Water Resources

Introduction

Antrim has a diversity of water resources, from small wetlands and vernal pools to the two main rivers, the Contoocook and North Branch of the Contoocook. An overwhelming majority of townspeople want to preserve our small town's natural and rural character. Certainly our rural nature is closely tied to the rivers, lakes, and ponds. They punctuate the landscape to provide visual appeal. We also rely on them for a wide variety of recreational pursuits. They help support our common and rare plant life and provide food and cover for a large variety of fish, waterfowl, mammals, and amphibians. Without our water resources our town would not have the charm and appeal it now has. Pure, clean water is vital not only for our good health and well being but also for the generations who follow us.

Watersheds

Antrim has one main watershed, the Contoocook River, which is part of the Merrimack River Basin. Our watershed can be broken down into the Contoocook River, the North Branch of the Contoocook River, Great Brook and Cochran Brook.



The Contoocook River at the Antrim-Deering bridge in Antrim. A slow-moving river, it is a favorite for people who want to take a leisurely canoe trip or fishermen interested in casting for cold and warm water species of fish.

The State of New Hampshire has established a Rivers Management and Protection Program. The policy statement for the program, RSA 483:1, says that "New Hampshire's rivers and streams comprise one of its most important natural resources, historically vital to New Hampshire's commerce, industry, tourism, and the quality of life of New Hampshire people."

Significantly, both the Contoocook and the North Branch of the Contoocook have been designated rural rivers under the Rivers Management and Protection Program. To be accepted into the program, a nominated river is reviewed by the Commissioner of the Department of Environmental Services. The river or segment of the river must contain or represent either a significant statewide or local example of one or more of the following:

- Scenic or recreational resource;
- Open space or natural resource;
- Fisheries, wildlife, vegetation, and rare species habitat;
- Cultural, historical, or archaeological resource;
- Hydrological or geological resource;
- Water quality;
- Scientific resource;
- Community resource.

The North Branch of the Contoocook, which has its origin in Stoddard, flows south then east into Antrim and eventually into the Contoocook River in Hillsborough. The Contoocook River forms the boundary of Antrim and Bennington as it flows to its confluence with the North Branch of the Contoocook.

Statutes designate rural rivers as "those rivers or segments adjacent to lands which are partially or predominantly used for agriculture, forest management and dispersed or clustered residential development. Some instream structures may exist, including low dams, diversion works and other minor modifications."

A rural designation means that water quality must be Class B (the second highest water rating) or have the potential for restoration to that level. The RSA goes on to state that "Management of rural rivers and segments shall maintain and enhance the natural, scenic, and recreational values of the river and shall consider, protect and ensure the rights of riparian owners to use the river for agricultural, forest management, public water supply, and other purposes which are compatible with the instream public uses of the river and the management and protection of the resources for which the river or segment is designated." For a more detailed discussion of the rivers' characteristics and values, see the NH Department of Environmental Services nomination of the rivers for special protection under RSA 483, Appendix 6.

The regulations further state that no new dams shall be permitted and that no channel alterations shall be permitted which interfere with or alter the natural flow characteristics, except for certain reasons approved by the Commissioner. Also, a new solid waste storage or treatment facility...shall be set back a minimum of 250 feet from the normal high water mark and must be screened with a vegetative or natural barrier. Similar

restrictions apply to new solid waste landfills. The regulations also state that "any land application within the river corridor of septage, sludge, or solid waste…shall be set back a minimum of 250 feet of the high water mark."



Unlike most of the Contoocook River in Antrim, the North Branch of the Contoocook is considerably rockier and flows through steeper terrain. Trout fishermen and kayakers regularly use this section at Loveren Mill Road. Portions of the river are rated Class IV and V white water. The entire river is cited by the Nationwide Rivers Inventory of the National Park Service as having three Outstandingly Remarkable Values.

In 1995 the Nationwide Rivers Inventory of the National Park Service recognized three Outstandingly Remarkable Values (ORVs) of Antrim's North Branch in the areas of recreation, history, and botany. To qualify for inclusion in the national inventory, a river corridor must possess unique, rare, and exemplary features that are significant within a broad eco region at a comparative regional or national scale. Very few rivers in New Hampshire are recognized for that many ORVs, placing the North Branch among the most valued rivers in the state. While the river and its immediate banks are somewhat protected, this protection does not extend beyond the actual river corridor, yet negative effects from businesses abutting this corridor could certainly affect the North Branch.

