

D. NATURAL RESOURCES

Cooper is a small rural town rich in natural resources. Of particular importance to town residents are Cathance and Vining Lake. Cathance Lake is considerably larger than Vining Lake and more than half of it extends south into the unorganized territory of Cathance Township. Canoeing and boating is available from a single town access point on Cathance Lake and provides a pleasant experience among Maine communities. Cathance Lake is visible to the traveler along Route 191 from Cooper Hill but shoreline development is not particularly evident as much of the land is forested.

Information on natural resources is necessary to protect environmentally sensitive areas, and to identify opportunities and constraints for development. The natural resources of our town contribute greatly to our quality of life. They provide open space, habitat, and recreational opportunities such as fishing, boating, ATV/snowmobiling, hunting, canoeing, hiking, and cross-country skiing, as well as other activities.

The goal of this section is to protect the quality and manage the quantity of Cooper's natural resources, as well as to safeguard the forest resources that support our economy.

LOCATION, TOPOGRAPHY AND GEOLOGY

The town of Cooper is located in the eastern part of Washington County, Maine. The town is situated approximately 100 miles east of Bangor and is bordered on the north by the towns of Alexander and Crawford, on the east by the towns of Meddybemps and Charlotte, and on the west and south by the unorganized territories of Berry Township, Cathance Township (formerly Townships 18 and 14 respectively) and Township 19. The land area of the town is approximately 20,837 acres (see Map 6: Land Cover).

Cooper is located in a region of massive granite intrusion that was glaciated in the Wisconsin age. The glacier caused till (unsorted, poorly drained soil) to be deposited over the entire region. This poorly drained till formed bogs and ponds and altered the drainage pattern. The topography in these areas is generally a blanket deposit that conforms to the underlying bedrock topography. However, the underlying granite caused the till to be more thickly deposited on the northwest sides of ridges: on the southeast sides boulders were "plucked" and transported further south. Thick till deposits are also found in bedrock "valleys" and depressions. The weight of the ice (in some places a mile thick) caused the land to be depressed in relation to the level of the sea. Marine sediments (silts and clays) were deposited in valleys and more sheltered locations. The release of pressure due to the melting allowed the land to rise slowly. This explains why silt and clay deposits can be found at elevations of 100 feet or more.

Thin drift, which makes up about 40 percent of the town's land area, consists of bedrock outcrops and/or thin surficial deposits. The topography here reflects the configuration of the bedrock surface, and ranges from smooth undulating hills to knobby terrain and higher ridges. See Map 3: Topography and Steep Slopes at the end of this section for general contour elevations.

LAND SUITABILITY FOR DEVELOPMENT

Cooper has no sewerage or public water facilities. Development depends on the private provision and maintenance of safe and adequate septic systems and wells. Septic systems should always be designed and constructed carefully, but this is especially crucial when such systems are placed in areas with poorly drained soils, shallow bedrock soils, and soils with high water tables. Development on poorly suited soils is the underlying cause of many environmental and economic problems. A community pays for improper land use through water pollution, high mitigation and maintenance costs on individual wells and public services, closure of swimming areas, and destruction of existing wildlife and scenic areas.

The United States Department of Agriculture (USDA) Soil Conservation Service (SCS) released digital soil classification maps for Washington County in 2007. Soils in Cooper are of several types: glacial till thinly deposited in the uplands; thick glacial till on northwest slopes and in bedrock depressions; marine silts and clays in the valleys and more sheltered locations, and glacial outwash or ice contact sands and gravels. These soils are not generally well suited to septic sewage disposal. Some are well suited to forestry.

Soils in Cooper are depicted on Map 5 – Soils Classification and include soil suitability indices that predict suitability for development based on soil characteristics that influence the cost of construction. Prime agricultural soils are also noted on Map 5.

Soil Potential for Low Density Development (LDD)

Very few areas of Cooper, or indeed of Maine in general, have large tracts of land that are ideal for residential development. The Natural Resources Conservation Service of the USDA has produced a handbook of Soil Survey Data for Growth Management in Washington County. The soil suitability indices on Map 5 – Soils Classification are interpreted from this publication

The rating of soil potential for low density urban development – provided in the legend on Map 5 - is used to guide the concentration of development in the growth areas in Cooper. Under this system soil potentials are referenced to an individual soil within the county that has the fewest limitations to development (depth to water table, bedrock etc.). This reference soil is given a value of 100 points. Costs that are incurred to overcome limitations to development are developed for all other soils. These costs, as well as costs associated with environmental constraints and long term maintenance, are converted to index points that are subtracted from the reference soil. The result is a comparative evaluation of development costs for the soils in the county. The overall range is large with values between 0 and 100. These numerical ratings are separated into Soil Potential Rating Classes of very low to very high. Thus a soil with a Very High rating has very good potential for development.

These maps and the data available from the Soil Conservation Service are useful to the town to predict the sequence of development; develop future land use plans and update zoning. They also indicate areas where streets or sewers may be prohibitively costly and identify where environmentally sensitive land should be protected. Individuals can learn problems or development costs associated with a piece of land and the advantage of one piece of land over

another prior to purchase. The information will help answer whether the site can support a septic system, if the basement will always be wet, if there is a high potential for erosion, and the bearing capacity of the soil.

Soil survey maps do not eliminate the need for on-site sampling, testing, and the study of other relevant conditions (for example, pockets of different soils having completely different qualities may be present), but they are an important first step that should precede development decisions.

