

Comprehensive Lake Inventory
for
Eastman Lake



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Eastman Community Association
Upper Valley Lake Sunapee Regional Planning Commission

Table of Contents

Section	Title	Page
1	Location and context	1
2	Physical waterbody characteristics	2
3	Water quality characteristics	4
4	Biological/ecological characteristics	6
5	Recreational characteristics	8
6	Shoreland characteristics	10
7	Watershed characteristics	12

List of Tables and Figures

Number	Title	Page
Table 1	Named streams in the Eastman Lake watershed	3
Table 2	Waterbodies in the Eastman Lake watershed	3
Table 3	Land use statistics for the shoreland of Eastman Lake, 2008	10
Figure 1	Shoreland Home Construction, 1975-present	11
Table 4	Land use statistics for the watershed of Eastman Lake, 2008	12
Table 5	Land use statistics for the land within 250 ft of Eastman Lake and its tributary streams, 2008	13
Table 6	Summary of town regulations that protect water quality	13

List of Maps and Appendices

Number	Title
Map 1	Eastman Lake Watershed – Aerial Photography 2008
Map 2	Eastman Lake Geographic Context Map
Map 3	Eastman Community Association – Extent of Housing Development, 2008
Map 4	Eastman Pond Watershed – 1950 USGS Topographic Quadrangle
Map 5	Eastman Pond Bathymetric Map
Map 6	Eastman Community Trails
Map 7	Land Use/Land Cover on Eastman Lake Shore
Map 8	Eastman Lake Shore – Aerial Photo 2008
Map 9	Eastman Lake Watershed Land Use/Land Cover
Map 10	Land Use/Land Cover of Shorelines & Streambanks
App. A	Comprehensive Shoreland Protection Act worksheet

1. Location and context

Eastman Lake is located in the western part of New Hampshire and lies within the Town of Enfield in Grafton County and the Town of Grantham in Sullivan County. The lake covers 335 acres, and receives water from its 4,900-acre watershed, also located in Grantham and Enfield (Map 1). Eastman Lake, at an elevation of 1,095 ft above sea level, is located in the headwaters of the Sugar River watershed. The Sugar River flows into the Connecticut River; therefore Eastman Lake is part of the Connecticut River Basin, which covers over 11,000 square miles in New Hampshire, Vermont, Massachusetts, and Connecticut (Map 2).

The Eastman Community Association is a large residential community that surrounds the lake on all sides; the Eastman Community is located primarily in Grantham, but also extends into Enfield to the north and Springfield to the east (Map 3). Eastman was developed as a vacation community in the 1970's and has evolved into a mixed community of permanent and seasonal residents. As of 2008, there are 1,324 single-family homes and condominium units in Eastman; there is a large population of seasonal residents, with a peak summer population around 5,000 and roughly 40% of the housing unoccupied during the winter.

Prior to its development as a residential lakefront community, the area around Eastman Lake was used for farming and logging. Early settlement of Grantham began in the 1770's and was concentrated primarily to the south of Eastman Lake, but 19th-century farmers did clear some of the land near the lake. Stone walls and cellarholes from this era can be seen on the Butternut Pond, Cole Pond, and Stroing Brook trails north of Eastman Lake. In the 1910's and 1920's, the land around Eastman Lake was used as a woodlot to supply the Draper Company bobbin factory, located on Stoney Brook, a western tributary of the lake. The small company town around the factory, where workers were housed, was known as Draperville and can be seen on old maps of the area (Map 4). When wood became scarce in the 1920's, the Draper mill and other mills in Grantham closed, and the town's population dropped significantly and did not recover until the 1970's.

The residents of Eastman are the primary recreational users of the lake; multiple beaches, boat racks, docks, and an activity center have been developed for residents. A boat launch on the southern tip of the lake is the only public access for the lake. The lake is not heavily used by people living outside Eastman, even though the public boat launch is within 2 miles of Interstate 89's Exit 13 and an estimated 325,000 people live within a 30-mile radius of the lake.

Residential development is the dominant land use around Eastman Lake, but unlike most lakes in New Hampshire, the immediate lakefront (50 ft from the water's edge) remains forested or with natural vegetation, with the exception of the condominiums on the southwestern side of the lake, the Visitor's Center and Activity Center on the south/southeastern side, and several small sand beaches.

