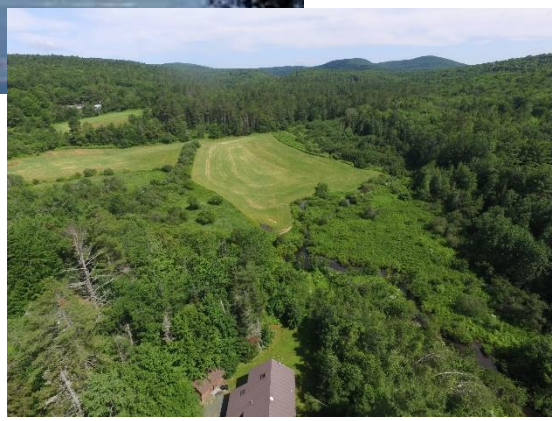
# 2020 Eastman Lake
# Watershed Management Plan Summary

**Developed for the Eastman Community Association**



Loren Wehmeyer, P.E., Ph.D., M.B.A. (lorenwehmeyer@gmail.com)
Jessica Trout Haney, Ph.D. (jthaney@gmail.com)
Taylor Devaney, B.S. (taylor.n.devaney@gmail.com)
Anna Hubbard, B.S. (abhubbs.21@gmail.com)

With report supplement (Appendix III) by Watershed Consulting Associates, LLC (Andres Torizzo, Kerrie Garvey, Emily French) and DK Watershed Resource Consulting LLC (Don Kretchmer)

Together with the input from Eastman Community Association (ECA) staff and residents, the State of New Hampshire, the Regional Planning Commission, and other stakeholders, local knowledge of the watershed was coupled with previous studies, reports and available data to identify problems and look for possible pollution sources. The primary causes and sources of pollution identified fit into the following categories, listed in priority order of the positive impact possible from ECA staff and resident actions.

1. Erosion
2. De-icing chemicals
3. Residential septic systems/water softeners
4. Dust control chemicals

To address these four causes and sources of pollution, long-term and short-time preliminary goals were defined, with measurable guideposts along the way. Eastman Lake, particularly the high public use areas, are the most critical areas to protect. Because so much of the surface water enters Eastman Lake through Mill Pond, this area is the most critical in terms of proactively addressing water quality issues. Erosion in Stony Brook is the most critical point source of water quality pollution in the watershed and provides the opportunity for the most important potential project-level activity. Several management measures throughout the watershed were identified to achieve pollutant load reductions.

The federal government, through the U.S. Environmental Protection Agency (EPA), is charged with providing resources to improve and protect the nation's water quality. Toward this end, the Clean Water Act Section 604(b) Water Quality Planning Grants provide funding to implement regional comprehensive water quality management planning activities. Funds are used for water quality management planning, which includes determining the nature, extent and causes of water quality problems, and then developing appropriate strategies. The federal Clean Water Act funding is distributed to states, which in turn make awards to organizations. An updated Watershed Management Plan (WMP) for Eastman Lake is an important step toward preparing to compete for funding from the Clean Water Act Section 604(b) Water Quality Planning Grants, and ultimately protect and improve water quality in the watershed. To be eligible to receive Clean Water Act Section 319 funds, a WMP, at a minimum, must include the following elements:

a. Identify causes and sources of pollution
b. Estimate pollutant loading into the watershed and the expected load reductions
c. Describe management measures that will achieve load reductions and targeted critical areas
d. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan
e. Develop an information/education component
f. Develop a project schedule
g. Describe the interim, measurable milestones
h. Identify indicators to measure progress
i. Develop a monitoring component

