oils.

**Goal 3: Continue to Improve Water Quality Throughout the Baker River Watershed**

Maintain and improve water quality at current Class B level for swimming, boating, fishing, and drinking if treated.

**RECOMMENDATION A**

Continue to test for E.coli levels along the Baker River main stem as currently being done by the Baker River Watershed Association in each of the 4 main stem towns.

**RECOMMENDATION B**

Continue to adhere to and follow current laws and regulations established by the Environmental Protection Agency’s Clean Water Act, NH Water Quality Standards, and the Comprehensive Shoreland Protection Act.

*Measures to Implement*

1. Continue to locate and mitigate point source pollution from the Ore Hill Mine Site.

2. Increase riparian buffers where needed.

3. Develop a non-point source pollution control plan with implementation measures.

4. Develop a storm water pollution control plan with implementation measures.

5. Continue to explore bio-engineering techniques where feasible to control stream bank erosion.
6. Continue to explore bendway weir and ‘J’ weir bio-engineering in conjunction with riprap options where feasible.

7. Explore re-channeling only as a last alternative, and identifying areas where needed.

8. Create and implement a stratified drift aquifer protection plan- with BMPs.

9. Create and implement source water protection areas for drinking water sources.

**RECOMMENDATION C**

Encourage foresters and loggers to become familiar with the *Best Management Practices for Erosion Control* during all harvesting operations.

**RECOMMENDATION D**

Establish town ordinances to help maintain water quality.

*Measures to Implement*

1. Enforce fines for dumping trash into the river.

2. Prevent junkyards from being placed within 500 feet of the Baker River.

3. Prevent disposal (or permanent placement) of old cars within the floodplain.

4. Reduce untreated parking lot runoff from new development.

**RECOMMENDATION E**

Address the concerns in maintaining NH Water Quality Standards noted in Chapter 6.2.

*Measures to Implement*

1. Encourage the White Mountain National Forest to mitigate impacts to Ore Hill Brook from the Ore Hill Mine Site.

2. Implement storm water drainage and runoff controls, as described by the EPA Stormwater Final Rule Phase II for certain development and facilities, as well as in general throughout the watershed.

**Goal #4: Encourage Recreation and Tourism**

Even though there are many conflicts with encouraging tourism and recreation throughout the Baker River watershed, there are many positive economic benefits to Warren, Wentworth,
Rumney, and Plymouth. There are several ways to reduce the conflicts of trespassing, littering, and vandalism throughout the Baker River.

**RECOMMENDATION A**

Designate additional public access points along the river.

*Measures to Implement*

1. Evaluate the need for additional public access areas and identify potential locations, and the need for sanitary facilities.

2. Towns throughout the main stem of the Baker River should avoid development of access points on sections of the river that are considered dangerous for access.

**RECOMMENDATION B**

Place signs at each of the public access points: 1) stressing the importance of respecting private property, 2) emphasizing “carry-in” and “carry-out” policies, and leaving the area clean for the enjoyment of future visitors, 3) and referencing RSA 212:34 which addresses landowner and recreational use of private property (see Appendix E for a description of RSA 212:34).

*Measures to Implement*

1. Enforce with fines for littering, trespassing, and vandalism.

2. Encourage volunteers and organizations to help keep the public access points litter-free and well maintained.

**RECOMMENDATION C**

Riparian landowners who do not want trespassing on their property, should follow state guidelines for posting their land to discourage trespassing.

**RECOMMENDATION D**

Efforts to educate the public about the need to get permission from landowners before going on private lands should be intensified. As an example, brochures provided to visitors to the watershed, should strongly emphasize this point. In addition, NH Fish and Game Department should make this point in their brochures distributed to hunters and fishermen.

Riparian landowners are encouraged to review RSA 212:34. This RSA describes landowners’ liability concerns and responsibilities (see Appendix E – RSA 212:34: Duty of Care).

**Goal #5: Protect and Provide Adequate and Diverse Wildlife Habitat**

As stated in Chapter 5, there is abundant and diverse wildlife species found throughout the Baker River watershed. The vast extent of the White Mountain National Forest within the watershed,
coupled with the rural nature along the main stem of the Baker River offers excellent wildlife habitat. Wetlands and riparian areas are among the most critical parts of any forest ecosystem. In fact, they are utilized by over 90% of the region’s wildlife species and provide the preferred habitat for over 40% of these species. Residents and visitors value being able to view wildlife directly or indirectly, and their presence will continue to draw in tourism dollars in the future.

Because of this, it is important to retain and enhance wildlife habitat along the Baker River main stem and its tributaries. As an added incentive, protecting riparian habitat for erosion control (Goal #1) and maintaining good water quality (Goal #3) will also provide excellent travel corridors and quality habitat for many wildlife species.

**RECOMMENDATION A**

Protect fisheries habitat by retaining, and in some cases, improving the water quality on the Baker River and its tributaries.

*Measures to Implement*

1. Encourage riparian growth to shade water bodies and enhance fish habitat.

2. Continue to encourage the White Mountain National Forest to monitor and work to improve water quality in Ore Hill Brook. (Presently, most of Ore Hill Brook is devoid of the macroinvertebrates and fish that used to thrive there – see Chapter 5.3 for details).