2. Physical waterbody characteristics

Eastman Lake is a medium-sized, shallow lake, with a mean water depth of 10 ft. The lake is composed of a single basin, with the deepest point (39 ft water depth) located in the southern half of the lake (Map 5). More than 50% of the lake is less than 15 feet in depth, primarily in the northern half of the lake. In 1972, an earthen dam at the southern end of the lake was constructed, which raised the water level ~14 ft and roughly doubled the size of the waterbody to cover 335 acres. The dam installation inundated the mouth of Stoney Brook, creating West Cove, and also flooded large areas of wetland on the north side of the lake.

A small number of coves break up the otherwise smooth shoreline; the ratio of shoreline length to lake surface area is 1.49, which indicates a generally regular, smooth interface between land and water. There are a few wetlands of very small size along the shore, primarily on the northern side of the lake. West Cove is considered an open-water wetland under the methodology of the National Wetlands Inventory because the water depth is less than 6.6 ft.

Three small islands are located in the northern half of Eastman Lake, which were created by the water level rise from the dam. Heron Island is the largest island, roughly 2.5 acres in size, and attracts residents with its trails and a primitive campsite. Loon Island is much smaller, less than 5,000 square feet, and is located near North Cove. The third island covers 1.8 acres north of Loon Island, remains unnamed, and is privately owned. None of the islands are developed.

Eight perennial streams flow into Eastman Lake; these streams drain the western and northern sides of the watershed (Map 1). The largest of these is Stony Brook, which flows from Grassy Pond south along Interstate 89 to its confluence with Butternut Brook and then into Mill Pond and over the Mill Pond dam into West Cove. Butternut Brook is also a large stream, which is the outlet of 37-acre Butternut Pond. These two streams contribute an estimated 70-75% of the water to Eastman Pond. Other streams along the northern and eastern shores of Eastman Lake are much smaller in length and width. The Lakes and Streams Committee's volunteer network samples the water quality at eight perennial streams and three intermittent streams that flow into Eastman Lake (Table 1). Other minor sources of water include intermittent flows near the West Cove beaches and drainage ditches.

Table 1. Named streams in the Eastman Lake watershed

Stream Name	Length (mi)	Outlet Location	Stream Type
Stony Brook	2.11	West Cove	perennial
Butternut Brook	1.86	Stony Brook	perennial
Anderson Pond Brook	0.42	northwest shore	perennial
West Shore Brook	unknown	northwest shore	perennial
Stroing Brook	0.81	northern shore	perennial
Northeast Brook	0.05*	northern shore	perennial
North Cove West Brook	unknown	North Cove	perennial
North Cove East Brook	unknown	North Cove	perennial
Tamari Brook	unknown	North Cove	perennial
Price Brook	unknown	eastern shore	intermittent
Whiting Brook	0.19	eastern shore	intermittent
Lyons Brook	unknown	eastern shore	intermittent

* Northeast Brook's length was calculated from Eastman Lake upstream to the first wetland.

Note: This table represents only those streams with names, either from United State Geological Survey topographic maps or the VLAP water sampling reference maps. Other small streams do exist within the Eastman Lake watershed.

While many streams flow into Eastman Lake, there is only one outlet, Eastman Brook, at the spillway of the dam at the southern end of the lake. There is sufficient flow into and out of Eastman Lake, that the lake volume is flushed twice per year (annual hydraulic flushing rate = 2.10). Eastman Brook flows southward to join with Bog Brook, forming Stocker Brook, which continues south to the North Branch of the Sugar River.

The watershed drained by the many tributaries to Eastman Lake covers 4,900 acres. This watershed is fairly small for the size of the lake; the ratio of watershed area to lake area is 15:1. There are several ponds in the watershed (Table 2) as well as 207 acres of wetlands, according to the National Wetlands Inventory.

Table 2. Waterbodies in the Eastman Lake watershed

Waterbody Name	Area (acres)	Town(s)	Location in Watershed
Mill Pond	2.72	Grantham	direct tributary
Grass Pond	5.68	Grantham	headwater pond
Halfmile Pond	6.80	Enfield	headwater pond
Anderson Pond	13.59	Grantham	direct tributary
Butternut Pond	37.09	Grantham	intermediate tributary
Eastman Lake	335.00	Grantham/Enfield	base of watershed

Note: Four unnamed ponds < 5 acres in size lie within the Eastman Lake watershed.