Highly Erodible Soils

The removal of surface vegetation from large areas of land can cause erosion, which is a major contributor of pollution to surface waters. Highly erodible soils have a potential to erode faster than normal. Soil composition affects its susceptibility to erosion but the combined effects of slope length and steepness are the greatest contributing factors when identifying highly erodible soils.

Most development and intensive land use can and should take place on areas with slopes of less than 15 percent (representing an average drop of 15 feet or less in 100 feet horizontal distance). On slopes greater than 15 percent, the costs of roads, foundations and septic, sewer and other utility systems rise rapidly. Map 3: Topography, Steep Slopes and Flood Zones depicts the location of steep slopes in Cooper.

FARM AND FOREST LAND

The U.S. Department of Agriculture defines prime farmland as the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmland produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment. Prime farmland is also often targeted as prime property for low-density residential development. Very few of the soils in Cooper are listed as Prime Farmland, the exception being a few areas along Route 191, East Ridge and Union Road as depicted on Map 5 – Soils. Several others are classified as Prime Farmland but only if either drained or irrigated.

Blueberry production

The most significant agricultural activity in Cooper is blueberry production. There are approximately 1100 acres in blueberry production (See Map 6 – Land Cover) none of which are irrigated. While the soils in Cooper are not ideal for many agricultural uses, they are well suited for blueberry production and this activity provides some employment in town.

Woodland Productivity

Maine's forests and forest industry still play a vital role in the state's economy, especially in Northern and Eastern Maine. Forested areas provide an abundant and diverse wildlife population for the use and enjoyment of all Maine citizens. Furthermore, the forest protects the soil and water and contributes to a wide variety of recreational and aesthetic experiences. The forest provides a wide variety of wildlife habitats for both game and non-game species. Loss of forestland can be attributed to development and to irresponsible harvesting techniques. When forestland ownership is fragmented, public access becomes more restricted due to increased land posting. To optimize forestland use, forests should be effectively managed and harvested.

Soils rated with a woodland productivity of medium or above are qualified as prime forestland soils. This designation does not preclude the development of these lands but only identifies the most productive forestland. These soils are rated only for productivity and exclude management problems such as erosion hazard, equipment limitations or seedling mortality. Cooper's important forest and farmland are shown on Map 6: Land Cover.

Timber harvesting is an important economic activity in Cooper and is conducted mostly through selection harvest but also by shelter wood, and clearcut methods, see Table D-1.

Table D-1 - SUMMARY OF TIMBER HARVEST INFORMATION, COOPER

YEAR	Selection harvest, acres	Shelterwood harvest, acres	Clearcut harvest, acres	Total Harvest, acres	Change of land use, acres	Number of timber harvests
1991-1994	365	40	45	450	0	7
1995	490	0	0	490	0	4
1996	350	10	23	383	0	5
1997	290	0	20	310	20	4
1998	544	0	0	544	0	3
1999	861	65	0	926	0	7
2000	79	75	0	154	0	9
2001	173	0	0	173	0	8
2002	40	0	10	50	10	11
2003	70	0	0	70	1	5
2004	181	0	0	181	1	8
2005	170	0	0	170	0	8
2006	270	350	0	620	0	9
Total	3,883	540	98	4,521	32	88

Source: Year End Landowner Reports to Maine Forest Service, 2008 (Note: to protect confidential landowner information, data is reported only where three or more landowner reports reported harvesting in the town)

It appears to the Comprehensive Plan Committee that several large and heavily cut areas are either unreported or not apparent in the table. The observation that the reported data under represents the amount of heavy cutting in Cooper is supported by the Land Cover data from 2006 (Map 6) which indicates substantially greater acreage that is heavily cut. There are areas of particular concern around Cathance Lake.

Changes in Forestland Ownership and Use

As in other parts of Washington County large industrial forest-land holdings have changed hands in the past few years. In 2006, 2,250 acres of industrial forestland in Cooper formerly owned by Georgia Pacific was transferred to Typhoon LLC and is now restricted by a conservation easement held by the New England Forestry Foundation. The easement includes language that supports public access on the property as well as "best management practices" for forest management. The lands included within the conservation easement are depicted on Map 2: Public Facilities and Transportation.

WATER RESOURCES

Watersheds

A watershed is the land area in which runoff from precipitation drains into a body of water. The boundaries of watersheds, also known as drainage divides, are shown for Cooper on Map 4: Water Resources. The portion of the watershed that has the greatest potential to affect a body of water is its direct watershed, or that part which does not first drain through upstream areas. Anything that can be transported by water will eventually reach and impact the quality of a water body. Development activities, such as house and road construction and timber harvesting, disturb the land that drains to a lake by streams and groundwater; thus these activities can pollute the watershed.

The town of Cooper shares the shoreline of Cathance Lake with the neighboring unorganized territory of Cathance Township. There are several small watersheds in Cooper depicted on Map 4, almost all of which drain toward the Dennys River. The exceptions are small portions of the upper watersheds of Seavey Brook and three small lakes in Township 19 which are part of the headwaters of the East Machias River. Vining Lake is another small headwater lake that drains into the East Machias watershed. As well, Fifteenth Stream traverses the northeast corner of Cooper and drains into Meddybemps Lake which is hydrologically connected to both the Dennys and the St Croix Rivers.

Howe Brook Mill Stream, flowing out of Mill Pond and the streams know as Big Inlet and Little Inlet all drain into Cathance Lake which ultimately reaches the Dennys River in Cathance Township. Dead Stream and Splinter Brook drain directly into the upper reaches of the Dennys River which forms the border between Cooper and the neighboring town of Charlotte.