3. Collaborate with NH Fish and Game Department and Plymouth State College to determine the effectiveness of the current stocking program. It may be more practical to spend resources in determining which fish species should be stocked, and improving fisheries habitat in conjunction with stocking programs.

**RECOMMENDATION B**

Protect riparian habitat and encourage buffer zones along the Baker River.

*Measures to Implement*

1. Meet several goals at the same time by riparian habitat enhancement and protection: wildlife/fisheries habitat; erosion control or minimization; improved aesthetics along the shoreline.

2. Encourage riparian landowners to place part of their property into conservation easements. Ideal situations would be several adjacent landowners working together to protect a larger tract of riparian habitat, or where their land abuts White Mountain National Forest.

**RECOMMENDATION C**

Protect threatened, endangered, sensitive and native species.
Measures to Implement

1. Local officials (Select Boards, Conservation Commissions and Planning Boards) use their authority to protect these areas through the review of wetland permits, forest applications, site plans, and intent to cut permits.

2. Continue to gather information from NH Natural Heritage Inventory (see Appendix F) and NH Fish and Game Department.

Goal #6: Adopt Watershed Protection Measures as part of Master Plans and Town Ordinances

One of the most important goals for this Baker River Watershed Management Plan is that it is not read once quickly and then placed on a shelf to collect dust. The Baker River Watershed Association has strived to create a watershed management plan that will offer practical means to protect the watershed into the future. The Association has taken time to include input from each of the four main stem towns, the White Mountain National Forest, riparian landowners, and the general public. It is believed that this Plan has come to fruition with input from people who care about their watershed.

RECOMMENDATION A

Include ideas derived from this watershed management plan into Warren, Wentworth, Rumney, and Plymouth Master Plans, as developed and updated.

RECOMMENDATION B

Implement and enforce local regulation of shoreland activities, referencing the Comprehensive Shoreland Protection Act. Refer to Appendix C for a list of websites with Comprehensive Shoreland Protection Act definitions and RSAs.

RECOMMENDATION C

Implement and enforce local measures to protect riparian habitat and reduce or minimize erosion throughout the Baker River and its tributaries. Local regional planning commission, North Country Council Inc., has drafted a document called a Model Riparian Buffer Conservation Ordinance for use by towns in developing their own riparian habitat protection ordinances. Contact North Country Council (107 Glessner Road, Bethlehem, NH 03574 (603) 444-6303) for a copy of this sample ordinance.

RECOMMENDATION D

Develop ordinances and fines to discourage the dumping of trash, and the storage of junk vehicles in the flood plain.
RECOMMENDATION E

Cooperate and coordinate efforts with ongoing relevant projects throughout the four mainstem towns of Warren, Wentworth, Rumney, and Plymouth.

Measures to Implement

1. Establish and support the work of local Conservation Commissions in all towns in the Baker River watershed (the Town of Warren currently does not have a Conservation Commission). Encourage joint meetings at least annually to discuss common interests and perhaps joint projects of mutual benefit.

2. Plymouth has begun a watershed modeling project for the Pemigewasset, Baker and Newfound River Watersheds. The objectives of the project are: to develop a flood-forecasting model for the watersheds to improve emergency response within the watersheds; to prepare operations models that will improve the ability to manage these lakes for recreation, flooding reduction and hydroelectric power generations. These efforts should be combined with work done by the Baker River Watershed Association.
# CHAPTER 8