Three dams regulate the flow of water in the Eastman Lake watershed. The 8-ft stone and earth dam on Butternut Pond, inside the Enfield Wildlife Management Area, is owned by the New Hampshire Fish and Game Department. The 13-ft concrete dam on Mill Pond is owned by the Eastman Community Association and was built to trap sediment carried by Stony Brook. Both of these dams are small in size and have minimal capacity to store floodwaters. Eastman Lake Dam holds back a large amount of water (2,100 acre-feet), and has additional flood storage capacity (maximum storage = 9,930 acre-feet.) Water levels are maintained with little annual fluctuation.

3. Water quality characteristics

The Eastman Community Association has participated in the Volunteer Lake Assessment Program since 1987; through this program, a team of volunteers has collected water samples for water quality assessment. Results in this report are from 1987 to 2007, as data are still being collected and processed for 2008. In addition, two lake surveys were performed by the Department of Environmental Services during this time period, one in 1987 and one in 1999.

The water quality of the lake has been improving since the beginning of sampling in 1987; however, a few key indicators point to continued human impacts to the lake. In 1987, the waterbody was considered eutrophic, or having high amounts of nutrients, specifically phosphorus. A eutrophic lake supports overly abundant algal growth, which can decrease the recreation and aesthetic values of the lake. While some small shallow ponds are naturally eutrophic, most eutrophic lakes have been enriched by human activities that allow fertilizer, soil, septic waste or road materials run off or leach into the lake. During the 1990's, the nutrient inputs to the lake apparently decreased, and the lake was reclassified to mesotrophic in 1999, which reflects a medium and desirable state of nutrients. From 1987 to 1996, average total phosphorus ranged from 7.0 µg/L to 12.5 µg/L; since 1996, the range has been from 2.8 µg/L to 10.0 µg/L, which is in the ideal range. While the median values of phosphorus are low, there have been some samples where phosphorus concentration spiked (e.g. 30 µg/L on 7/14/2003) – these spikes may indicate specific phosphorus-loading events, such as an erosion event after a heavy rainfall, fertilizer runoff, or a septic system failure. These events are potentially very damaging to the lake, as the excess nutrients may fuel an algal bloom, putting the lake in a temporary eutrophic state.

Another metric of lake water quality is transparency, or the depth to which a black and white Secchi disk can be seen. This value naturally fluctuates during the year (2.7-4.4m in 2007 at the Deep Spot), but the trend over the past twenty years has been stable. Transparency values between 2-4.5 m are considered good; the average value for New Hampshire lakes is 3.2 m.

A third important metric is a significant area of concern. Conductivity, which indirectly measures the level of salts, is the capacity of water to carry an electric current. Eastman Lake's sampling data shows that conductivity levels are high throughout the watershed. New Hampshire lakes generally have low conductivity, and values over 100 µMhos/cm indicate enrichment from human activities. Septic system failures, erosion, fertilizer runoff, and road salt runoff are four probable culprits. Stroing Brook, Tamari Brook, and two stations near Interstate 89 have shown extremely high conductivity levels (>500 µMhos/cm) at least once since 2000. Conductivity is a general indicator, therefore chloride testing has begun in order to gain a better understanding of what is driving the high conductivity.

Like many northeastern lakes, Eastman Lake has become more acidic due to acid deposition ("acid rain") and limited capacity to buffer acidic inputs due to granite

bedrock. Measurements of pH (acidity), Acid Neutralizing Capacity, and calcium concentration (a major component of ANC) are all relatively low. The ANC, in particular, indicates that the lake is moderately vulnerable to increases in acidity. Because of acidity, Eastman Lake, Halfmile Pond, and 234 other waterbodies in New Hampshire were placed on the 2006 Impaired Waters list. Since that time, a study of the Total Maximum Daily Load for acid deposition has been completed for these lakes and ponds, which resulted in these waterbodies' removal from the Impaired Waters list. Anderson Pond remains on the Impaired Waters list for acidity. Acidity, or low pH, has a detrimental effect on fish and other organisms.