Cathance Lake's fisheries resources are managed by the Maine Department of Inland Fisheries & Wildlife as a cold-water fishery that has been stocked annually with landlocked salmon (*Salmo salar sebago*) since 1937. Periodic stockings of brook trout (*Salvelinus fontinalis*) occurred at Cathance from 1956 to 1972. Stockings of brown trout (*Salmon trutta*) occurred between 1939 and 1941 and then again between 1962 and 1971. Occasional stockings of lake trout (*Salvelinus namaycush*) occurred at Cathance between 1941 and 1946.

There are no mapped aquifers with potential yields greater than 10 gallons per minute in the town of Cooper. However, certain local wells do yield between 10-50 gallons per minute. A

mapped aquifer with potential yields of 10-50 gallons per minute is located in neighboring Meddybemps under the large blueberry heath located on either side of Route 191. Except for blueberry fields scattered along the major roads through town, the majority of these watersheds are forested.

Threats to water quality come from point and non-point discharges. Point source pollution is discharged directly from a specific site such as a municipal sewage treatment plant or an industrial outfall pipe. There are no point source discharges within the town of Cooper.

Non-point source pollution poses the greatest threat to water quality in Maine communities and Cooper is no exception. The most significant contributing source comes from erosion and sedimentation as well as excessive run-off of nutrients, particularly phosphorus. In excessive quantities phosphorus acts as a fertilizer and causes algae to flourish or “bloom”. Additional contributing factors include animal wastes, fertilizers, sand and salt storage, faulty septic systems, roadside erosion, leaking underground storage tanks, and hazardous substances.

Rivers, Streams, and Brooks

As defined by Maine's Natural Resources Protection Act, a river, stream, or brook is a channel that has defined banks (including a floodway and associated flood plain wetlands) created by the action of the surface water. Cooper's rivers, streams and brooks, illustrated on Map 4, include:

1. Fifteenth Stream (Dennys River watershed)
2. Big Inlet and Little Inlet (Dennys River watershed)
3. Splinter Brook (Dennys River watershed)
4. Mill Stream (Dennys River watershed)
5. Dead Stream (Dennys River watershed)
6. Vining Stream (East Machias River watershed)

To assess what portion of Maine's rivers, streams, and brooks meet the goal of the Clean Water Act; MDEP uses bacteriological, dissolved oxygen, and aquatic life criteria. All river waters are classified into one of four categories, Class AA, A, B, and C as defined by legislation. Class AA is the highest classification with outstanding quality and high levels of protection. Class C, on the other end of the spectrum, is suitable for recreation and fishing yet has higher levels of bacteria and lower levels of oxygen. The classifications for Cooper's waterways are shown on Map 4 – Water Resources and listed in the following table with definitions of all classifications in the footnotes:

Table D-2 COOPER WATER QUALITY CLASSIFICATIONS

Waterway	Waterway Segment	Classification ¹
Dennys River	Main Stem	Class AA.
Dennys River	Tributaries	Class A
East Machias River	Tributaries	Class A unless otherwise specified

Shorelands and Floodplains

Shorelands are environmentally important areas because of their relationship to water quality, their value as wildlife habitat and travel, and their function as floodplains. Development and the removal of vegetation in shoreland areas can increase runoff and sedimentation leading to an

¹ 1. Class AA waters. Class AA shall be the highest classification and shall be applied to waters which are outstanding natural resources and which should be preserved because of their ecological, social, scenic or recreational importance.

A. Class AA waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection, fishing, recreation in and on the water and navigation and as habitat for fish and other aquatic life. The habitat shall be characterized as free flowing and natural. [1985, c. 698, § 15 (new).]

B. The aquatic life, dissolved oxygen and bacteria content of Class AA waters shall be as naturally occurs. [1985, c. 698, § 15 (new).]

C. There may be no direct discharge of pollutants to Class AA waters, except storm water discharges that are in compliance with state and local requirements. [1999, c. 243, §8 (amd).]
[1999, c. 243, §8 (amd).]

2. Class A waters. Class A shall be the 2nd highest classification.

A. Class A waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as natural. [1985, c. 698, § 15 (new).]

B. The dissolved oxygen content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher. The aquatic life and bacteria content of Class A waters shall be as naturally occurs. [1985, c. 698, § 15 (new).]

C. Direct discharges to these waters licensed after January 1, 1986, are permitted only if, in addition to satisfying all the requirements of this article, the discharged effluent will be equal to or better than the existing water quality of the receiving waters. Prior to issuing a discharge license, the department shall require the applicant to objectively demonstrate to the department's satisfaction that the discharge is necessary and that there are no other reasonable alternatives available. Discharges into waters of this classification licensed prior to January 1, 1986, are allowed to continue only until practical alternatives exist. There may be no deposits of any material on the banks of these waters in any manner so that transfer of pollutants into the waters is likely. [1989, c. 890, Pt. A, §40 (aff); Pt. B, §62 (amd).]
[1989, c. 890, Pt. A, §40 (aff); Pt. B, §62 (amd).]

3. Class B waters. Class B shall be the 3rd highest classification.

A. Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired. [1985, c. 698, § 15 (new).]