The ORV says the 16-mile stretch of river from Rye Pond in Stoddard to the confluence with the Contoocook in Hillsborough "contains an expert whitewater section rated as Class V (near Liberty Farm Road)...historically significant arch bridge is located in the segment. Three exemplary natural ecological communities are supported by the river including an Atlantic White Cedar Swamp, a Southern New England Level Bog and a Southern New England Acidic Seepage Swamp."

The final designation for the North Branch is of a more general nature. The ORV says that "while no specific national evaluation guidelines have been developed for the 'other similar values' category, assessments of additional river-related values consistent with the foregoing guidance may be developed -- including, but not limited to, hydrology, paleontology and botany resources."

A 26-mile stretch of the Contoocook River from Bennington to the West Hopkinton Dam is cited as having an Outstandingly Remarkable Value for its recreational features. Although some of the areas quoted in the ORV citation are downstream of Antrim, the languid flow through Antrim is a source of enjoyment for beginning or intermediate canoers or kayakers. The ORV also says this segment just downstream of Antrim, "includes some of the most significant white water canoeing in all of New England. Difficulty ranges up to Class IV with large rocks and obstructions adding to the river's turbulence. Segment includes noted areas such as S-turn (Class III-IV) and Freight Train Rapids (Class IV - V)."

For a river to be noted for its recreational opportunities, it must "have the potential to be popular enough to attract visitors from throughout or beyond the region of comparison or unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing and boating.

- Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.
- The river may provide, or have the potential to provide, settings for national or regional usage or competitive events."

An historical designation means "the river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region."

For a more detailed list of the assets of the Contoocook and North Branch of the Contoocook Rivers, see the Resources Assessment from the Contoocook and North Branch Rivers Local Advisory Committee River Corridor Management Plan in Appendix 4.

Antrim should determine what steps can be taken to enhance these values. Can we make the rivers more accessible? Should we establish such development as roadside picnic areas to allow visitors and residents to more fully enjoy our water resources?

We must be very cautious when allowing commercial or industrial growth along our rivers, lakes, and ponds. Both the State of New Hampshire and the National Park Service have long recognized the Contoocook River and North Branch of the Contoocook River as having great values for those who live in Antrim and those who visit us. We know intuitively that a commercial venture on the banks of the Contoocook or North Branch would detract from the inherent appeal of that area, and could negatively impact water quality as storm water runs off impervious surfaces. We should look to more benign forms of development in these areas and establish future development areas away from our water resources, particularly when non-residential growth encroaches on a water source.

Other Water Resources

Like the two major rivers in town, Antrim's lakes, ponds, and streams are important water, recreational, and scenic resources. It is vital that they be recognized for the value they provide to the town and in so doing, protected from overdevelopment and pollution.

Campbell Pond

It is approximately 17 acres in size. It is the former water supply and present backup water supply for Antrim.

Cochran Brook

It begins upstream of Campbell Pond, flows into the pond and then southeasterly about three miles to the Contoocook River.

Franklin Pierce Lake

Franklin Pierce Lake is approximately 519 acres in size. The southern third of the lake is in Antrim, while the main body and the Harriman Electric Power Dam are in the town of Hillsborough. It is a warm water fishery. Recreational uses include fishing, water skiing, boating, sailing, swimming and bird watching. Nesting loons have been observed at the west end of the lake, near the point where Pierce Lake Road ends. There is limited public access in Antrim to this lake.

Great Brook

The brook begins on the western hills (Tuttle, Holt, and Patten Hills, and Willard Mountain), flows into Gregg Lake and then flows easterly two miles into the village section of town and ultimately to the Contoocook River.

Gregg Lake

This lake is approximately 195 acres in size. It is a moderate warm water fishery. Recreational uses include fishing, picnicking, water skiing, boating, sailing, and bird watching. Public access is adjacent to the Antrim town beach.



Gregg Lake is the home of Antrim's town beach and a picnic area.