The site remediation database maintained by the Department of Environmental Services shows only one hazardous material spill event in the Eastman Lake watershed, a leaking residential heating oil tank in 1999. This minor spill has been cleaned up, and the account is closed. Eastman Lake is at risk of future accidents of this sort; however, the distance of most homes from the lakeshore decreases the likelihood that hazardous materials would enter the waterbody.

The historic uses of Stony Brook as a sawmill and bobbin factory likely contributed a significant amount of sawdust to the streambed, which may have been transported downstream to the lake. Sampling of the stream and lake bottom has not been conducted. Large sawdust deposits decompose and release long-stored nutrients into the water, in addition to smothering aquatic habitat. The dredging of Mill Pond in 2008 may have removed some of this sediment.

Eastman Lake has had some more recent threats to water quality, due to human activities and systems in the watershed. Several years ago, a faulty septic system serving a manufactured home leaked into Stony Brook, the primary tributary to the lake. The Town of Grantham and the Department of Environmental Services identified the source and took measures to resolve the problem. In May 2007, Eastman volunteer monitors noticed water discoloration in Stony Brook, which was caused by bridge construction on Butternut Brook. The bridge work did not have appropriate permits and the Town of Grantham and the Department of Environmental Services shut down operations and required restoration. Most recently, during the summer of 2008, two back-ups in the sewer system that serves the condominiums in West Cove led to discharge of sewage near the lake. Testing did not show bacterial contamination in the lake, but beaches were closed temporarily as a precautionary measure. These three events highlight the importance of properly maintaining systems and taking necessary precautions when working in the watershed in order to protect the lake.

4. Biological/ecological characteristics

The mesotrophic status of Eastman Lake indicates that the lake is moderately productive and thus can support a variety of flora and fauna. The abundance of algae and other phytoplankton, as measured by the chlorophyll-a concentration, is not excessive (2.94-4.89 ug/L in summer 2007.) Twenty years ago, algal abundance was much higher (12.60 ug/L in July 1987), but has been steadily declining. The most recent sample at the Deep Spot sampling station that showed nuisance levels of chlorophyll-a (>15 ug/L) was collected in 1994.

The dominant types of phytoplankton found in Eastman Lake, diatoms and golden-brown algae, are also indicative of a moderately productive lake. However, in October 2006 and July 2007, cyanobacteria were also dominant in the phytoplankton sample. High levels of cyanobacteria, which often form a dense bloom or scum on the water's surface, can be toxic to wildlife, pets, and humans. There have been no documented cyanobacteria blooms in Eastman Lake to date; however, vigilance is advised to prevent exposure, if a bloom should occur.

Floating and emergent vegetation is common along most of the shoreline. A 1999 survey found that the most common species were pickerelweed, pipewort, non-flowering sedge, and pondweed. Water shield, arrowhead, three-way sedge, cattails, yellow water lilies, and sweet gale were sparse. No aquatic invasive plant species have been documented in Eastman Lake, thanks to good luck and the hard work of Lake Host and Weed Watcher volunteers. Three wetland and streambank invasive species, *Phragmites australis* reed, Japanese knotweed, and purple loosestrife, are established elsewhere within the watershed. Beetles have been released to biologically control the purple loosestrife along the Interstate 89 corridor.

Moving up the food chain, there are many warmwater fish species resident in Eastman Lake, described in a 1963 report by the New Hampshire Fish and Game Department: "Mixed sizes of horned pout were stocked in 1946, 1950, and 1953. Suckers, shiners, sunfish, pickerel, and yellow perch are also reported present." Largemouth and smallmouth bass were introduced and now the lake supports a self-sustaining population of warmwater fish. Little is known about the aquatic macroinvertebrate community; these small animals feed on plants, other macroinvertebrates, and detritus and play a vital role in nutrient cycling.

Residents of Eastman have been reporting their wildlife sightings to be published in the "What's Out There" column of *Eastman Living*. Analysis of the past five years of columns (Spring 2003-Fall 2008) indicates that Eastman Lake and its watershed provide habitat for many water-dependent species of birds and mammals. The animals listed below require healthy lake and lakeside habitat to survive and reproduce, and include both seasonal/migratory and year-round residents.