## IMPLEMENTATION SCHEDULE AND MILESTONES

Below is a summary table of the Goals for the Baker River watershed and a proposed schedule for implementation of the Goals and Objectives.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objective</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal 1</strong>&lt;br&gt;Increase Public Education and Involvement</td>
<td>Distribute educational brochures for the public to understand natural watershed processes</td>
<td>Yearly</td>
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<tr>
<td></td>
<td>Public events like “Shrub Your Buffer”</td>
<td>Yearly</td>
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<td></td>
<td>Place signs with the name of streams at road crossings to increase public awareness</td>
<td>2003-2005</td>
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<tr>
<td></td>
<td>Document what currently exists for riparian buffers</td>
<td>Complete: refer to riparian habitat map in this report</td>
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<tr>
<td></td>
<td>Determine ways to protect riparian habitat – feasibility study</td>
<td>2003-2005</td>
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<tr>
<td></td>
<td>Institute local regulations to protect riparian zones</td>
<td>2003-2010</td>
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<tr>
<td></td>
<td>Monitor bendway weirs and ‘J’ weir options with biotic control to determine effectiveness</td>
<td>Yearly</td>
</tr>
<tr>
<td><strong>Goal 2</strong>&lt;br&gt;Minimize or Control Erosion</td>
<td>Encourage riparian landowners to re-vegetate along shoreline of the Baker River and its tributaries</td>
<td>Yearly – through educational materials and events</td>
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<td></td>
<td>Install and maintain culverts using BMPs Comply with wetlands requirements</td>
<td>Yearly</td>
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<tr>
<td></td>
<td>Notification application to Wetlands Bureau for culvert maintenance</td>
<td>Yearly if needed or every 5 years</td>
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<tr>
<td></td>
<td>Enforce BMPs for logging</td>
<td>Yearly</td>
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<tr>
<td>Goal</td>
<td>Objective</td>
<td>Timing</td>
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<tr>
<td><strong>Goal 3</strong>&lt;br&gt;Improve Current Water Quality</td>
<td>Continue to test for E.coli&lt;br&gt;Attain NH water quality standards for Class B. Maintain good quality waters.</td>
<td>Seasonally</td>
</tr>
<tr>
<td></td>
<td>Adhere to EPA’s Clean Water Act and Comprehensive Shoreland Protection Act</td>
<td>2003 - into the future</td>
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<tr>
<td></td>
<td>Distribute educational brochures and outreach programs for proper waste disposal and importance of good water quality</td>
<td>Yearly</td>
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<tr>
<td></td>
<td>Establish town ordinances to help maintain water quality&lt;br&gt;Implement storm water runoff BMPs</td>
<td>2005-2010</td>
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<tr>
<td></td>
<td>Encourage White Mountain National Forest to mitigate impact to Ore Hill Brook</td>
<td>2003 – into the future</td>
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<tr>
<td></td>
<td>Implement stormwater drainage and runoff controls as described by the EPA Stormwater Final Rule Phase II</td>
<td>2003-2010</td>
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<tr>
<td><strong>Goal 4</strong>&lt;br&gt;Encourage Recreation</td>
<td>Designate additional public access points</td>
<td>2003-2010</td>
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<td></td>
<td>Place signs at each access point with information on respecting private landowners’ rights and “carry-in”/ “carry-out” policies</td>
<td>2003-2010</td>
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<tr>
<td></td>
<td>Riparian landowners who want to post their property should adhere to State regulations for posting against trespassing</td>
<td>Yearly</td>
</tr>
<tr>
<td><strong>Goal 5</strong>&lt;br&gt;Protect Wildlife and Fish Habitat</td>
<td>Encourage riparian growth to shade water bodies and enhance fish habitat</td>
<td>2003 – into the future</td>
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<tr>
<td></td>
<td>Continue to collaborate with NH Fish and Game and Plymouth State College for Fish and Wildlife inventories</td>
<td>2003 – into the future</td>
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<tr>
<td></td>
<td>Encourage protection of riparian habitat through voluntary conservation easements by private landowners</td>
<td>Yearly information and initiatives get people interested</td>
</tr>
<tr>
<td>Goal</td>
<td>Objective</td>
<td>Timing</td>
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</tbody>
</table>
| **Goal 5 (continued)**  
**Protect Wildlife and Fish Habitat** | Local officials use their authority to protect threatened and endangered wildlife through review of wetland permits, forest applications, site plans, and intent to cut permits | As needed for each town |
|  | Continue to gather and update information on endangered, sensitive and native species | Yearly |
| **Goal 6**  
**Watershed Protection**  
**Incorporated into Master Plans and Town Ordinances** | Incorporate goals and recommendations into Master Plans | When Master Plans are being updated in each of the four towns |
|  | Develop local regulations based on the Comprehensive Shoreland Protection Act | 2010 – 2015 |
|  | Implement local measures to protect riparian habitat through a protection ordinance | 2005 - 2015 |
|  | Develop ordinances and fines to discourage the dumping of trash, including vehicles along the flood plain | 2005 – 2010 |
|  | Combine and coordinate efforts with town-wide and watershed-wide relevant projects | Ongoing |
CHAPTER 9
CONCLUSIONS

9.1 Summary

Based on research for this management plan, existing data, and input at meetings with each main stem town and the public, the Baker River watershed water quality is generally good to excellent at this time. The headwaters of the watershed contain enviable protection from development and pollution impacts with pristine water quality. The lower sections of the watershed have successfully improved water quality, and it is highly likely that this trend will continue given regulatory oversight, the work of the Baker River Watershed Association, and general public expectations.

Buffers with associated wildlife corridors and fish habitat benefits are adequate and will improve with increased public education and riparian landowner involvement. Compliance with existing State and Federal regulations such as proper subsurface disposal of septic waste, wetland permitting, and the shoreland protection program will assist in maintaining the current status. Extension and development of new buffer zones will undoubtedly improve the ability of the watershed to provide wildlife habitat, fish habitat, good water quality, and recreational activities.

Monitoring and implementation of future remediation practices at the Ore Hill Mine Site will steadily reduce the negative environmental impacts in that area of the watershed. It is anticipated that through collaboration and partnership opportunities, the Ore Hill Mine Site will be reclaimed.

Erosion along the banks of the Baker River will continue to be problematic due to natural forces. There are 153 sites with high erosion potential that have been inventoried along the main stem. Future erosion control projects such as the bendway weirs in Wentworth and ‘J’ weirs at the King sawmill in Wentworth will alleviate individual site-specific problems, but will have to be addressed on a site-by-site assessment basis. It is hard to measure the overall benefit, or affix a cost savings to the more subtle positive impacts that implementing BMPs and proper installation of water bars have on the watershed. The combined efforts of public education, maintenance of proper buffers, and encouraging use of BMPs throughout the watershed will improve water quality and decrease the overall erosion problems.

9.2 Future use of Digital Data

One advantage of this Watershed Management Plan is the fact that it is in digital format. The intent is to provide a foundation that can be built upon perpetually, avoid redundancy of work done previously. Sections, maps, or the entire plan can be updated as changes occur throughout the watershed.
Likewise, distribution can be expedited via electronic attachments of sections or the whole plan. Hardcopy reproduction is sometimes advantageous and can be provided through easy retrieval of these data.

