

# **DRAFT Summary and Recommendations (East Pond)**

## **Introduction**

The report done by the Colby Environmental Assessment Team (CEAT) on East Pond should be available early in the year 2000. We provide this draft summary and recommendations section as a means of underscoring some of the information reported in the public presentation. A much more detailed treatment will be found in the report.

Cultural Eutrophication is a major threat to East Pond. Development and other land use activities, specifically along the shores of the lake, have led to increased phosphorus and nitrogen in the lake. In the East Pond Watershed, residential land area has more than doubled in the last 35 years.. Subdivision and construction is continuing to occur around the lake. East Pond is showing signs of severe cultural eutrophication. In order to improve water quality, the Colby Environmental Assessment Team (CEAT) has compiled recommendations to aid in the remediation process of East Pond. A number of activities to reduce phosphorus inputs are currently in progress, but their continuation is essential to the success of any major remediation techniques that may be adopted. If inputs are not cut down, other efforts to improve the water quality of the lake will be negated.

## **Water Quality**

### **Monitoring Suggestions**

The Maine Department of Environmental Protection (MDEP) has monitored water quality at Site 1 (see site map) in East Pond since 1975. In order to continue a comprehensive analysis of water quality, CEAT recommends the following:

Testing should continue at sites 1, 2, and site 3 in East Pond and site 10 located at the confluence in the Serpentine

- Tests at these sites should measure phosphorus concentrations , transparency, dissolved oxygen, temperature and pH
- Test should be done at least three times a year in order to account for seasonal changes. Tests should be conducted in late spring, during the summer, and in early fall. These tests should be conducted for surface, bottom, and epicore samples.

## **Development**

### **Buffer Strips**

Buffer strips are one of the most cost effective and important ways to decrease phosphorus loading from storm runoff and sedimentation into the lake. The effects of adequate buffer strips are significant since tree and shrub canopy intercepts rain, reducing its impact on the soil, the low herbaceous plants, and the duff

layer filter sediment. Trees and shrubs reduce runoff, and their root systems hold the soils in place thereby preventing erosion, insulating against noise, enhancing privacy, and providing protection against wind and sun.

### **Site Specific Design**

To improve the quality and effectiveness of a buffer strip, one must first consider the characteristics of the site and identify potential problems. The characteristics of the site may include the location of buildings, slope of land, and soil type. The size and layout of the lots will help determine buffer design. If the lot is not large, and buildings are close to the lake, having a 75 ft buffer may not be an option. However, even a small row of bushes between structures and shoreline is better than nothing at all. Buffers should be placed between areas of human activity and the lake, including driveways (paved or gravel), garages and houses.

The slope of the land may determine how densely and at what depth of buffer needs to be planted. Steep slopes encourage sediment erosion, and if the slope of the land is steep, the effectiveness of the buffer strip may be diminished, thus requiring a deeper buffer strip. Any depressions or irregularities occurring on the property should be viewed as an asset, as they are effective in slowing the flow of water toward East Pond.

When selecting native vegetation to be planted, soil type and environmental conditions should be considered. It is not difficult to find low maintenance plants that are long-lived, hardy, sturdy, and aesthetically pleasing. The moisture and composition of soil (sand, clay, or pebbles), the level of sunshine received, and type of plants desired should be considered. Any number of landscaping establishments or nurseries could be contacted in order to advise proper planting times and more specific recommendations. For a list of native and naturally occurring trees, shrubs, and vines see Appendix H in the full report.

### **Development Procedures**

On most properties there are footpaths leading from the structure(s) to the dock or lake. These footpaths should be no wider than 6 ft and should be winding. This prevents footpaths from becoming channels for storm water runoff.

When constructing a new structure the 100 ft development zoning laws should be observed. The amount of impervious surface should be minimized, winding footpaths should be constructed, and all possible vegetation should be left undisturbed.