Common loons, common and hooded mergansers, mallards, great blue herons, and belted kingfishers are typical summer residents on Eastman Lake, Mill Pond, and Anderson

Pond. Also reported are wood ducks, buffleheads, Canada geese, an American bittern, bald eagles, and an osprey. A migrating double-crested cormorant and white-winged scoter were seen once, an indication that many migratory waterfowl may utilize Eastman Lake as a stopover.

Common loons are a threatened species in New Hampshire, and are considered moderately rare globally. The Loon Preservation Committee has tracked population and nesting statistics of loons on New Hampshire's lakes and ponds; Eastman Pond's records date back to 1976. Eastman Lake has had one pair of adults every year for the last 32 years, and nesting attempts occurred in all but 5 of the years. Nesting attempts were successful more than 50% of the time (16 successful attempts in 27 years.) Reasons for nest failure include water level rise, predation, disturbance, and unknown causes. Loon nesting areas are signed and roped off to minimize human disturbance. A nesting raft was floated in 2008 to prevent nest flooding, but the loons nested on Heron Island instead. Besides human disturbance, predation by snapping turtles is a major concern.

Moose, raccoon, beaver, and black bear are often spotted in the watershed. River otter have been spotted in both Eastman Lake and Anderson Pond, and mink have been seen around Anderson Pond. In addition, snapping turtles and painted turtles are residents of Anderson Pond; it was suggested in "What's Out There" that snapping turtles migrate to Anderson Pond to hibernate. Tree frogs vocalizing in vernal pools were also documented.

Underrepresented in "What's Out There" are passerine (perching) songbirds, amphibians, and reptiles. These species are more difficult to identify, due to their size, morphology, and/or behavioral habits. For example, residents reported that snapping turtles were often found crossing the roads near Anderson Pond, but other turtle sightings were not identified to species; this may be due to the distinctive form and size of snapping turtles and the similar size and morphology of several other common turtle species.

5. Recreational characteristics

Eastman Lake is a popular lake for boating, swimming, and fishing, but that popularity is generally limited to the residents and visitors to the Eastman community. Because Eastman Lake is not a recreational destination for the region, but rather for a small community, the lake does not suffer from excessive recreational pressure. There are several reasons for this, including the nature of Eastman as a private community, limited public access and amenities, a 10-mph speed limit, and the prohibition on personal ski craft.

Canoeing, kayaking, and sailing are the most popular boating activities. Eastman Community Association provides boat racks, docks, slips, and moorings for the storage of canoes, kayaks, sailboats, and outboard motorboats. Of the 569 boats registered at these locations, it is estimated that only 9 are motorboats. There is a public boat launch at the southern end of the lake, which is used by both motorboats and non-motorized watercraft. Sunfish sailboats, canoes, and paddleboats are available for rental at the South Cove Activity Center. In addition, many residents with waterfront lots store their boats, predominately canoes and kayaks, on the shore near their homes. The 10-mph speed limit and the prohibition of personal ski craft make Eastman Lake very attractive to recreationists seeking a safe, quiet, and peaceful experience. All areas of the lake are open to boating, but to protect the loons, nesting sites are posted and marked with buoys during nesting season.

Boating activity on the lake is highest on holiday weekends during the summer, particularly the Fourth of July, and weekends see more activity than weekdays. In 2008, Lake Host records of boat launch use show that the average number of boats is two times greater on weekends than on weekdays (5.4 boats/day on weekends c.f. 2.6 boats/day on weekdays.) Assuming that boaters using the public boat launch comprise one-quarter of all boaters, the average number of boats is estimated at 22 boats/day on summer weekends and 10 boats/day on summer weekdays. The average density of boats is estimated to be 1 boat per 15 acres on weekends, and 1 boat per 32 acres on weekdays.

While no statistics on beach use have been recorded, it is likely that the six swimming beaches are utilized in a similar fashion, with highest use on weekends and holidays. One exception to this is the South Cove beach, where the summer recreation program for children runs Monday through Friday. The West Cove beaches were closed by the Eastman Community Association twice in 2008, both times as a precautionary measure following a sewer system blockage and subsequent backup. Water samples taken after the backup did not show elevated *E. coli* levels.