Lily Pond

This small pond is less than 10 acres in size. Hiking and bird/wildlife watching are the main recreational uses of the pond. Public access is by foot trail through a series of formal and informal easements.

Mill Pond

The Mill Pond in the center of town is less than 2 acres in size, and was created in Antrim's industrial past from the flow of Great Brook. The town owns the property and dam at its base on Summer Street. The Mill Pond is the site of Antrim's annual spring fishing derby.

Rye Pond

It is approximately 13 acres in size with portions of the pond in the towns of Antrim, Nelson, and Stoddard. It is a warm water fishery with limited public access.

Steele's Pond

It is approximately 36 acres in size. It provides the water source for a small hydro power plant, whose generated electricity is sold to Public Service of New Hampshire. Recreational activity at this pond is limited to fishing off the bridge and through the ice during the winter.



Steele's Pond is fed by the North Branch of the Contoocook and leads into Franklin Pierce Lake.

Willard Pond

This pond is more remote than most others in town. It is approximately 96 acres in size. It is an excellent cold water fishery. It is part of the dePierrefeu-Willard Pond Wildlife Sanctuary. Fly fishing, hiking, and bird watching are the main recreational uses of the sanctuary. Public access is provided for boats. No gasoline powered boats are allowed.



Willard Pond is considered by some trout fishermen as one of the best trout ponds in southern New Hampshire. It is one of the few bodies of water stocked with Tiger trout. Nesting loons also can be found at the pond, although they cannot be disturbed. Loons nest close to the water's edge and a wake from a boat could wash the eggs out of the nest.

Groundwater Systems

Bedrock, the solid rock that forms the earth's crust, can be exposed at the surface of land or be as much as 100 feet underground, according to the U.S. Geological Survey (USGS). Above the bedrock can be what are called unconsolidated deposits, which is material of various size particles that are free to move and have been accumulated, distributed, stratified and/or sorted by natural processes. Sand is an example of unconsolidated deposits. The natural processes that created these deposits could be glacial processes, stream and river flows and even slow settling in lakes and swamps. Wind and rain, which cause weathering, are also factors. The importance of these deposits is their ability to hold and transmit potentially large quantities of water.

Aquifers

An aquifer is a layer of porous or fractured material, such as soil, sand, gravel, bedrock, etc. that can be used as a water supply source. According to USGS, the potential of that material or formation to provide water is dependent on the size and number of the pore spaces in the material or fractures in the bedrock, the amount of water available in the

material type or thickness of the aquifer (saturated thickness), and the ability of the water to move through that material to a well (transmissivity).

There are two main types of aquifers: bedrock aquifers and stratified drift aquifers.

Bedrock aquifer is water that is stored in fractures, fissures, and cracks in the bedrock. Bedrock aquifers are usually suitable for supplying single-family homes, but not for supplying a community group.

A stratified drift aquifer, according to USGS, is "a coarse-grained sand or sand and gravel deposit that contains a usable supply of water." Most of the deposits of stratified drift aquifers were created by melt water during the retreat of glaciers during the Pleistocene. The importance of stratified drift aquifers for water for human use is reflected in the fact that about 14 percent of New Hampshire is underlaid by stratified drift aquifers, according to the USGS.

According to the *New Hampshire DES Guide to Groundwater Protection*, most of the high yielding aquifer wells in the state are stratified drift aquifers. The guide says that from the state's registered groundwater wells, 33 million gallons of water are extracted per day from stratified drift aquifers as opposed to only 4 million gallons per day from bedrock aquifer wells.



Map V-1: Stratified Drift Aquifer Boundary and Transmissivity Rates



Map V-2: Stratified Drift Aquifer and Saturated Thickness

The Importance of Groundwater

It is probably impossible to overstate the importance of groundwater to the town. In many areas, the groundwater and surface water are closely linked and a potential threat to one source is a threat to the other. Groundwater is important as drinking water and vitally important to fish, other aquatic and land species as well as for recreation. So maintaining pure groundwater also means maintaining pure surface water.