The ability to expand, change, and update electronic data also can have a negative aspect. Watershed to Wildlife, Inc. strongly suggests that the Baker River Watershed Association address the following issues:

- Electronic data can be easily modified, manipulated, and used for purposes other than those originally intended by nearly anyone who has access to computers.

- Due to base map scales and inherent errors, the data being created for this project have limitations, which restrict their appropriateness for applications outside the scope of this project. In many instances, such as wetland permitting, stream bank restoration, and property line locations, ground verification is necessary. (See Appendix B)

It is important that the Baker River Watershed Association protect itself against any misuse of the data. The Association, in order to limit its liability, should draft a data licensing agreement or appropriate disclaimer form, if copies of the data or any portion thereof are released to a third party; subject to any federal and state regulations concerning public information and ‘right to know’.

9.3 Future GIS Development

Data used for researching and creating this management plan has provided a preliminary base for development of a Geographic Information System (GIS). Much of this information has been created by numerous other organizations, including but not limited to, UNH Complex Systems (GRANIT), NH-DES, USGS, NRCS, Watershed to Wildlife, Inc., and others. It is vitally important that sources and accuracies are considered and stated as these databases are applied to new updates and/or additional coverages. Often the output and analysis of GIS data is only as accurate as the least accurate base data. (See Appendix B for accuracy references.)

With the considerations listed above, Watershed to Wildlife, Inc. encourages the Baker River Watershed Association to develop a GIS for the watershed for the following reasons:

- Sufficient properly formatted data is already available to produce a basic GIS tool.

- Additional data will continue to be produced by others that the Association could incorporate into their existing GIS.

- The Association could create additional GIS coverages in future projects.

- Large volumes of data can be stored in a GIS with ease of retrieval and updating capabilities with backup disks of all data.

- An unlimited array of GIS analysis and models can be performed with a GIS, ranging from specific areas to watershed-wide outputs.
Examples of further GIS analysis would be identifying areas where buffers of 100 feet may be sufficient when slight to moderate slopes and stable soils are factored in, but 200 foot buffers may be needed in steep sloping areas that have loose, granular, sands. Another example might be an analysis of existing buffers, identifying areas that have insufficient wildlife corridors or areas where critical wildlife habitat can be linked along the Baker River. Such analysis can be applied in unlimited combinations as the database and layers of coverage increase, hopefully providing a tool for proactively protecting such areas.

9.4 Implementation of the Watershed Management Plan

One of the most important elements of this watershed management plan is for its implementation and incorporation into future town and watershed planning. It is hoped that an implementation strategy will keep this plan from sitting on a shelf collecting dust. Ideas to keep the momentum going with this watershed management plan include the following:

- The Baker River Watershed Association should set up a system to continually monitor the status and successes of implementing the plan.
  - The Association should set up annual review of themselves, members, and volunteers to evaluate progress.

- The Association should continue to meet with the four main stem towns throughout the watershed to keep the plan current with each town, especially as new Master Plans or Zoning Ordinances are being developed.

- The Association should continue to explore partnership opportunities, some of which are listed in Appendix D.

- The Baker River Watershed Association should seek additional funding to further assess the entire Baker River watershed, including an inventory of natural resources.

Future work, which could stem from this management plan, includes:

- The Baker River Watershed Association, working with local conservation commissions, colleges, schools, local planning commissions, U.S. Forest Service, and NH Fish and Game Department, could identify important natural resources within the Baker River corridor. These areas can be targeted for future studies.

- The Baker River Watershed Association, working with community conservation commissions or land trust organizations (the Society for Protection of NH Forests or the Nature Conservancy, for example), could help protect properties throughout the watershed, especially those identified as prime riparian habitat.
  - The aerial photographs (DOQ’s) that were submitted in digital format with this Baker River Watershed Management Plan will be useful tools to help identify areas of prime riparian habitat. Although fieldwork may be necessary, the maps
will greatly reduce the time in the field and therefore make the work more time-efficient.

- Future aerial photographs (DOQs) will also provide a means of tracking changes and shifts of vegetation throughout the watershed.

  - Encourage communities to seek grants from federal, state, and private organizations to provide funding for restoration of areas that have been disturbed.

    - Use of GIS maps presented with this watershed management plan, as well as those developed in the future, will be valuable tools in determining future areas for restoration.

    - The creation of this watershed management plan, along with additional work the Association has done to date, should greatly increase future funding opportunities.

  - The Baker River Watershed Association can coordinate work with NH Department of Environmental Services and the Army Corps of Engineers to determine erosion control methods that are the most effective, especially in locations where erosion along the Baker River creates significant safety hazards or economic losses to the public.
WENTWORTH
BAKER RIVER
RIPARIAN BUFFER
ANALYSIS
10/04/02

LEGEND

EXISTING RIPARIAN BUFFER
100 FOOT BUFFER
300 FOOT BUFFER
BRIDGE

SCALE: 1" = 6000'

WATERSHED TO WILDLIFE, INC.
544 Jefferson Road, Whitefield, NH
603-837-2367, www.wetlandwildlife.com
BAKER RIVER
RIPARIAN BUFFER ANALYSIS
10/04/02