B. The dissolved oxygen content of Class B waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher, except that for the period from October 1st to May 14th, in order to ensure spawning and egg incubation of indigenous fish species, the 7-day mean dissolved oxygen concentration shall not be less than 9.5 parts per million and the 1-day minimum dissolved oxygen concentration shall not be less than 8.0 parts per million in identified fish spawning areas. Between May 15th and September 30th, the number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 64 per 100 milliliters or an instantaneous level of 427 per 100 milliliters. [1985, c. 698, § 15 (new).]

C. Discharges to Class B waters shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community. [1985, c. 698, § 15 (new).]
[1985, c. 698, § 15 (new).]

4. Class C waters. Class C shall be the 4th highest classification.

A. Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as a habitat for fish and other aquatic life. [1985, c. 698, § 15 (new).]

increase in the amount of nutrients and other pollutants that reach surface water. This can lead to algal blooms and degraded water quality. Steep slopes with highly erodible soils are particularly susceptible to erosion. The Shoreland Zoning Ordinance, with revisions adopted by Cooper in 2006 is designed to provide protection to shorelands.

Floodplains serve to accommodate high levels and large volumes of water and to dissipate the force of flow. A floodplain absorbs and stores a large amount of water, later becoming a source of aquifer recharge. Floodplains also serve as wildlife habitats, open space and outdoor recreation without interfering with their emergency overflow capacity. Flooding can cause serious destruction of property and activities that increase paved or impervious surfaces and/or that change the watercourse on floodplains increase the quantity and rate of runoff that can intensify flooding impacts downstream.

The Town of Cooper does not participate in the Flood Insurance Program and has no Floodplain Management Ordinance. The flood hazard areas inundated by 100-year flood are not available in paper or digital format for the town of Cooper and so are not mapped for this plan.

Intensive development in floodplains, flood prone areas, and "special flood hazard areas" should be avoided. In addition, existing development and incompatible land use activities should not be permitted to expand and should be amortized for their eventual elimination, to the maximum extent possible. For these reasons Cooper should seek funds to have its floodplains mapped.

Enrollment in the National Flood Insurance Program would help Cooper obtain the initial mapping of its floodplains and in so doing help to reduce the risk of property loss through proper permitting of all floodplain development and the availability of flood insurance. As a participating community every property owner and renter in Cooper would be eligible to purchase flood insurance, regardless of their location. The availability of flood insurance solves many of the real estate/lending issues that occur in non-participating communities, or which could occur if the community were suspended from the program. [Floodplain insurance is required as a condition of a loan for structures in a floodplain.] An additional benefit of participation in the NFIP is that the community is eligible to apply for funds (on a competitive basis) under the 404 Post Disaster Hazard Mitigation Grant program. Also, in the event of a Presidentially declared disaster, residents will have access to forms of disaster assistance which are not available in non-participating communities.

Wetlands

The term "wetlands" is defined under both state and federal laws as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support prevalence of vegetation typically adapted for life in saturated soils." Wetlands include freshwater swamps, bogs, marshes, heaths, swales, and meadows.

Wetlands are important to the public health, safety and welfare because they act as a filter, absorb excess water, serve as aquifer discharge areas, and provide critical habitats for a wide range of fish and wildlife. They are fragile natural resources. Even building on the edge of a wetland can have significant environmental consequences. Some wetlands have important

recreational and educational value providing opportunities for fishing, boating, hunting, and environmental education.

The Maine DEP has identified wetlands located within Cooper, as illustrated on Map 4: Water Resources. These wetlands were identified as wetlands by aerial photo interpretation. Interpretations were confirmed by soil mapping and other wetland inventories. Field verification of the location and boundaries of the wetlands should be undertaken prior to development. The Maine DEP has jurisdiction over freshwater wetlands and floodplain wetlands under the Natural Resources Protection Act (NRPA)/Wetland Protection Rules and Site Location of Development Act. Finally, the Mandatory Shoreland Zoning Law provides protection to mapped non-forested wetlands. Cooper contains many open water wetlands associated with its rivers and streams and very large wetlands in the northwestern portion of town.

Lakes, Phosphorus and Development

The quality of our lakes as recreational resources, gems of natural beauty and fisheries is a result, at least in part, of their phosphorus content. Phosphorus controls the level of algae² production in lakes. The abundance of algae in the lake water determines the clarity of the water as well as the amount of well-oxygenated cold water available to cold water fish species (trout and salmon) in the summer months. Low phosphorus concentrations yield clear lakes with plenty of deep, cold water oxygen. Higher phosphorus concentrations cause lakes to be cloudy and oxygen may be severely depleted or eliminated from the deep, cold water in the summer months. Very high concentrations cause dense blooms of blue-green algae, which turn the water a murky green and accumulate in smelly, decaying scums along the shoreline.

Phosphorus is a very common element typically associated with soil and organic matter. It gets into our lakes in a variety of ways. The rainfall that falls directly on the lake has some phosphorus dissolved in it and groundwater may contribute some phosphorus from septic systems around the shoreline. Most of the lake's phosphorus comes from stormwater runoff draining from the lake's watershed to the lake in tributary streams and drainage ways. The amount of phosphorus in the lake depends on what the stormwater runs over on its way to these streams and drainage ways. If the watershed, the land area draining to the lake, is forested, the phosphorus concentration in the lake will be low because the forest is an effective phosphorus sponge, and does not release its phosphorus readily to the stormwater. However, stormwater draining from developed land, whether residential, commercial or industrial, contains a lot of phosphorus. Since the portion of stormwater phosphorus that supports algae growth tends to be associated with small, lightweight soil particles, it is carried very easily and efficiently by stormwater and can be delivered to the lake from anywhere in the watershed. So, generally speaking, the more developed a lake's watershed is, the higher its phosphorus concentration.