### **Areas of Immediate Concern**

The immediate cause of concern for the residents of East Pond should be areas of concentrated development with risk or high risk properties. The Colby Environmental Assessment Team (CEAT) has identified particular areas of concern that will be detailed in the final report. On average, areas surrounding Brickett Point are of concern, as is the west side of Libby Point and the north side of the lake. The residents of these approximate areas should take measures to improve buffer strip quality. Each property owner needs to take into consideration the characteristics and available resource base for change. However, for significant change to occur, and the quality of East pond to improve, these measures need to be taken.

Areas which contain both high risk roads as well as high risk buffers are areas of immediate concern, and should be prioritized when remediation action is considered and taken. The areas that are of particular concern include shoreline surrounding areas of Brickett Point, the shoreline just northeast of Brickett Point, as well as a significant portion of the southern and northwestern shorelines. It is recommended that individual property owners take action to improve buffer quality and cooperate to improve and maintain roads.

### **Provide Action Plans**

One course of action that could be explored is personal consultation of interested property owners. A letter could be issued to all property owners offering personal consultations regarding the specific characteristics of their land. A knowledgeable individual from the East Pond Association could then consult with the property owner, to address the specific issues as well as offer more tailored suggestions for improvement. Thus, those property owners interested in definite actions for improvement would receive the support they desire.

### **Roads**

Erosion and water runoff from roadways contribute to the phosphorous loading of the lake, along with the loading of other nutrients and organic pollutants. Consequently, roads with higher erosion potentials need to have better runoff management and overall upkeep than roads with lower erosion potentials. CEAT has divided the roads surrounding East Pond into three categories: High Risk, Risk, and Acceptable. These ratings serve to prioritize the order in which road repair, beyond standard road upkeep, should be addressed for the improvement of lake water quality. The order in which remediation occurs should be further prioritized by whether or not a given road leads to areas of the shoreline which contain inadequate buffer strips.

High Risk roads generally need improvements in at least three of the four categories comprising the road total score: Surface Total, Ditching Total, Culvert Total, and Water Diversion Total. These roads also typically have high erosion potential, which will compound the problems covered under their road total score.

### **High Risk Roads**

#### **Lake Ridge Estates**

Lake Ridge Estates contains roads in poor shape with high erosion potential. Road surface could be improved with the building of a crown and the elimination of berms or ridges. Ditches need to be formed in many places to divert water runoff away from the road and to more acceptable areas. At least one existing culvert is in poor condition and needs to be replaced. The erosion potential of Lake Ridge Estates is also high and is a negative factor when combined with the fact that water from the road runs mostly uninhibited into the lake. Water diversions should be formed to help divert water off the road and into more desirable wooded areas.

### Steep Road

Steep Road is our identifier for the road between Sunset Blvd. and Alden Camps. The surface of this road can be improved with the rebuilding of the crown, elimination of ruts and resurfacing with a more compact substance. Ditching also needs to be added along the sides of the road to carry water away from the road's surface. The lack of water diversions is a big problem on this road, they need to be added, especially since the road has such a high erosion potential.

### Loon Lane

Surface erosion by storm runoff can be reduced on Loon Lane by rebuilding the road's crown and replacing aging culverts. Ditching, while not a major problem, should be maintained and added if deemed necessary for a given segment. In at least one segment, a berm prevents the shedding of water from the road's surface and needs to be eliminated. The erosion potential for the average segment on Loon Lane is high and special consideration needs to be given to establishing water diversions to break up the flow of water down the road and divert it to more suitable areas.

### Sadulsky Estates

Sadulsky Estates can improve their road surface condition by supplementing the road's crown in places where it has been reduced, and rebuilding it all together on those segments where ruts have formed. Once the crown has been repaired, ditching needs to be added to the sides of the road where they are needed to divert the water. These two improvements may considerably reduce the eroding of the road surface that is already visible in several areas. Water diversions are also needed in places along the road to keep runoff from flowing directly into the lake. As supported by the visible signs of erosion, the erosion potential of the average segment is high.