LEGEND
- EXISTING RIPARIAN BUFFER
- 100 FOOT BUFFER
- 200 FOOT BUFFER
- BRIDGE

SCALE: 1" = 4000'
TOTAL DISTANCE = 36 MILES, 2982 FEET
ELEVATION CHANGE = 3,095 FEET

THE RIVER DROPS AN AVERAGE OF 87 FEET PER MILE THROUGHOUT ITS COURSE

DATA GENERATED FROM USGS TOPOGRAPHIC MAPS JANUARY, 2003
PROFILE OF THE BAKER RIVER THROUGH THE TOWN OF WARREN

TOTAL DISTANCE = 8 MILES, 3827 FEET
ELEVATION CHANGE = 1316 FEET

THE RIVER DROPS AN AVERAGE OF 151 FEET PER MILE THROUGH THE TOWN OF WARREN

DATA GENERATED FROM USGS TOPOGRAPHIC MAPS JANUARY, 2003
PROFILE OF THE BAKER RIVER
THROUGH THE
TOWN OF WENTWORTH

TOTAL DISTANCE = 7 MILES, 2653 FEET
ELEVATION CHANGE = 140 FEET

THE RIVER DROPS AN AVERAGE OF 20 FEET PER MILE THROUGH THE TOWN OF WENTWORTH

DATA GENERATED FROM USGS TOPOGRAPHIC MAPS JANUARY, 2003
PROFILE OF THE BAKER RIVER THROUGH THE TOWN OF RUMNEY

TOTAL DISTANCE = 10 MILES, 3326 FEET
ELEVATION CHANGE = 41 FEET

THE RIVER DROPS AN AVERAGE OF 4 FEET PER MILE THROUGH THE TOWN OF RUMNEY

DATA GENERATED FROM USGS TOPOGRAPHIC MAPS JANUARY, 2003

MAP PRODUCED BY:
WATERSHED TO WILDLIFE, INC.
54 JEFFERSON ROAD, WHITEFIELD, NH 03598
WWW.WATERSHEDTOWILDLIFE.COM
TOTAL DISTANCE = 5 MILES, 3386 FEET
ELEVATION CHANGE = 12 FEET

THE RIVER DROPS AN AVERAGE OF 2 FEET PER MILE THROUGH THE TOWN OF PLYMOUTH

DATA GENERATED FROM USGS TOPOGRAPHIC MAPS JANUARY, 2003
REFERENCES


Connecticut River Joint Commissions. 1999. Introduction to Riparian Buffers no. 1. Distributed by the VT Connecticut River Watershed Advisory Committee and the NH Connecticut River Valley Resource Commission, P.O. Box 1182, Charlestown, NH 03603


Hampshire. Published by the Society for the Protection of New Hampshire Forests. Concord, NH.


APPENDIX A

GLOSSARY

**Best Management Practices (BMP)** – a practice or combination of practices determined to be the most effective and practicable means of preventing negative impacts of silvicultural activities.

**Biodiversity** – the variety and variability of all living organisms. This variety includes the diversity of plants, animals, fungi, algae, etc. their genetic variability, and the natural communities in which they live.

**Buffer Zone** – an area situated between two different habitats or habitat management activities. The objective of the buffer zone is to reduce the possibility of adverse impact on land use and water quality. For example, retaining 250 feet of riparian habitat along the Baker River helps to protect the river from human activities such as logging, agriculture, and impervious surfaces.

**Clean Water Act (33 U.S.C 1251-1387)** – established to restore and maintain the chemical, physical, and biological integrity of the United States waters. It provides for the control of discharges into rivers, both from point and nonpoint sources. The CWA is administered by the U.S. Environmental Protection Agency (EPA) and the NH Department of Environmental Services.

**Comprehensive Shoreland Protection Act** – (CSPA) – sets minimum standards and requirements for the development, use, and subdivision of all land within 250 feet of the water’s edge (reference line). The protected shoreland is essential to maintain the quality of our rivers, lakes, ponds, and tidal waters. The CSPA became effective July 1, 1994, is enforced by the NH Department of Environmental Services, and is enforceable for all lands adjacent to 4th order streams or higher.

**Ecosystem** – A community of species (or group of communities) and its physical environment, including atmosphere, soil, sunlight and water.

**Erosion** – physical breakdown, chemical solution, and movement of broken down and dissolved rock materials.

**Floodplain** – the area of land adjoining the designated portions of the river and tributaries which will be inundated by a flood which has 1% chance of occurring or being exceeded in any given year (100-year floodplain). Areas determined by hydrologic studies or through having a history of flooding or are delineated by the best available information on flooding in the area.

**Hyperheic zone** – the volume of saturated sediment beneath and beside streams and rivers where groundwater and surface water mix.
Integrated Resource Management – The simultaneous consideration of various disciplines to balance competing demands on a natural system to maintain or enhance its health, diversity, and cultural aesthetic value.

MTBE – (Methyl Tertiary Butyl Ether), an additive to gasoline to enhance combustion and remove lead that can pollute groundwater.

Nonpoint Source – non-continuous diffuse inputs of pollutants above the inputs from undeveloped land of similar origins.

Open Space – any publicly or privately owned undeveloped land, including floodplains, woodlands, and farmlands.

Point Source – a pollutant reaching a receiving water by a pipe or man-made conveyance from a discrete source.

Riparian – along the banks of a river or stream.

Sedimentation – the process in which mineral or organic matter carried by water or ice is deposited.