For lakes with developed or developing watersheds, there are two requirements for keeping phosphorus low and water quality high. First, existing sources of phosphorus to the lake, particularly from soil erosion in the watershed and from inadequate shoreline septic systems on sandy or shallow soils, need to be minimized. The DEP has developed a manual, the Lake

² Algae are microscopic plants, which grow suspended in the open water of the lake or in concentrated clumps around the shallow margins of the lakeshore.

Watershed Survey Manual, to guide volunteers in identifying and characterizing watershed phosphorus sources with the assistance of professionals. DEP also has grant programs available to assist in funding these surveys and in fixing the problems identified by the surveys. Second, new additions of phosphorus to the lake that will result from residential and commercial growth in the watershed need to be minimized.

The Maine DEP and the Volunteer Lake Monitoring Program (VLMP) have collaborated in the collection of lake data to evaluate present water quality, track algae blooms, and determine water quality trends. The Cathance Lake Association is a very active collaborator in water quality monitoring. This dataset does not include bacteria, mercury, or nutrients other than phosphorus. Table D-3 provides summaries of the water quality data for those lakes in Cooper where monitoring has occurred.

Table D-3 LAKE CHARACTERISTICS AND WATER QUALITY SUMMARIES

Waterbody	Acres	Mean Depth (ft.)/ Maximum Depth (ft.)	Watershed	Water Quality (WQ) Monitoring
Cathance Lake	3227	24/75	Dennys River	Collected since 1977 (8 years of data); basic chemical information and Secchi Disk Transparencies (SDT). Water Quality (WQ) considered above average and potential for nuisance algal blooms is low.
Vining Lake	25	14/40	East Machias River	Limited data available.

Source: PEARL Database, Senator George J. Mitchell Center for Environmental and Watershed Research, Maine DEP, and Maine Volunteer Lake Monitoring Program, 2005.

Lake water quality is considered above average on Cathance Lake and potential for algal blooms is low under current conditions. There is no baseline data on Vining Lake from which to compare as development pressures increase.

Evaluating New Development Proposals in Lake Watersheds The DEP has developed a method, described in detail in the manual “Phosphorus Control in Lake Watersheds: A Technical Guide for Evaluating New Development”³, to evaluate whether or not a proposed development will add a disproportionate amount of new phosphorus to a lake. It provides a standard which limits the amount of phosphorus that a proposed new development can add to the lake and a means by which the development can be designed and evaluated to insure that it meets the standard for that lake. It principally addresses the long-term increase in stormwater phosphorus

³ Phosphorus Control in Lake Watersheds: A Technical Guide for Evaluating New Development - Part A of Chapter 3 in the technical guide describes how the DEP determines phosphorus allocations using the other information included in the spreadsheet. Part B of Chapter 3 describes how to estimate the increase in phosphorus loading to the lake that will result from new subdivision and commercial/industrial type developments. This is the same method that is used to evaluate development applications in lake watersheds that are submitted to DEP under the Site Location Law and the Stormwater Management Law. It is also used by many towns to evaluate applications for new development under their Subdivision and Site Review ordinances. Typically, this analysis is performed by the developer’s consultant, either an engineer, surveyor or soil scientist, though in some it is performed by the developer. DEP can provide assistance to local planning boards in reviewing these submittals as well as to the developer or his/her consultant in performing the analysis.

that occurs when land is converted from forest or field to residential, commercial or industrial development. Though the standards in this manual will greatly reduce potential long-term impacts on lake water quality, the standards do not totally prevent contributions of phosphorus from new development. Also, since these standards will likely not be applied to all new phosphorus sources in the lake’s watershed, their implementation may not, by itself, be sufficient to prevent a noticeable decline in lake water quality. In order to insure that lake water quality is maintained, new development standards should be applied in conjunction with efforts to reduce or eliminate some of the most significant existing sources of phosphorus in the watershed.

Phosphorus Allocations - Table D-4 provides phosphorous information for Cathance Lake. The last column of the table indicates an estimated per acre phosphorus allocation, in pounds of phosphorus per acre per year (lb/acre/yr), for Cathance Lake. This allocation serves as a standard for evaluating new development proposals. It is applied to the area of the parcel of land being developed to determine how much the development should be allowed to increase phosphorus loading to the lake. For instance, a development proposed on a 100 acre parcel in a lake watershed with a per acre allocation of 0.05 lb/acre/yr would be allowed to increase the annual phosphorus loading to the lake by 5 lb (0.05 X 100). If the projected increase in phosphorus loading to the lake from the development does not exceed this value, than it can safely be concluded that the development will not add an excessive amount of phosphorus to the lake.

Table D-4 PER ACRE PHOSPHOROUS ALLOCATIONS FOR COOPER LAKES

LAKE	Direct land drainage area in Township in acres DDA	Area not available for development in acres ANAD	Area available for development in acres (DDA - ANAD) AAD	Growth Factor GF	Area likely to be developed in acres (GF x AAD) D	lbs. phosphorus allocated to towns share of watershed per ppb in lake F	Water quality category WQC	Level of Protection (h=high (coldwater fishery); m=medium) LOP	Acceptable increase in lake's phosphorus concentration in ppb C	lbs. per acre phosphorus allocation (FC/D) P
Cathance Lake	7138	350	6788	0.2	1358	132.4	good	h	1	0.098
Vining Lake	n/a									

Source: Maine DEP, 2006

Fishery Resources

The Maine Department of Inland Fisheries and Wildlife (IFW) has rated the lakes, ponds, and streams in Cooper as to their value as fisheries habitat. Each water body is rated according to whether it receives cold water or warm water fisheries management. Cold water management supports salmonid species such as salmon and trout, while warm water management supports black bass, chain pickerel, and perch. Some lakes have a combination of both coldwater and warmwater fisheries management.