### E1-D

E1-D is the label for one of the side streets off of Brickett Point Road. The surface of this road is rutted and the sides are bermed. Water runoff is given no place to travel to and is instead kept on the road where it picks up velocity and sediment and flows uninhibited into the lake. To address this problem, the crown of the road needs to be re-established, berms broken down, and ditches formed. Culverts and water diversions are badly needed and should be placed accordingly. Even though the erosion potential for this road is low, the poor condition of the road's surface will make up for it if not repaired.

### Benson Cove

Benson Cove's poor surface score can be improved with the rebuilding of the crown, elimination of berms, and the resurfacing of the road with more compacted sediment. An existing culvert is in very bad shape and needs to be replaced. Fortunately, the erosion potential of Benson Cove is low, and erosion can be significantly reduced with these recommendations.

### Camp Manitou

Camp Manitou, containing one of the few paved sections of our survey, has a series of roads that are in need of varying degrees of repair. The need of repair seems to increase the closer the roads come to East Pond. The crown is a big problem in most places and needs to be rebuilt. The presence of ruts and potholes in the road support this, and in certain places a berm adds to the problem. Erosion is evident in many places on the road's surface and sediment trails can be seen leading directly into the lake. Proper ditching and the placement of culverts and water diversions are needed.

### Sarazin Estates

Sarazin Estates, even though it is scored as a seasonal road, already has a road total in the worst 25 percent of those surveyed. The crown needs to be rebuilt and the ruts and berms eliminated. The road surface should also be redone with a more compact sediment. While ditches are not needed along the entirety of the road, they are needed in some sections. In addition to the repair of the road surface, Sarazin Estates is in most need of some culverts and water diversions to keep the water from eroding the surface of the road and flowing into East Pond.

### Cardinal Road

The road total score for Cardinal Road is the lowest of the high risk section. This is due partially to the fact that it is a seasonal road, which gives it a much lower surface score than if it were a year round road. However, it is the combined erosion potential of Cardinal Road that gave it a high risk rating. Out of all the roads surveyed, Cardinal Road has the highest total erosion potential score of road. The erosion potential of the average segment is also among the worst 25 percent. It is because the chance of erosion is so high that even though Cardinal Road is only seasonal, it still poses a significant threat as a phosphorus source for East Pond. To help diminish this threat, ditching is needed and could be added to help divert some of the water away from the road's surface. Water diversions should also be added to help break up the flow of water down the road, and to keep the water from picking up too much sediment and speed as it travels.

### E1-DA

E1-DA is the label for another one of the side streets off of Brickett Point Road. The crowning of the road and the elimination of potholes could improve the surface condition. Ditching and water diversions are needed to carry water away from the road and divert it from flowing into the lake. Luckily, the erosion potential of E1-DA is relatively low, so the impact of this road can be reduced with remediation and upkeep.

### Birchcrest

Birchcrest, which is located off of Bricket Point Rd., received a relatively low surface score as a result of being a seasonal road. However, this is not a necessarily accurate reflection the road's actual surface condition, but rather the condition of the road for its present use. If Birchcrest were used year round, it would have one of the worst surface score of all the roads. The crown needs to be re-established and supplemented throughout. Berms need to be eliminated and replaced with adequate ditching. Water is

not well diverted and flows primarily into East Pond, and while the erosion potential of this road is not very high, water diversions still need to be established.

### Moores Road

Moores Road has incomplete data for erosion potential, but can still benefit from some repair work. The surface should be replaced with a more compact substrate and the crown needs to be re-established in the process. Berms should be eliminated and replaced with ditching to keep as much water as possible off the road's surface. In areas where water runs across the road, culverts should be installed.