Standards for Water Classification - Class A waters are considered as being potentially acceptable for water supply uses after adequate treatment. Class B waters are considered to be acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies. Class C waters are suitable for recreation in and on the water, fishing, aquaculture, propagation and restricted harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation and as a habitat for fish. Class D waters encounter intractable or very difficult pollution problems. Both Class C and D waters today indicate unacceptable quality; the goal is to implement practices to upgrade all waters to Class B or Class A.

Watershed – Total land area that drains directly or indirectly into a particular stream or river. Watersheds cross many political boundaries and are generally broken down into subwatersheds. For example, the Baker River watershed is a subwatershed of the Pemigewasset River Watershed, which, in turn, is a subwatershed of the Merrimack Watershed.

Wetland – Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Zoning – The specification of areas within a municipality and regulation of how land and structures can be used for business, industrial, residential, and other purposes.
APPENDIX B
ACCURACY ISSUES

Gather Existing Data

As part of the research for this project, existing maps and data for the Baker River were collected and reviewed. Not all existing data is directly incorporated in the Management Plan, but all was used indirectly as reference material. The following table shows which maps were obtained, their scale, and the national mapping standard accuracy measure. Since many decisions are based on parcels as they relate to rivers, roads, trails, ponds, wetlands and other features, it is important to point out the working accuracies of these data sources. Combining these sources in various overlays provides an excellent overview and planning tool, but does not replace the need to perform site-specific investigations for many developmental requests. Please refer to the table below to better understand some of these accuracy issues.

Accuracies of Existing Maps

<table>
<thead>
<tr>
<th>Data</th>
<th>Source</th>
<th>Ratio</th>
<th>Scale</th>
<th>National Mapping Standard Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerial photos (DOQs)</td>
<td>USGS</td>
<td>1:5,000</td>
<td>1&quot; = 416.7’</td>
<td>Acceptable accuracy within 12.48 feet</td>
</tr>
<tr>
<td>Topographic (DRGs)</td>
<td>GRANIT</td>
<td>1:24,000</td>
<td>1” = 2,000’</td>
<td>Acceptable accuracy within 60 feet</td>
</tr>
<tr>
<td>Additional GRANIT layers</td>
<td>GRANIT</td>
<td>1:24,000</td>
<td>1” = 2,000’</td>
<td>Acceptable accuracy within 60 feet</td>
</tr>
<tr>
<td>Source Water, Stratified Drift Aquifers, Drinking Water, Potential Contamination Sources…</td>
<td>NH-DES Water Division</td>
<td>1:24,000</td>
<td>1” = 2,000’</td>
<td>Acceptable accuracy within 60 feet</td>
</tr>
<tr>
<td>National Wetland Inventory</td>
<td>U.S. Fish and Wildlife Service</td>
<td>1:100,000</td>
<td>1” = 8,333’</td>
<td>Acceptable accuracy within 250 feet</td>
</tr>
<tr>
<td>Global Positioning System (GPS) Points</td>
<td>Garmin III plus</td>
<td>N/A</td>
<td>N/A</td>
<td>Generally within 30’ but dependent upon satellite availability, PDOP, refraction, etc.</td>
</tr>
</tbody>
</table>
## APPENDIX C
### WEBSITE RESOURCES

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>WEBSITE ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut River Joint Commissions</td>
<td><a href="http://www.crjc.org">www.crjc.org</a></td>
</tr>
<tr>
<td>Connecticut River Watershed Council</td>
<td><a href="http://www.ctriver.org">www.ctriver.org</a></td>
</tr>
<tr>
<td>GRANIT</td>
<td><a href="http://www.sr.unh.edu">www.sr.unh.edu</a></td>
</tr>
<tr>
<td>Merrimack River Watershed Council</td>
<td><a href="http://www.merrimack.org/">www.merrimack.org/</a></td>
</tr>
<tr>
<td>Natural Resource Conservation Service</td>
<td><a href="http://www.usda.nrcs.gov">www.usda.nrcs.gov</a></td>
</tr>
<tr>
<td>NH Audubon Society</td>
<td><a href="http://www.nhaudubon.org">www.nhaudubon.org</a></td>
</tr>
<tr>
<td>NH Department of Environmental Services</td>
<td></td>
</tr>
<tr>
<td>• Comprehensive Shoreland Protection Act</td>
<td><a href="http://www.des.state.nh.us/wetlands">www.des.state.nh.us/wetlands</a></td>
</tr>
<tr>
<td>• River Management and Protection</td>
<td><a href="http://www.des.state.nh.us/rivers/link-1.htm">www.des.state.nh.us/rivers/link-1.htm</a></td>
</tr>
<tr>
<td>NH Natural Heritage Inventory</td>
<td><a href="http://www.nhdfl.com/organization/div_nhnhi.htm">www.nhdfl.com/organization/div_nhnhi.htm</a></td>
</tr>
<tr>
<td>Plymouth State College</td>
<td><a href="http://www.plymouth.edu">www.plymouth.edu</a></td>
</tr>
<tr>
<td>Society for Protection of NH Forests</td>
<td><a href="http://www.spnhf.org">www.spnhf.org</a></td>
</tr>
<tr>
<td>University of New Hampshire Cooperative Extension Service</td>
<td><a href="http://ceinfo.unh.edu">http://ceinfo.unh.edu</a></td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency</td>
<td></td>
</tr>
<tr>
<td>• EPA surf your watershed</td>
<td><a href="http://www.epa.gov">www.epa.gov</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.epa.gov/surf/">www.epa.gov/surf/</a></td>
</tr>
<tr>
<td>U.S. Forest Service – White Mountain</td>
<td></td>
</tr>
<tr>
<td>National Forest</td>
<td><a href="http://www.fs.fed.us/r9/white">www.fs.fed.us/r9/white</a></td>
</tr>
<tr>
<td>U.S. Geological Survey – Real-Time Water Data</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://h2o.usgs.gov/public/realtime.html">http://h2o.usgs.gov/public/realtime.html</a></td>
</tr>
</tbody>
</table>
Partnerships are critical to the advancement of the Baker River Watershed Management Plan and BRWA goals and should be capitalized whenever possible. Some possible partnering opportunities are as follows:

<table>
<thead>
<tr>
<th>Rumney Conservation Commission</th>
<th>Plymouth Conservation Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wentworth Conservation Commission</td>
<td>Town of Warren</td>
</tr>
<tr>
<td>Town of Dorchester</td>
<td>Woodstock Conservation Commission</td>
</tr>
<tr>
<td>Groton Conservation Commission</td>
<td>Town of Ellsworth</td>
</tr>
<tr>
<td>Town of Benton</td>
<td>Orford Conservation Commission</td>
</tr>
<tr>
<td>Piermont Conservation Commission</td>
<td>Lyman Conservation Commission</td>
</tr>
<tr>
<td>Canaan Conservation Commission</td>
<td>Orange Conservation Commission</td>
</tr>
<tr>
<td>Holderness Conservation Commission</td>
<td>Rumney Ecological Committee</td>
</tr>
<tr>
<td>Campton Conservation Commission</td>
<td>Plymouth State College</td>
</tr>
<tr>
<td>NH Fish and Game Department</td>
<td>NH Department of Environmental Services</td>
</tr>
<tr>
<td>UNH- Complex Systems- GRANIT</td>
<td>Quincy Bog Center</td>
</tr>
<tr>
<td>Trout Unlimited</td>
<td>Warren Fish Hatchery and Wildlife Center</td>
</tr>
<tr>
<td>US Forest Service- White Mountain National Forest</td>
<td>The Appalachian Trail Conference</td>
</tr>
<tr>
<td>Dartmouth Outing Club</td>
<td>Plymouth Outing Club</td>
</tr>
<tr>
<td>UNH Cooperative Extension</td>
<td>Natural Resource Conservation Service</td>
</tr>
<tr>
<td>NH Audubon Society</td>
<td>North Country Council - Regional Planning Commission</td>
</tr>
<tr>
<td>All local elementary and high schools</td>
<td>Merrimack River Watershed Council</td>
</tr>
<tr>
<td>Mascoma Watershed Council</td>
<td>Resource Conservation and Development (RC &amp;D)</td>
</tr>
<tr>
<td>Americorp Program</td>
<td>Connecticut River Joint Commissions (CRJC)</td>
</tr>
<tr>
<td>The Nature Conservancy</td>
<td>Society for the Protection of NH Forests</td>
</tr>
</tbody>
</table>
APPENDIX E
NEW HAMPSHIRE RECREATIONAL USE AND TRAIL STATUTE

TITLE XVIII. FISH AND GAME, CHAPTER 212. PROPAGATION OF FISH AND GAME LIABILITY OF LANDOWNERS

212:34. Duty of Care

I. An owner, lessee or occupant of premises owes no duty of care to keep such premises safe for entry or use by others for hunting, fishing, trapping, camping, water sports, winter sports or OHRVs as defined in RSA 215-A, hiking, sightseeing, or removal of fuelwood, or to give any warning of hazardous conditions, uses of, structures, or activities on such premises to persons entering for such purposes, except as provided in paragraph III hereof.

II. An owner, lessee or occupant of premises who gives permission to another to hunt, fish, trap, camp, hike, use OHRVs as defined in RSA 215-A, sightsee upon, or remove fuelwood from, such premises, or use said premises for water sports, or winter sports does not thereby:

(a) Extend any assurance that the premises are safe for such purpose, or

(b) Constitute the person to whom permission has been granted the legal status of an invitee to whom a duty of care is owed, or

(c) Assume responsibility for or incur liability for an injury to person or property caused by any act of such person to whom permission has been granted except as provided in paragraph III hereof.

III. This section does not limit the liability which otherwise exists:

(a) For wilful or malicious failure to guard or warn against a dangerous condition, use, structure or activity; or

(b) For injury suffered in any case where permission to hunt, fish, trap, camp, hike, use for water sports, winter sports or use of OHRVs as defined in RSA 215-A, sightsee, or remove fuelwood was granted for a consideration other than the consideration, if any, paid to said landowner by the state; or

(c) The injury caused by acts of persons to whom permission to hunt, fish, trap, camp, hike, use for water sports, winter sports or use of OHRVs as defined in RSA 215-A, sightsee, or remove fuelwood was granted, to third persons as to whom the person granting permission, or the owner, lessee or occupant of the premises, owed a duty to keep the premises safe or to warn of danger.
## APPENDIX F
### NATURAL HERITAGE INVENTORY DATA

Rare Species and Exemplary Natural Communities throughout the towns of Warren, Wentworth, Rumney and Plymouth