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Address	System Active?	Population	Well Type	Well Depth	Yield
Route 9	А	500	BRW	485	75.00
White Birch Point Road	А	43	BRW	350	13.00
Breezy Point Rd, Route 9	А	33	BRW	580	34.00
Depot Street	А	865	GPW	118	215.00
Junction of Routes 9 & 31	Ι	28	SPR	8	0.00
Trillium trail, off Elm Ave	А	25	BRW	280	20.00
Rte 9, North Branch River	Ι	27	BRW	0	0.00
Brimstone Corner Road	А	300	BRW	800	8.00
Brimstone Corner Road	Ι	2	BRW	900	10.00
Brimstone Corner Road	А	250	BRW	940	9.00
100 Old N Branch Rd, Rte 9	А	27	BRW	338	40.00

Antrim Community Wells

Definitions GPW = Gravel Pack Well BRW= Bedrock Well SPR = Spring System Active?: A= Active; I= Inactive Yield = Gallons/Minute

The following table from the *New Hampshire DES Guide to Groundwater Protection* shows potential contamination sources to water supplies.

- Vehicle service and repair shops
- General service and repair shops
- Metalworking shops
- Manufacturing facilities
- Cleaning services
- Food processing plants
- Underground and above-ground storage tanks
- Transportation corridors
- Septic systems
- Laboratories and certain professional offices (medical, dental, veterinary)

- Salt storage and use
- Snow dumps
- Stormwater infiltration pond or leaching catch basins.
- Waste and scrap processing and storage
- Hazardous waste facilities
- Fueling and maintenance of earth moving and logging equipment
- Concrete, asphalt, and tar manufacture
- Cemeteries
- Agricultural chemicals

Some other hazardous materials found in the home are: gasoline, motor oil, other automotive fluids, auto batteries, paint, paint thinner, other solvents, pesticides, cleaning products, and herbicides.

In some cases, land has become so polluted in some communities that it has no further value. Pierce Rigrod, a principal planner with the NH Department of Environmental Services, cited an example of one piece of land which was used to store 400 cars and became so polluted it could not be sold.

Some contaminants don't move far in groundwater. On the other hand, some, such as xylene, benzene, toluene and methyl tertiary-butyl ether (MTBE) dissolve easily in groundwater. In fact, MTBE, a gasoline additive, is especially potent, according to the NH DES guide. It says that just one gallon of gasoline containing 11 percent MTBE can contaminate six million gallons of drinking water to a level of 13 parts per billion – New Hampshire's drinking water standard. See the map of Antrim's aquifer and the relationship of its public water supply (PWS) well to potential contamination sources (PCSs) (including potential sources of MTBE contamination) identified in the NH DES 'Local Potential Contamination Source (PCS) Inventory.'

It also is worth noting that other contaminants such as degreasing solvents including trichloroethylene (TCE) tend to sink beneath the water table and can form small pools which are hard to locate in the aquifer. They can contaminate groundwater for decades.



Map V-3: NH DES Potential Contamination Sources (PCSs) to the Antrim PWS

Stormwater Management

Stormwater runoff is water from rain or melting snow that cannot be absorbed by the ground naturally. The water, from roofs, paved areas, bare soil and steep slopes, flows over the ground, absorbing pollutants, sediments, organic matter, animal wastes, pesticides, and fertilizers and drags litter along with it. Traditionally, management practices were designed to collect, detain, and divert water to the nearest surface water body or watercourse. This approach is inadequate.

Controlling stormwater runoff is critical not only for large development areas, but also for smaller sites which do not require permits from the U.S. Environmental Protection Agency (EPA) or New Hampshire Department of Environmental Services (DES). According to Section 2, § 2.1 on stormwater management included in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* (October, 2008), "...small-scale developments can have serious, cumulative impacts on water quality. To mitigate these effects, communities are encouraged to adopt a local stormwater management ordinance instituting stormwater controls for projects of all sizes and during all phases of development." The handbook is a cooperative enterprise of several New Hampshire governmental agencies.

The handbook recommends that towns and cities adopt a zoning ordinance to address stormwater issues. See *http://des.nh.gov/Stormwater* for more information. A model zoning ordinance can be found in the stormwater chapter of the handbook.