Cathance Lake is managed as a coldwater fishery. The Maine Department of Inland Fisheries and Wildlife currently stocks Cathance Lake with landlocked salmon. Vining Lake is managed as a cold-water pond that stratifies in mid-summer and it is managed for stocked Brook Trout. Both Cathance and Vining Lakes are considered by the Maine Department of Inland Fisheries and Wildlife to have “high value” cold-water fishery resources. Until and unless public access is

affirmed on Vining Lake the Maine Department of Inland Fisheries and Wildlife has indicated they will not continue to stock Vining Lake.

Cathance Lake and Vining Lake are open to fishing and boating. Freshwater fish that are found in Cathance Lake include searun alewife, American eel, banded killifish, brook trout, brown bullhead, fallfish, rainbow smelt, landlocked salmon, smallmouth bass, threespine stickleback, white sucker, and yellow perch. Freshwater fish found in Vining Lake include brook trout, ninespine stickleback, northern redbelly dace and rainbow smelt.

Land use activities that directly affect water quality can significantly alter or destroy the value of these areas for fish. Land clearing or development in the adjacent upland habitat, or “riparian zone”, can also degrade a fishery. Riparian habitat functions to protect water quality and fisheries values by filtering out excessive nutrients, sediments, or other pollutants leaching in from upland areas, by maintaining water temperatures suitable for aquatic life, and by contributing vegetation and invertebrates to the food base.

Groundwater - Sand and Gravel Aquifers

Aquifers may be of two types: bedrock aquifers and sand and gravel aquifers. A bedrock aquifer is adequate for small yields. A sand and gravel aquifer is a deposit of coarse-grained surface materials that, in all probability, can supply large volumes of groundwater. Boundaries are based on the best-known information and encompass areas that tend to be the principal groundwater recharge sites. Recharge to these specific aquifers, however, is likely to occur over a more extensive area than the aquifer itself.

The Maine Geological Survey has identified no extensive sand and gravel aquifers within Cooper. As noted above there is a large aquifer in neighboring Meddybemps, as shown on Map 4 - Water Resources. According to the Maine Department of Human Services, Bureau of Health, Division of Health Engineering, Drinking Water Program there are no Public Water Supply Sources in Cooper.

Map 4 can be used to identify surface sites that are unfavorable for storage or disposal of wastes or toxic hazardous materials. It is important to protect groundwater from pollution and depletion. Once groundwater is contaminated, it is difficult, if not impossible, to clean. Contamination can eventually spread from groundwater to surface water and vice versa. Protecting a groundwater resource and preventing contamination are the most effective and least expensive techniques for preserving a clean water supply for current and future uses. Possible causes of aquifer and surface water contamination include agriculture, run-off of animal waste, faulty septic systems, road-salt storage and application, leaking above ground or underground storage tanks, agricultural run-off, auto salvage yards, and landfills. In addition to these major sources, things as diverse as golf courses, cemeteries, dry cleaners, burned buildings, and automobile service stations are potential threats to groundwater.

MARINE RESOURCES

Though inland, some Cooper residents rely on coastal resources for their livelihood.

Table D-5 COUNT OF RESIDENTS HOLDING MARINE FISHING LICENSES

Type	License Year		Grand Total
	2004	2007	
Harvesters	1	1	2

Source: Maine Department of Marine Resources, 2008

Table D-6 COUNT OF LICENSES HELD BY COOPER RESIDENTS

Count of License Types/Town	Harvesters by Year		Harvesters by Year Total
	2004	2007	
License Type			
Lobster/Crab, Student	1	1	2
Seaweed, supplemental	0	1	1

Source: Maine Department of Marine Resources, 2008

Table D-7 COUNT OF LOBSTER TRAPS FISHED BY COOPER RESIDENTS

Year	2004
Total Trap Tags	100

Source: Maine Department of Marine Resources, 2008

CRITICAL NATURAL RESOURCES**Maine Natural Areas Program**

The Natural Areas Program is administered by the State Department of Conservation whose job it is to document Rare and Unique Botanical Features. These include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities.

There is one such rarity in Cooper along its border with the town of Charlotte (formed by the Dennys River). This Rare and Exemplary Community is known as a Stream Shore Ecosystem, a group of communities bordering and directly influenced by the open-water portion of a stream (first order through third or fourth order). It includes vegetated aquatic communities as well as the emergent and bordering communities. Most communities are palustrine; streams are generally too small to exert many disturbance effects on adjacent terrestrial areas. Terrestrial forests bordering streams are included under forested upland ecosystems.

There are also three Rare and Exemplary plant communities in the Meddybemps Heath (see description below) in neighboring Meddybemps.

Wildlife Habitats

Conserving an array of habitats and their associated wildlife species will help in maintaining biological diversity and ensuring that wildlife and human populations remain healthy. To feed and reproduce, wildlife relies on a variety of food, cover, water, and space. Development often has negative impact on these, resulting in the loss of habitats and diversity, habitat fragmentation and loss of open space, and the loss of travel corridor.