### WARREN

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Federal</th>
<th>State</th>
<th>Town</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL COMMUNITIES - Terrestrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NNE Rich Mesic Forest</strong></td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td><strong>NNE Seepage Forest</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td><strong>NNE Rich Mesic Forest</strong></td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>PLANTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambiguous Sedge (<em>Carex amphibole</em> var <em>rigida</em>)</td>
<td>-</td>
<td>T</td>
<td>Historical</td>
<td>4</td>
</tr>
<tr>
<td>Ginseng (<em>Panax quinquefolius</em>)</td>
<td>-</td>
<td>T</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>**Goldies Fern (<em>Dryopteris goldiana</em>)</td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Green-Bracted orchis (<em>Coeloglossum viride</em>)</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

### WENTWORTH

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Federal</th>
<th>State</th>
<th>Town</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL COMMUNITIES - Terrestrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CNE Dry Transitional Forest on Acidic Bedrock or Till</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td><strong>SNE Acidic Rocky Summit/Rock Outcrop Community</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>PLANTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Fern-Leaved Foxglove (<em>Aureolaria pedicularia</em> var <em>intercedens</em>)</td>
<td>-</td>
<td>E</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Ginseng (<em>Panax quinquefolius</em>)</td>
<td>-</td>
<td>T</td>
<td>Historical</td>
<td>40</td>
</tr>
<tr>
<td>VERTEBRATES – REPTILES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood Turtle (<em>Clemmys insculpta</em>)</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>

---

5

**Listed?**  
E = Endangered  
T = Threatened

**Flags**  
**** = Highest importance  
*** = Extremely high importance  
** = Very high importance  
* = High importance

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact Natural Heritage Inventory at (603) 271-3623 to learn more about this or other ways of setting priorities.
Rare Species and Exemplary Natural Communities throughout the towns of Warren, Wentworth, Rumney and Plymouth (continued)

### RUMNEY

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Federal</th>
<th>State</th>
<th>Town</th>
<th>State</th>
<th># Locations reported in last 20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NNE Circumneutral Cliff Community</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>***SNE Acidic Rocky Summit/Rock Outcrop Community</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>SNE Circumneutral Talus Forest/Woodland</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>NNE Cliff Seep Community</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>PLANTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ciliated Willer-Herb (Epilobium cilatum)</strong></td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Cranesbill (Geranium carolinianum var. confertiflorum)</td>
<td>-</td>
<td>E</td>
<td>Historical</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cutleaf Toothwork (Dentaria lacinia)</td>
<td>-</td>
<td>E</td>
<td>Historical</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Douglas’ Knotweed (Polygonum douglasii)</strong></td>
<td>T</td>
<td></td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>*<strong>Fern-Leaved Foxglove (Aureolaria pedicularia var. intercedens)</strong></td>
<td>E</td>
<td>T</td>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>*<strong>Fragrant Fern (Dryopteris fragrans)</strong></td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>*<strong>Ginseng (Panax quinquefolius)</strong></td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Missouri Rock-Cress (Arabis missouriensis)</strong></td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Piled-Up Sedge (Carex cumulate)</strong></td>
<td>-</td>
<td>T</td>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>VERTEBRATES - BIRDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*<strong>Peregrine Falcon (Falco peregrinus anatum)</strong></td>
<td>M</td>
<td>E</td>
<td>1</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

### PLYMOUTH

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Federal</th>
<th>State</th>
<th>Town</th>
<th>State</th>
<th># Locations reported in last 20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrews’ Gentian (Gentiana andrewsii)</td>
<td>-</td>
<td>T</td>
<td>Historical</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Loesel’s Twayblade (Liparis loeselii)</td>
<td>-</td>
<td>T</td>
<td>Historical</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Sweet Goldenrod (Solidago odora)</td>
<td>-</td>
<td>T</td>
<td>Historical</td>
<td>12</td>
<td></td>
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<tr>
<td><strong>VERTEBRATES – REPTILES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wood Turtle (Clemmys insculpta)</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Listed? E = Endangered T = Threatened

Flags

**** = Highest importance

*** = Extremely high importance

** = Very high importance

* = High importance

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact Natural Heritage Inventory at (603) 271-3623 to learn more about this or other ways of setting priorities.
APPENDIX G

RESOURCES FOR ASSISTANCE ON MAJOR STREAM BANK EROSION PROBLEMS

Natural Resource Conservation Service
Woodsville Service Center
250 Swiftwater Rd, Woodsville, NH 03785-1424
(603) 747-2001 ext. 13

New Hampshire Department of Environmental Services – Wetlands Bureau
PO Box 95, Concord NH 03302
(603) 271-2147
email: wetmail@des.state.nh.us
Website: http://www.des.state.nh.us/wetlands/

U.S. Army Corps of Engineers, New England District
Attention: CENAE-R-PT
696 Virginia Road
Concord, MA 01742-2751
Phone: (978) 318-8338
FAX: (978) 318-8303

Engineering Consultants – (who specialize in stream bank and erosion control)
A list of NH certified Professional Engineers can be found at:
New Hampshire Joint Board
57 Regional Drive
Concord, NH 03301
Phone: (603) 271-2219
FAX: (603) 271-6990
llavertu@nhsa.state.nh.us
http://www.state.nh.us/jtboard/home.htm