Wetlands

New Hampshire recognized in 1967 that wetlands were a vital part of the environment when it began to regulate coastal wetlands. Two years later, the state included fresh water regulations. Wetlands can be divided into many different types: tidal marshes, mud flats, freshwater swamps, rivers, lakes, bogs, and wet meadows, to name a few. According to the *Environmental Fact Sheet* issued by New Hampshire's Wetlands Bureau, there are three characteristics used to define wetlands.

- **Hydrology** the presence of water. Wetlands occur when water is present for extended periods during the growing season.
- **Hydric Soils** In wetlands, the spaces between soil particles are filled by water for a long enough period to reverse the chemical reaction that can occur between oxygen and the soil's elements, giving the soil a darker color.
- Vegetation Plants that can survive in low-oxygen soils and under-saturated conditions have a distinct advantage in wetlands. Plants that can only survive in a wetlands environment are known as indicator species because their presence definitively shows that the area is a wetland. An example is the cattail.

Wetlands are vital not only for recreation but as a critical habitat for certain species. They provide flood storage, may be used as water supplies, and provide sedimentation control. A swamp or marsh, according to the fact sheet, may be regarded as worthless for recreation or business but in reality is extremely valuable in that its removal may have immediate harmful effects on adjacent upland and lakes and streams.

Emergent vegetation such as lily pads, arrowweed, cattails and marsh grasses provide nursery habitat for many species. Many ducks nest in marsh grasses; young fish hide among lily pad and arrowweed stems to avoid predators; and frogs and salamanders leave clusters of eggs in the shallows.

Wetlands filter water by slowing it down and allowing sediments and some contaminants to settle out. Vegetation traps the sediments and their roots serve to ensure the underlying soil stability. Plants and microorganisms break down and recycle some materials that can be used by larger organisms.

Peterborough's 2003 Master Plan discusses the various wetlands found in this part of New Hampshire:

Marsh

Cattail marshes are a common type of wetland....They are shallow wetlands with mineral muck soils (not peat); the primary form of vegetation in them is cattails and emergent grasses. They vary in size from small pockets to large wetland complexes. Cattail marshes are highly-productive, natural communities that provide important ecological functions. The cattails themselves, for example, can regulate water levels by storing excess water in their roots and stalks. They also provide habitat for many types of birds and waterfowl, fish, muskrats, beavers, frogs, and both snapping turtles and painted turtles. They also are a great spot to hear spring peepers. Currently, the great productivity of cattail marshes is being threatened by an invasive

species, purple loosestrife (*Lythrum salicaria*), which is beginning to make headway in Peterborough, and the surrounding area.

Swamp

A swamp is often confused with marsh but is distinguished by the presence of trees and shrubs rather than open water. Swamps occur on saturated soils and are flooded for most, if not all, of the growing season. A red maple swamp is typical of our region. The brilliant fall foliage of red maples (also known as "swamp maples") is indication of an underlying wetland. The vegetation in swamps is predominately dense forest or tall shrub thicket. Trees that can tolerate saturated soils are hemlock, spruce, red maple, yellow birch. Certain ferns, blueberries, spotted touch-me-nots, and skunk cabbage are common swamp plants. Swamps provide habitat for a wide variety of wildlife.

Bog

Bogs are characterized by substantial peat accumulation (> 40 cm), high water tables, and acidic-loving vegetation. There are no significant inflows or outflows of water from a bog. They are covered with a layer of floating vegetation adapted to wet, acidic, and nutrient-poor soils. Sphagnum moss is the dominant plant in bogs, along with some uncommon wildflowers, especially orchids. Bogs are a rich teaching tool about a glacier's footprint, and about unique soils creating unique plant and animal communities.

Vernal Pool

Often mistaken for useless puddles or mud-spots in the woods, vernal pools are important, productive hatcheries for an abundance of species. They are temporary pools of ice and snowmelt that form in the late winter and spring and often disappear by late summer. Because they are temporary, they do not support fish, allowing many aquatic and amphibian species to lay their eggs and hatch the next generation in a predator-free wetland. Frogs, toads, and salamanders migrate to wetlands to lay their eggs in early spring. The chorus of spring peepers announces mating and egg-laying time, as well as the presence of a wetland. Eggs laid in vernal pools have the greatest odds of survival. Once hatched, many species return only to the pools where they were born, and can reproduce nowhere else. Vernal pools are easily lost through human disturbance. Few people know their importance as birthing pools for the intricate web of life; only a few towns have protective ordinances for vernal pools. Landowners unaware of the important ecological role of vernal pools often fill them in.