### **Risk and Acceptable Roads**

For the roads that are categorized as Risk, surface quality and the need for adequate culverts should be addressed first in road repair. Only one of the nine Risk roads had sufficient culverting, and all Risk roads could benefit from some degree of surface repair. Ditching should be the next priority as it is a prevalent problem among Risk roads and is an important factor in maintaining road quality. Water diversions on most of the roads were satisfactory, but careful attention should always be paid to where water is flowing off the road and for how long the water can travel down a given segment before being diverted to more desirable areas.

Acceptable roads are not necessarily in perfect condition, but they are in good enough condition not to be an immediate threat to the health of the lake. However, consistent road upkeep and management is essential. Many of the Acceptable roads have high erosion potentials that would create problems if the road conditions were allowed to deteriorate.

### **Septic Systems**

Septic systems can have a significant impact on the water quality of East Pond through leaching of microorganisms, nitrogen and, perhaps most importantly, phosphorus. While the potential input from individual systems may not pose a significant threat to water quality, the aggregate of all systems in the watershed represents a much greater potential. Therefore it is important to take measures to lessen the impact of septic systems, by attempting the proceeding recommendations.

- Mandate the replacement of all pre-1974 septic systems over a specified limited time period, such as was done in Vassalboro
- Raise awareness of and encourage application to the MDEP grant program and KVCAP loan program for the replacement of septic systems
- Mandate the installation of water meters on wells with installation of new septic systems, in order to more easily ascertain the pressure on septic systems (Lussier, pers. comm.)
- Encourage the use of legal easements between property owners on septic systems when one property is unsuitable for septic system installation
- Increase education for proper use of septic systems in order to reduce system pressure
  - water conservation
  - less detergents, grease, kitchen wastes
- Continue regulatory process on seasonal conversions

- Encourage group efforts and cooperation in conducting volunteer septic system surveys
- More consistent regulations or codes between towns

## Lake Remediation

The Remediation Techniques section of the report consists of an in-depth review of many potential remediation techniques. Among these techniques are approaches that have been thoroughly tested and their results observed in lakes across the United States and throughout the world. These techniques, simply because they reduce the fear of the unknown, are more desirable choices for the remediation of East Pond. The Remediation Techniques section also reviews the features of some lesser known and infrequently documented techniques.

The implementation of any remediation technique must be accompanied by watershed management. Nutrients can be removed or sequestered in an unavailable form, but if external loading persists, the affect of the treatment will quickly be negated. Three well documented remediation techniques reviewed in the Remediation Techniques section have as their target, the treatment of an anoxic hypolimnion, which can occur in thermally stratified lakes. East Pond is not a thermally stratified lake, and for this reason these techniques are not applicable. Two of the lesser documented techniques reviewed (Barley Straw and Nutri-Pod) were determined to be applicable only on a small scale. The practice of sediment removal was dismissed as a feasible option on the basis of the exorbitant costs involved. Algicides, the most common of which is copper sulfate, were determined to be an undesirable remediation option due to the ecosystem and human health concerns that are associated with their application.

The process of elimination left six techniques of lake remediation that could be utilized in the case of East Pond. It is important to recognize that these remediation techniques could, hypothetically, be applied in East Pond. This is not to say that all are of equal appeal. Among the biomanipulation techniques, trophic cascade, provision of cover for the zooplankton population, macrophyte induced sediment stabilization and the floating of photosynthetic mats are options which hold greater appeal. Dilution and flushing, although effective in many lakes, have constraints which would make their use in East Pond difficult. Each of the P-inactivation techniques has benefits and drawbacks, but all seem to be feasible possibilities for East Pond. Among the phosphorus inactivation techniques, alum treatment is the most well-documented and therefore has the most potential for use in East Pond.

- **Biomanipulation**

This is a broad category of techniques which seek to either physically remove nutrients from the lake, inhibit nutrient release from the sediments or manage an excessively robust phytoplankton population, which is the product of elevated lake nutrient levels. The biomanipulation techniques worthy of consideration for use in East Pond are as follows:

*Floating of Photosynthetic Mats*

This is a technique that actually eliminates nutrients for the lake ecosystem.