Eastman Lake supports a self-sustaining warm-water fishery, and a small number of fishermen routinely fish the lake. On a peak day in summer, the average number of fishermen on the lake is 3-4 people, with a maximum around 12. Regular fishermen, either singly or in pairs, tend to fish on weekdays, either in the early morning or late afternoon; families with children and larger groups are more commonly seen fishing on the weekends. Ice fishing attracts a small group of fishermen during the winter, as well.

There are no restrictions on fishing beyond the general regulations of the New Hampshire Fish and Game Department. There is a general statewide advisory on fish consumption due to potential mercury exposure, and fish from Eastman Lake and many other lakes were submitted in summer 2008 to the Department of Environmental Services State Laboratory for mercury testing. Depending on the results from the State Lab, there may be changes made to the fish consumption advisory.

Other activities in and around the lake include: walking on lakeside trails, picnicking at the beaches or on Heron Island, camping and hiking on Heron Island, watching wildlife, and attending events at the lakeside South Cove Activity Center. The 4.7-mile Eastman Lake Trail completely encircles the lake, passing through a trail easement between the lake and private residences; other trails lead to Butternut Pond, Anderson Pond, and other parts of the Eastman Lake watershed (Map 6). In the winter, cross-country skiing, snowshoeing, and ice skating are popular activities on the lake. Since 2002, a triathlon has been held in Eastman, with a swim in the lake and a 5K run on the trail on the western lakefront. In 2008, over 200 athletes participated in the triathlon. There are two road races held in Eastman per year, in addition to the triathlon.

There are several lake activities that are rooted in recreation and appreciation, but that go beyond simple enjoyment of the lake's resources; these activities include education, stewardship, and citizen science. The Lakes and Streams Committee is composed of a group of Eastman residents who are heavily involved in developing programs to protect Eastman Lake. A large crew of volunteers acting as Lake Hosts, Weed Watchers, or water quality monitors through the Volunteer Lake Assessment Program. The Eastman Community Association has been participating in VLAP since 1987 and the Lake Host program since 2003. Weed Watchers have been doing some monitoring for several years, but in 2008, the group became well-organized and more methodical in their surveys. The Lakes and Streams Committee also plans the educational lectures, tours, and activities of Lake Awareness Week, and holds an annual Ice Out contest and celebration.

Of all these activities, only cross-country skiing and the road races/triathlon are marketed to the public, i.e. non-residents of Eastman. The public boat launch is utilized by non-residents to some extent, and there are several ice fishermen who are non-residents. This places Eastman Lake in a unique position, where the primary users of the lake are those who live around it.

6. Shoreland characteristics

Eastman Lake is surrounded by a residential community composed of single-family homes and two condominium complexes. Most of the “lakefront” housing is actually set back slightly from the shoreline, and a naturally vegetated shoreline is maintained except at the beaches and on West Cove. The shoreland, defined as the area within 250 ft of the water’s edge, is split roughly half-and-half into forested and developed/cleared land (Table 3; Maps 7 & 8). Thirteen roadways intersect the shoreland area, including several sections of the Road Round the Lake. Fifty-one single-family residences lie partially or wholly within the shoreland area, 14 in Enfield and 37 in Grantham. Almost all of the West Cove condominiums, roughly half of the South Cove condominiums, and the South Cove Activity Center, and the Visitor’s Center are all within 250 ft of the lake. Impervious surfaces comprise roughly 13 acres, or 8% of the total shoreline area. Impervious surface was calculated based on land use, not directly estimated.

Table 3. Land use statistics for the shoreland of Eastman Lake, 2008.

Land Use Class	Acres	Percent
Fields/Cleared	3	2%
Forested (includes wetlands)	88	51%
Institutional	3	2%
High-Density Residential	41	24%
Medium-Density Residential	31	18%
Transportation	6	3%
All Land Uses	172	

* Land within 250 ft of Eastman Lake incl. islands

The shoreland is privately owned, except for the public boat launch managed by the Fish and Game Department, but the Eastman Community Association has open space easements as well as parcels of undevelopable land along the shore. The pattern of development on the lakefront is not expected to change, as the vast majority of lake-front single-family homes and the condominiums have already been built, in the late 1970’s and 1980’s (Figure 1). The rate of new home construction on the lakefront is less than one building per year; only five new homes were built on lakefront parcels since 2000. This rate is expected to continue to fall as there are very few building lots still available along the lakefront. However, the rate of renovation, additions, and tear-downs will likely stay stable or may slightly increase, due to the age of the housing stock and the change in demographics from a seasonal to year-round population.