The richest wildlife diversity in Cooper is avian. There are several areas of waterfowl and wading bird habitat and three large deer wintering areas. See Map 7 - Critical Habitat.

Cooper also contains one Focus Area of Statewide significance. It is part of what is called the Meddybemps Heath, a 2,500 acre heath that is the second largest domed bog ecosystem in the Eastern Coastal and Eastern Interior regions. The Great Heath in Columbia is the largest. Meddybemps Heath lies at the southwest side of Meddybemps Lake where Sixteenth and Fifteenth Streams converge at the lakeshore. It is contained within the three towns of Alexander, Cooper and Meddybemps. It is a large peatland embedded with remnant geologic features including an elongate esker that separates much of the lake from the interior of the bog. Nearly half of this peatland is dwarf shrub bog and other community types include crowberry-lichen bog, sweetgale mixed shrub fen, peatland lagg, black spruce bog woodland, leatherleaf bog lawn, and mixed cedar woodland fen. Meddybemps Heath is entirely in private ownership and threats to its ecological integrity include invasive species (eg. purple loosestrife), peat mining, hydrologic alteration including draining and cranberry conversion.

Essential Wildlife Habitats - Essential Wildlife Habitats are defined under the Maine Endangered Species Act as a habitat "currently or historically providing physical or biological features essential to the conservation of an Endangered or Threatened Species in Maine and which may require special management considerations". According to MDIFW, Cooper has no sites of essential wildlife habitat.

Significant Wildlife Habitat - Significant Wildlife Habitat, as defined by Maine's Natural Resources Protection Act (NRPA), is intended to prevent further degradation of certain natural resources of state significance. NRPA-defined Significant Wildlife Habitats in Cooper are illustrated on Map 7 - Critical Habitat and include several areas of inland waterfowl/wading bird habitat - used for breeding, migration/staging and wintering habitat for inland waterfowl or for breeding, feeding, loafing, migration, or roosting habitats for inland wading birds. There are also three deer wintering areas – forested areas used by deer to avoid deep snow/cold (non-forested wetlands, non-stocked clearcuts, and deciduous – or larch-dominated stands less than 10-acres in size may be include within the polygons as drawn on Map 7).

In addition to the habitats that have been mapped by IF&W and mentioned above, other notable wildlife habitats in Cooper include large, undeveloped habitat blocks and riparian habitats, and vernal ponds. Larger undeveloped blocks of forest and wetlands provide habitat for wide-ranging mammals such as bobcat and black bear, as well as for rarely-seen forest birds and a myriad of other wildlife species. Riparian areas offer habitat for many plants and animals and can also

serve as wildlife travel corridors, as well as playing an important role in protection of water quality, as noted in the plan. See also Appendix D for a local naturalist's list of wildlife sightings in Cooper for the period 2007 to 2010.

The following streams in the town of Cooper have "high value" wild eastern brook trout populations and associated habitats that should be protected: Howe Brook, Mill Stream, Big Inlet, Dead Stream, Andrews Brook, Splinter Brook, Fifteen Stream, Little Inlet, Denny's River and East Stream. When any work is being done in and around these streams "Best Management Practices" should be used. The town should consider changing its shoreland zoning ordinance to designate "no cut zones" within 100' feet of these brooks. This will help guard against erosion, nutrient loading, spawning impaction, water recharge rate changes and thermal pollution due to loss of shade canopy. These 100' riparian protection zones should be made up of woody vegetation to help protection the thermal temperature regimes of the water for native aquatic species. In addition best practices for crossing these streams include, in order of priority, installation of bridges, open-bottomed arch culverts, three-sided box culverts, embedded four-sided box culverts filled with natural substrate or four-sided box culverts with internal weirs or as a last resort corrugated metal culverts. The spans of any of these crossings should be 1.2 times the bank-full width (as mandated by the Army Corp. of Engineers). This will allow each span to accommodate 50 to 100 year flood flows and protect the integrity of the road and save the town money in the long term. These installations will allow fish populations to migrate through these crossings unencumbered as well as terrestrial animals at moderate and low water conditions. The use of plastic or concrete smooth bore culverts should only be used on high value fishery waters in almost flat, deep dead-water areas.

Atlantic Salmon - In December 1999, the State of Maine banned angling for Atlantic salmon statewide. In November 2000, the National Marine Fisheries Service and the US Fish and Wildlife Service officially declared as endangered the Atlantic salmon populations in eight Maine rivers (Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap and Sheepscot Rivers and Cove Brook). Accordingly, it is unlawful to angle, take or possess any Atlantic salmon from all Maine waters (including coastal waters), and it is a federal offense to take fish in the above-mentioned eight Maine rivers. Any salmon incidentally caught, must be released immediately, alive and uninjured.

Upper reaches of the Dennys River form part of the eastern boundary of the town of Cooper. The Atlantic Salmon Commission has protected the land adjoining the River where there are extensive wetlands within Cooper (see Maps 2, 4 and 7).

Control of non-point sources of pollutants, principally nutrients and sediments, through the use of local ordinances is one means by which Salmon habitat can be protected without removing additional parcels from the assessment rolls when they are purchased for conservation.