Wet Meadow

A meadow with certain ferns growing in it gives suggestion of wetland soils. A core sample of soil would reveal underlying soil types characteristic of a wetland.



Map V-4: Surface Waters, NWI Wetlands, & Hydric Soils in Antrim

Recreation

Ponds, rivers, and streams are focal points for a large number of recreational activities. Because Antrim has a wide variety of water bodies, from the rushing North Branch River, to the gently flowing Contoocook River and isolated Willard Pond, it supports a broad range of recreational opportunities.

Gregg Lake is the site of Antrim's town beach and picnic area. The North Branch River, Willard Pond, and Willard Pond Brook are stocked by the state with four species of trout. In 2005, more than 3,200 trout were stocked in these waters. But for those who are interested in warm water species, they can be found in the Contoocook River, Steele's Pond, Franklin Pierce Lake, and Gregg Lake. Large mouth and small mouth bass, northern pike, and pan fish can be found in these waters.

Those who prefer hiking near water have a number of different trails available such as those at Willard Pond, McCabe Forest, and Lily Pond.

For kayaking enthusiasts, the North Branch River offers Level IV and V rapids upriver of Liberty Farm Road. Those who prefer a more leisurely pace can canoe or kayak the Contoocook River.

Rivers, streams, and ponds are natural areas for wildlife viewing. Moose are drawn to water areas as are migratory birds, beavers, otters, muskrats and mink. Antrim's water

resources offer a great deal to the town from potable water to recreation. They represent one of the town's most valuable resources.

Conclusions

We must be very cautious about allowing commercial or industrial growth along our rivers or near our lakes and ponds. Both the State of New Hampshire and the National Park Service have long recognized the Contoocook River and North Branch of the Contoocook River as having great value for those who live in Antrim and those who visit us. Development diminishes the beauty of a water source. We know intuitively that a business with a high intensity of use on the banks of the Contoocook or North Branch would detract from the inherent appeal of that area. We should look to more benign forms of commercial development and establish industrial parks away from our water resources.

Antrim's aquifers are important sources of water. The most important aquifers have been identified and we should not allow commercial or industrial development to contaminate these areas. Any sources of potential pollution should be closely reviewed and monitored when located near any of the aquifers.

Antrim's two major highways, Route 202 and Route 9, gateways to the town, run side by side along the Contoocook and North Branch Rivers, respectively. On the western end of Route 9, the highway runs along the south bank of the North Branch River; to the east, at the border of Hillsborough, it travels near Franklin Pierce Lake. To preserve the viability of these important resources and to preserve the charm and rural character of the town, we should update our regulations to manage development in these sensitive and valuable areas.

We also should consider opening up access to our more highly prized waters. One proposal already on the table is to provide a trail along the north side of the North Branch River between Loveren Mill Road and Liberty Farm Road. Other water resources should be considered for wildlife viewing, photography, hiking, fishing, hunting, and scenic views.

Preserving and protecting all of Antrim's water sources will go a long way toward keeping Antrim a beautiful, small town where everyone can enjoy our rivers, lakes, ponds, and wetlands.

Recommendations

- Determine which water resources have inadequate public access and find ways to make them more accessible.
- Establish a stormwater zoning ordinance to control stormwater runoff in order to protect not only our rivers, lakes, ponds, and streams but also our subsurface waters.

- Observe the spirit and regulations of the State of New Hampshire's Rivers Management and Protection Program and the National Park Service's Outstandingly Remarkable Values as they pertain to the Contoocook and North Branch Rivers.
- Determine if some of our water resources can be promoted as tourist attractions.
- Only allow commercial/industrial development within 500 feet of a water resource if the development complies with the State of New Hampshire Shoreland Protection Act and best management practices.
- Prevent vernal pools from being filled in or drained.
- Require vegetative buffers between developments and valuable surface water bodies.