All single-family homes on the shoreland have septic systems; the only sewer system connections within 250 ft of the lake are those to the West Cove and South Shore condominiums. There is concern regarding the age and adequacy of septic systems, and a committee is developing a survey for residents regarding this issue. The sewer system is also aging and has had two recent backups.

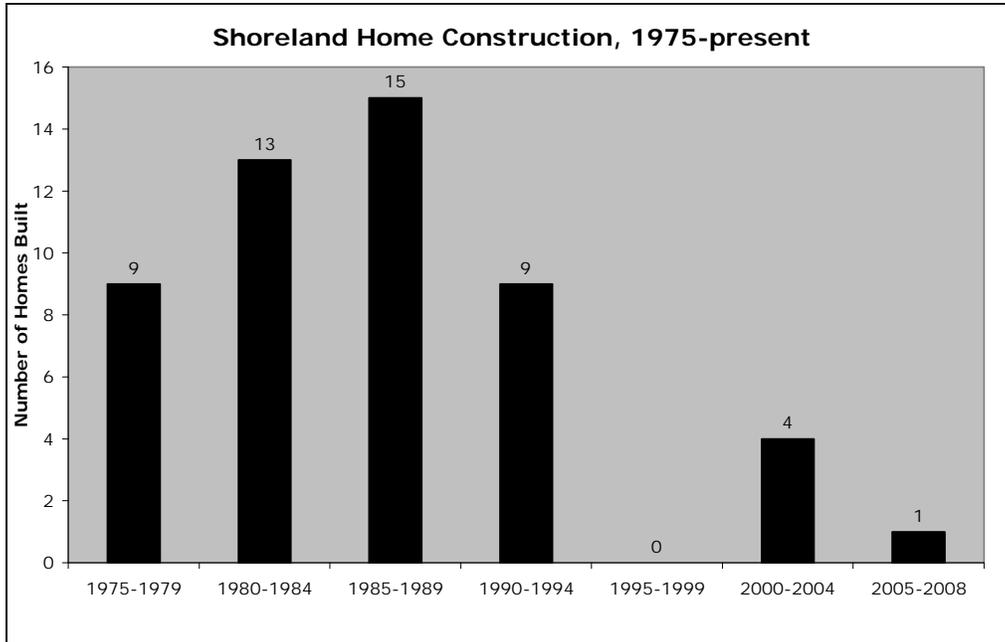


Figure 1. Single-family residence construction within 250 ft of Eastman Lake, based on tax assessment records from the Towns of Grantham and Enfield.

Erosion potential is high due to the sloping topography of the shoreland. More than half (64%) of the shoreland area is classified with a slope greater than 15%. In addition, soils are shallow, and 32% of the shoreland may have some areas of exposed bedrock. These numbers are drawn from the Sullivan and Grafton County Soil Surveys, which provides a rough estimate of where steep slopes and bedrock may lie.

Erosion is also a concern at the six sand beaches owned by ECA that dot the shoreline. On beaches, erosion occurs both by wave action and in overland stormwater runoff. Wave-attenuation barriers have been installed at the East Cove beach to slow erosive wave action. To address stormwater runoff across beaches and help stabilize the sand, various erosion-control installations (plantings, culverts, and runoff diverting structures) have been completed at the West Cove beaches, North Cove beach, and East Cove beach. Erosion remains an issue of concern, as there were problems with the installation and other erosion problems remain.

The design of the Eastman Community minimizes, in general, the impact of residential development on the views from the lake (Map 7). The vast majority of the immediate lakefront is forested, although in winter, houses become more visible. Exceptions to the forested lakefront are the beaches, the condominiums in West Cove, the South Cove Activity Center, and the ski hill. Views of the lake from the road are limited; the best view is from the top of the dam on the Road Round the Lake. Beaches and the Eastman Lake trail provide excellent views.