PUBLIC ACCESS POINTS

Within the town, there is one beach operated for town taxpayers, residents and their guests providing fresh-water access to Cathance. It is depicted on Map 2, Cooper Public Facilities and

Transportation. There are several additional traditional access points that traverse private land in the town of Cooper. There are three public boat launches providing access to Cathance Lake in Cathance Township, one fully ramped boat launch on Route 191 and two carry-in access points at the south end of the Lake. A complete discussion of these accesses is provided in Chapter G – Recreation, Scenic Resources and Open Space. Several questions in the Public Survey (see Chapter K – Town Survey) were dedicated to issues surrounding the lakes in Cooper.

Investments in improvements on Cathance Lake were mixed. Expansion of public dock facilities are not generally supported. Additional public access is supported by some with somewhat lesser amounts of support for expanded swimming facilities on Cathance Lake.

Opinions on expanding the facilities at Cathance Lake were very polarized. The strongest support exists for expanded picnic and garbage facilities. Creation of a fund for purchase of additional land for public access was highly polarized.

STATE PARKS AND PUBLIC RESERVED LANDS

There are no state parks or public reserve lands in Cooper. As noted there is one large parcel (362 acres) owned by the Atlantic Salmon Commission adjoining the Dennys River in the southeastern portion of the town.

As noted above, 2,250 acres of industrial forestland in the northeast corner of the town is restricted by a conservation easement held by the New England Forestry Foundation. The easement includes language that supports public access on the property as well as "best management practices" for forest management.

There are another 578 acres enrolled in the open space program in 2 parcels; one owned by the Quoddy Regional Land Trust (103 acres) along the Dennys River and another owned by the Bailey Wildlife Foundation (476 acres) on Hoggs Neck in Cathance Lake.

NATURAL RESOURCE PROTECTION

There is a variety of laws and legal incentives that protect the natural resources in Cooper. Those of greatest significance are summarized below.

Pertinent Federal and State Laws:

- Maine Natural Resources Protection Act (NRPA) – which regulates activities in, on, over or adjacent to natural resources such as lakes, wetlands, streams, rivers, fragile mountain areas, and sand dune systems. Standards focus on the possible impacts to the resources and to existing uses.
- Maine Storm Water Management – regulates activities creating impervious or disturbed areas (of size and location) because of their potential impacts to water quality. In effect, this law extends storm water standards to smaller-than Site Law-sized projects. It requires quantity standards for storm water to be met in some areas, and both quantity and quality standards to be met in others.
- Maine Site Location of Development Law – regulates developments that may have a substantial impact on the environment (i.e., large subdivisions and/or structures, 20 acre-plus developments, and metallic mineral mining operations. Standards address a range of environmental impacts.
- Maine Minimum Lot Size Law – regulates subsurface waste disposal through requirements for minimum lot size and minimum frontage on a water body. The minimum lot size requirement for a single-family residence is 20,000 square feet; the shoreland frontage requirement is 100 feet. The requirements for multi-family and other uses are based on the amount of sewage generated.
- Maine Endangered Species Act – regulates the designation and protection of endangered species including disallowing municipal action from superceding protection under the Act.
- The Forest Practices Act - regulates the practice of clear cutting by setting regeneration and clear cut size requirements.

Pertinent Local Laws - At the local level, Cooper has adopted minimum shoreland standards, as required by the State Mandatory Shoreland Zoning Act. Surface waters in Cooper are also protected through the Plumbing Code and state mandated Subdivision Regulations. Cooper last revised its shoreland zoning ordinance in 2006. Cooper has also adopted a minimum lot size law (1 acre). This Comprehensive Plan recommends the adoption of a Zoning Ordinance to provide further protection to the water resources.

Pertinent Tax Incentive Programs: A variety of programs provide financial incentives for landowners to keep land undeveloped and managed for long term productivity. They include the following:

- Farm and Open Space Tax Law - (Title 36, MRSA, Section 1101, et seq.) encourages landowners to conserve farmland and open space by taxing the land at a rate based on its current use, rather than potential fair market value.

Eligible parcels in the farmland program must be at least five contiguous acres, utilized for the production of farming, agriculture or horticulture activities and show gross earnings from agricultural production of at least \$2,000 (which may include the value of commodities produced for consumption by the farm household) during one of the last two years or three of the last five years.

The Open Space portion of this program has no minimum lot size requirements and the tract must be preserved or restricted in use to provide a public benefit by conserving scenic resources, enhancing public recreation opportunities, promoting game management or preserving wildlife habitat. In 2009, Cooper had 2 parcels totaling 578.88 acres enrolled in farmland and open space tax status.

- Tree Growth Tax Law - (Title 36, MRSA, Section 571, et seq.) provides for the valuation of land classified as forestland on the basis of productivity, rather than fair market, value.

According to municipal records for fiscal year 2009, Cooper had 33 parcels totaling 9140 acres in tree growth tax status.

These programs enable farmers and other landowners to use their property for its productive use at a property tax rate that reflects farming and open space rather than residential development land valuations. If the property is removed from the program, a penalty is assessed against the property based on the number of years the property was enrolled in the program and/or a percentage of fair market value upon the date of withdrawal.

SUMMARY

Cooper currently offers protection to its natural resources with locally adopted shoreland zoning regulations. These ordinance provisions will be updated to be consistent with the requirements of State and Federal Regulations and reviewed for improvement to specifically protect the lakes in Cooper. The town will continue to cooperate with the many local and regional organizations

working to protect the natural resources within and surrounding Cooper including the Dennys and East Machias River Watershed Councils, the Downeast Lakes Land Trust and neighboring communities. Regional efforts will focus on watershed protection, and land conservation.