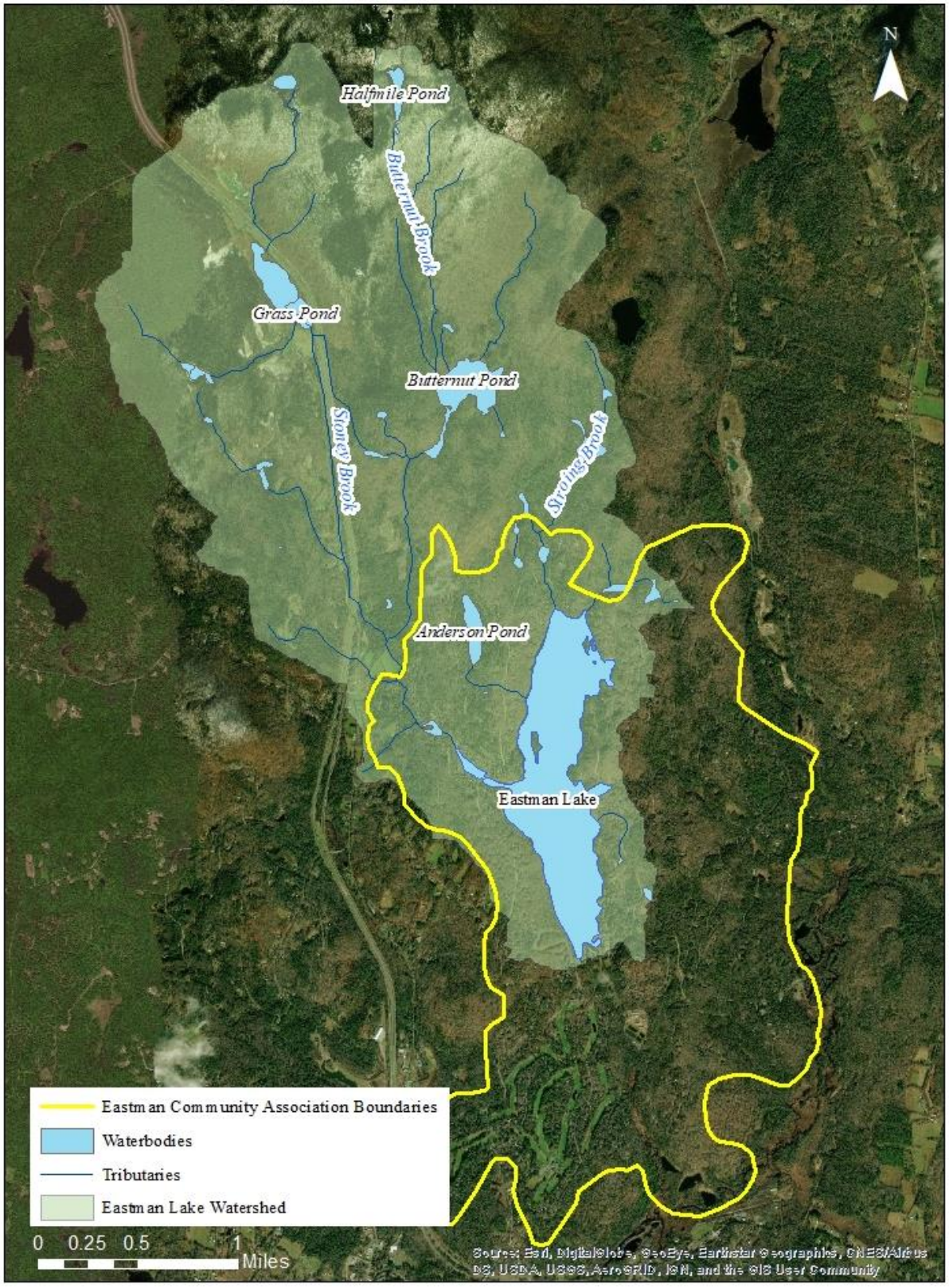



**Figure 1**. Eastman Lake watershed and Eastman Community Association boundaries.

## IDENTIFY ISSUES OF CONCERN

Four key water quality areas, based on measured data and trends, have emerged that warrant monitoring and a management strategy: conductivity/chloride, turbidity, dissolved oxygen, and phosphorus.

*Conductivity/chloride*, among other sources in the watershed, is an indication of road de-icing and humectant use on roadways to limit dust. Conductivity in Eastman Lake is high compared to the state median and is increasing broadly around the lake. The state median conductivity is 40 uS/cm, compared to 227 uS/cm in Eastman Lake.

*Turbidity* is a measure of material suspended in a waterbody. Amplified by unstable banks in the primary tributary upstream of the Eastman community, sediment is moving into the Mill Pond/Eastman Lake system at a rate of greater than 7 NTU. Much of this sediment is retained in Mill Pond, but not all of it, indicated by occasionally high turbidity measurements. Fifteen out of 844 turbidity measurements in Eastman Lake from 1994-2017 (1.8%) exceeded 10 NTU). However, no measurements (out of 72) since September 22, 2015 have exceeded 10 NTU.