7. Watershed characteristics

The Eastman Lake watershed has a distinct development pattern, in that residential development is concentrated near the lake and the upper watershed is almost entirely forested (Table 4; Map 9). Interstate 89 and Route 10 run north-south through the watershed, and there is some residential development and agricultural fields on roads adjacent to the highway corridor. Impervious surfaces are concentrated in the southern half of the watershed, covering roughly 243 acres, or 5% of the total area. Impervious surface was calculated based on land use, not directly estimated.

Table 4. Land use statistics for the watershed of Eastman Lake, 2008.

Land Use Class	Acres	Percent
Fields/Cleared	120	3%
Forested (includes wetlands)	3,925	83%
Institutional	10	<1%
High-Density Residential	64	1%
Medium-Density Residential	346	7%
Transportation	251	5%
All Land Uses	4,717	

Thirty percent of the watershed is outright protected from future development. The Enfield Wildlife Management Area, managed by the Fish and Game Department, covers 1,368 acres in the upper watershed, including Halfmile and Butternut Ponds and part of Stroing Brook. The Flewelling Conservation Easement, held by the Town of Grantham, covers an additional 58 acres in the upper watershed. Small community parcels and open space easements held by the Eastman Community Association are also protected from development, but are not included in this estimate.

The topography of the watershed is steep, with 60% of the area with 15% slope or greater. Soils with exposed bedrock comprise 36% of the watershed as well. These features may limit development to some degree; however, it is likely that there will be significant development pressure on the 2,678 acres of forest and field that is currently unprotected, most of which is located outside of the Eastman Community in the upper parts of the watershed. Some further development within Eastman is also likely, as several residential lots have not yet been built upon.

Of special concern are land uses along streams and shorelines in the watershed. Land uses in these areas can have a direct effect on water quality. Land within 250 feet of a stream, lake, or pond in the watershed is 79% forested and 21% developed (Table 5; Map 10). 370 acres of these shorelines is protected from development, 27% of the total area. Impervious surfaces cover roughly 90 acres, or 7% of the total area. All condominiums (West Cove, South Shore, East Lake) are connected to the Eastman sewer system; in addition, single-family homes around Mill Pond (on Robin Ln., Butternut Rd., and Mill Pond Rd.) and on Snow Hill have sewer connections. All other single-family homes located within the watershed rely on private septic systems.

Table 5. Land use statistics for the land within 250 ft of Eastman Lake and its tributary streams, 2008.

Land Use Class	Acres	Percent
Fields/Cleared	49	1%
Forested (includes wetlands)	1,070	23%
Institutional	5	<1%
High-Density Residential	38	1%
Medium-Density Residential	93	2%
Transportation	94	2%
All Land Uses	1,349	

* Land in watershed within 250 ft of stream or pond

Regulations from the state, the Towns of Grantham and Enfield, and the Eastman Community Association serve to protect Eastman Lake and its watershed. The State approves septic systems for new construction, and also restricts clearing, building, and land use activities within 250 ft of the water through the Comprehensive Shoreland Protection Act (CSPA). A worksheet describing the tenets of the CSPA is attached as Appendix A.

The Towns of Grantham and Enfield both have restricted development on steep slopes and near wetlands and waterbodies; the regulations pertaining to Eastman Lake's shoreland are summarized below (Table 6).

Table 6. Summary of town regulations that protect water quality

Type of Regulation	Town of Grantham	Town of Enfield
Watercourse/Waterbody	75-ft structure/road setback	50-ft building setback
Wetland	75-ft setback for septic	50-ft building setback Overlay district
Steep Slopes	N/A	No building on slopes >25%
Erosion Control Plans	Required for roads near shoreline	
Other	Floodplain regulation Allow cluster development Local excavation regulation	Floodplain regulation Allow cluster development Local excavation regulation

The Environmental Control Committee reviews and enforces land use bylaws within the Eastman Community Association. In addition to Town and State approval for development, the ECC must also approve construction and renovation. These bylaws include the following provisions, which protect the lake:

- the regulation of fertilizer use and tree removal per the Comprehensive Shoreland Protection Act,
- the regulation of any tree removal that is more than 20 ft from a structure or within 5 ft of a side or rear property line,
- the prohibition of piers, wharfs, and docks into the water,
- the requirement of driveway culverts, and
- the requirement that driveways have less than 15% slope.

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