Photosynthetically active vegetation is introduced during the spring, allowed to grow and absorb nutrients throughout the summer months, then removed and composted in

the fall. It could be beneficial, not only for its nutrient removal, but for its potential to provide, once composted, a nutrient rich fertilizer for local farms.

#### *Provision of Cover for the Zooplankton Population*

As in the case of the above, the end result is a robust zooplankton population that will suppress excessive growth on the part of the phytoplankton population. The means of arriving at this end is the expansion of the lake macrophyte community. Aquatic vegetation can provide shelter from predators and desirable nursery conditions for young zooplankton.

#### *Macrophyte Induced Sediment Stabilization*

The philosophy behind this approach is the inhibition of nutrient release from sediments. It would involve expanding a lake's macrophyte (rooted plant) populations. The root structure and biomass of aquatic vegetation can lower the susceptibility of a lake to mechanical mixing (wind, waves, boat activity, etc.).

#### *Trophic Cascade*

This approach involves stocking the lake with piscivorous fish (fish which eat fish), with the desired result of reduced pressure on the zooplankton community. A robust zooplankton population could, in turn, suppress the phytoplankton population and thereby control algal blooms.

#### *Enhancement of Copepod Populations*

The copepod is a potential answer to the failure of zooplankton in dealing with the filamentous phytoplankton species which dominate during the late summer. Its feeding mechanisms are not subject to clogging in the same manner as those of the zooplankton.

#### *Regulation of Runoff*

This is a reiteration of the necessity for watershed management, with a specific concern for the health of the zooplankton population. Many common insecticides are highly toxic to zooplankton. If these chemicals are prevalent in watershed runoff, the eventual impact on phytoplankton blooms can be of an enhancing nature.

- **Flushing**

The technique of flushing is used to increase the export of algal cells from a lake. This technique has been used successfully on lakes with similar characteristics to those of East Pond. In the case of East Pond, the most effective way of flushing the lake would be through a reconstruction and regulation of Coffin Dam. Presently, Coffin Dam is able to alter the level of the lake by 12 inches. A restructuring of the dam could possibly increase the extent to which the level of the lake could be dropped and algal cells could be flushed out. This flushing would need to be done during times of peak phosphorus levels and algal growth in the pond.

- **Alum Treatment**

Phosphorus inactivation by means of alum treatment is a common and well-documented practice in Maine lakes and in lakes throughout the United States. It's a treatment that could be applied in East Pond, as it has shown relatively good results in applications to lakes of characteristics similar to East Pond's. Alum treatment can be particularly appealing in the sense that it attacks the problem of excessive phosphorus from two directions. It can effectively remove the majority of phosphorus in the water column and successfully cap the sediment layer. The result is the inhibition of the release of phosphorus from what may be (in the case of East Pond) the primary nutrient source. There are some important drawbacks to alum treatment that must be thoughtfully considered before application. The primary concern is the unknown. There have been some inadvertent, deleterious impacts on the lake ecosystem following, otherwise successful, alum treatments.

## **Education**

Beyond physical changes that can be made to the Watershed, it is important not to overlook the effect that increased education and awareness regarding land use impacts can have on improving water quality. It is important to inform residents of the impact their daily activities have on the water quality of East Pond as they may not all be aware of the relationship between land use and water quality. CEAT recommends the following strategies.

- Incorporate lake education into the curriculum of the School systems of Smithfield and Oakland and encourage local schoolchildren to become involved in the monitoring of East Pond and its surrounding watershed
- Continue use of the East Pond Newsletter to serve as a source of information to residents
- Have town officials, in conjunction with the Maine Department of Environmental Protection, conduct workshops to educate residents on water quality monitoring and effective roads and buffer strip characteristics
- Encourage the availability of this report to the following:
  - residents of the East Pond Watershed and Serpentine Watershed
  - East Pond Lake Association
  - local libraries