*Dissolved oxygen* is essential for the survival of fish and other aquatic organisms. Chronically low dissolved oxygen can be associated with high sedimentation and may lead to eutrophication. Eutrophication is defined as excessive richness of nutrients in a waterbody leading to a dense growth of plant life that starves the waterbody of the oxygen necessary to sustain the lives of aquatic organisms. In 2018, dissolved oxygen at the deep spot monitoring location reached 0 mg/L for the bottom 5 of the 13 meters of depth.

*Phosphorus* is the key nutrient in still bodies of water. When there is too much phosphorus, it can speed up eutrophication, resulting in excessive aquatic plant life, algae growth and cyanobacteria. Phosphorus measurements, while often below the state median, are highly variable in Eastman Lake. The state median for phosphorus is 9.1 ug/L (New Hampshire Department of Environmental Services, 2009), compared to 1.2 from 1994-2017 in lake/pond measurements in Eastman Lake.

## SET PRELIMINARY GOALS

Long-term preliminary goals include:

1. All parameters listed in the New Hampshire Department of Environmental Services, Volunteer Lake Assessment Program Individual Lake Report, Waterbody Report Card table for Eastman Lake will reliably remain in the category of Very Good.
2. Eastman Lake will reliably exceed all New Hampshire Water quality standards and have median values in the target range
    a. Chloride: ≤230 mg/L (chronic)
    b. E. coli: ≤88 cts/100 mL – public beach
    c. E. coli: ≤406 cts/100 mL – surface waters

d. Turbidity: ≤10 NTU above natural level
e. Dissolved oxygen: ≥6 mg/L at any place or time, or 75% minimum daily average, unless naturally occurring
f. pH: from 6.5 and 8.0 (unless naturally occurring)
g. Median chlorophyll-a concentrations from 2.5 to 4.4 ug/L
h. Median phosphorus concentrations from 7.0 to 10.0 ug/L
i. Total phosphorus: unless naturally occurring, shall contain no phosphorus in such concentrations that would impair any existing or designated uses

Short-term preliminary goals include:

3. Reduce sedimentation in Mill Pond by 70 percent from 115 cubic feet per year to 35 cubic feet per year
4. New or Improved ECA standards will be solicited
    a. Forestry concerns in sensitive watershed areas
    b. Septic system installation and maintenance in sensitive/at risk watershed areas
    c. Water softener installation and maintenance in sensitive watershed areas
    d. Sand and salt application in sensitive watershed areas
5. Monitoring plan will be enacted in-line with long-term modeling needs
6. Data storage system will be implemented to manage and store watershed data

## IDENTIFY CAUSES AND SOURCES OF POLLUTION

Together with the input from ECA staff and residents, the State of New Hampshire, the Regional Planning Commission, and other stakeholders, local knowledge of the watershed was coupled with previous studies, (Pike Hydro (2018), Dubois & King (2016) and (2017)), reports (Eastman Community Association (2009), (2012), (2017), (n.d.), (2019), and Upper Valley Lake Sunapee Regional Planning Commission (2009)), and available data to identify problems and look for possible pollution sources. The primary causes and sources of pollution identified fit into the following categories, listed in order of the positive impact possible from ECA staff and resident actions. In other words, the priority order was established based upon a numeric analysis of the estimated pollutant loads attributable to pollutant sources in the watershed, the pollutant load reduction that would result from the proposed action, and the in-lake water quality that would result from implementing the action.

### Priorities

1. Erosion - Stream restoration and stabilization along Stony Brook is estimated to prevent 80 cubic feet of excess sedimentation (annually) from entering Mill Pond.
2. De-icing chemicals – Annually, the Eastman Community Association applies around 2.8 tons of salt to roadways. This is in addition to salt application on local roads, the highway, the interstate, and on private driveways. Estimates of salt application on driveways within the Eastman Community Association range from 336-1,512 pounds of salt annually. Education, outreach, and contractor standards has the potential to reduce salt application by 25%, reducing pollutant loading to between 252 and 1,134 pounds of salt per year.

3. Residential septic systems/water softeners – Over 50 percent of the 484 septic systems within the Eastman Lake watershed boundary and within the Eastman Community Association are over 20 years old. Many of these border Eastman Lake and its tributaries. These older systems may not adequately treat the waste they receive. Additionally, using the 2 percent average failure rate for Merrimack County, the default value used in the STEPL model, approximately 10 septic systems within the watershed and within the Eastman Community Association have failed. Identifying failed and failing systems can prevent an estimated 65/gallons/person/day of untreated wastewater from entering Eastman Lake. Assuming 3 people per home in 10 homes with failed systems results in 712,000 gallons of untreated wastewater per year
4. Dust control chemicals – The Eastman Community Association purchases approximately 36,000 gallons of 35% $CaCl_2$ solution annually. Reducing speeds and altering the road surface has the potential to eliminate the need for dust control chemicals.

## DESCRIBE MANAGEMENT MEASURES THAT WILL ACHIEVE LOAD REDUCTIONS IN TARGETED CRITICAL AREAS

- Stony Brook hayfield stabilization
- Schedule and prioritize drainage ditch and swale sediment clean-out
- Establish standards for ECA homeowners regarding de-icing and driveway design in sensitive areas
- Continuously-improve ECA de-icing practices
- Establish standards for ECA homeowners regarding septic system maintenance in sensitive areas
- Continuously-improve ECA dust control practices
- Continuously-improve coordination between ECA committees on issues in sensitive areas
- Continuously-evaluate the long-term water quality monitoring strategy
- South Cove Activity Center de-icing strategy
- Sewer line extension feasibility study
- Water softener standards for ECA homeowners in sensitive areas

The following specific and general recommendations are offered for Eastman Lake based on the review of the current water quality data and this lake model update.

1. To evaluate the ecological condition of the lake and evaluate progress in load reduction, monitoring for total phosphorus, Secchi transparency and chlorophyll a as a part of the NH VLAP Program and total phosphorus in the deep spot and on tributaries where applicable, should be continued for the foreseeable future.

2. Consideration should be made to evaluate flow into Eastman Lake via the major tributaries. This can be accomplished through installation of staff gages and development of calibration curves for each gage. This will allow calculation of phosphorus loads from each tributary when tributary total phosphorus concentrations are combined with flow data.

3. Continued effort should be made to document stratification and accumulation of hypolimnetic phosphorus in Eastman Lake.

4. Spring overturn sampling for phosphorus may better approximate the annual average phosphorus concentration in Eastman Pond than summer measurements.

5. Continue aggressive watershed management efforts including but not limited to:
   - Maintain and expand vegetated buffers around the lake to slow runoff and take up nutrients.
   - Maintain and upgrade septic systems. Where possible, move them further from the lake.
   - Do not use fertilizers or detergents/soaps that contain phosphorus.
   - Encourage infiltration/treatment of runoff from developed land surfaces including rooftops, roads, parking areas, and landscaped areas. Infiltration/treatment allows phosphorus to be captured by soil particles while water returns to the lake as groundwater.
   - Continue protection of the as much as possible of the watershed in a natural state. Because the watershed is small, disturbance could have immediate, adverse impacts to the lake. Consider permanent watershed protection through conservation easements or other permanent protection over the portions of the watershed that are not currently under conservation.
   - Discourage waterfowl from using nearshore areas by not providing food or allowing egress from the lake to lawn areas by using natural buffers or barriers/deterrents.
   - Properly dispose of all pet waste away from the lake.

6. Any future major changes proposed in the watershed such as development, changes in drainage, or logging should be evaluated in terms of their potential to influence lake water quality. The updated LLRM model developed as a part of this project can be readily adapted to evaluate any major watershed change.

7. Incorporate new water quality, land cover, septic or sediment data into LLRM as it becomes available. At a minimum, the model should be updated every 5 years.

8. Evaluation of the limited historic water quality data suggests that while there have been episodes of poorer water quality throughout the time period, most of the time water quality supported the designated uses of Eastman Lake. A goal that includes supporting designated uses all of the time is a worthy one to pursue. Reaching that goal will require a commitment to watershed management as well as water quality monitoring.