

**Indian Lake Watershed Project**  
**Watershed Survey and Water Quality Monitoring**

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## **Introduction**

### **History**

Located in northern Worcester MA, Indian Lake (Figure 1), previously known as North Pond, is within the Mill Brook sub watershed in the headwaters of the Blackstone River watershed. In the 1830's a dam was constructed to act as a reservoir and serve as a reliable water source for the Blackstone Canal. The footprint of Indian Lake has grown from 40 acres and now covers an area of 190- acres. The present mean depth is approximately 9 feet and a maximum depth of around 20 feet. The lake is state owned, and has three parks as well as a public boat launch. In total the watershed covers 2,084 acres, extending into the Town of Holden at the northern border of Worcester. It was surrounded by farmland and marshes, but now the surrounding watershed consists of heavily developed residential and urban land use. The Ararat Brook is the major tributary feeding Indian Lake, flowing into the northwest corner of the lake. The Ararat Brook accounts for 54 percent of the total drainage area into Indian Lake, at 1,132 acres. The main outlet for Indian Lakes' drainage is a dam with controls maintained by the City of Worcester. The dam is located in the northeast area of the lake, owned, operated and maintained by the City of Worcester, which flows into Salisbury Pond and eventually into the Blackstone River.

## **Timeline of Key Events**

Indian Lake was originally North Pond, comprising of about 20 acres

1820s: Lake was dammed and the level raised to provide a reservoir for the newly constructed Blackstone Canal; Indian Lake now encompassed over 200 acres.

1960s thru 1980s: Copper sulfate applied regularly to manage algae blooms. Through the years, this was paid for by Heald, City of Worcester and Indian Lake Watershed Association.

1971: “Draft Environmental Impact Statement Pursuant to Section 102(2)(c), PL 91-190 for Route 52 (Rt. 190)” Federal Aid Highway Project prepared for Mass. Department of Public Works by Charles A. Maguire & Associates, Inc. Approximately 10 acres of the lake was lost due to the construction of Rt. 190.

1978: the Indian Lake Improvement Association was formed and in 1985, the Indian Lake Watershed Association (ILWA) was incorporated as a non-profit 501c3.

1980’s-1990’s City of Worcester upgraded pumping stations around Indian Lake as well as pinpointed and repaired leaking sewer lines.

1982: Eutrophication and Feasibility Study for Indian Lake by Tighe & Bond ordered by the Comm of MA Executive Office of Environmental Affairs

1986: Full lake herbicide treatment to combat nonnative invasive weeds at a cost of nearly \$100,000

1989: Lycott Environmental Diagnostic/Feasibility Study for the Management of Indian Lake



prepared for the City of Worcester and Mass Division of Water Pollution Control.

1998: Indian Lake Listed on state's 303d list of Impaired Water Bodies for Nuisance Aquatic Plants, Organic Enrichment and Low Dissolved Oxygen due to phosphorus which is deemed to be accelerating eutrophication (dying).

1998: Worcester was issued NPDES Permit MAS010002 storm water discharge permit which includes many improvements to infrastructure and practices to protect Worcester waterways.

1990s: Local Boy Scout stencils over 1500 storm drains as an Eagle Scout project.

1990s: Drawdown recommended by Lycott put in place. Lake has been lowered to between 4 and 6 feet vertical from late October to late February/early March since that has been a key tool to manage invasive weeds without the use of chemicals.

2002: State published the Total Maximum Daily Loads (TMDL)... this is a report that sets acceptable limits for phosphorus in Indian Lake and outlines corrective actions to achieve that goal. This document suggests a 40% reduction in phosphorus is needed to improve the waterway.

2003: Watershed wide survey – volunteers covered 15+ square miles to identify pollutants and other items that may be negatively impacting the waterways. Action items included erosion control, street paving, and catch basin maintenance. 2005: DEP Non-Point Source Pollution

319 grant for Indian Lake Resource Restoration Original project budget: \$437,900 (\$253K from DEP); goals to reduce nutrient and phosphorus loading 2007 Aquatic Control Technologies hired by ILWA to characterize sediment at 4 locations as step towards sediment removal.

2010: Students at WPI complete first Independent Qualifying Project: Aquatic Plant Life Survey and Bathymetric Survey of Little Indian Lake.

2011: City of Worcester hires Brown & Caldwell do prepare a Phosphorus Reduction Plan for Indian Lake.

2012: Gov. Deval Patrick signed legislation that restricts the use of phosphorus in lawn fertilizers, a measure that is expected to help cities and towns comply with federal regulations requiring that phosphorous be removed from storm water.

2012: ILWA reaches out to WPI seeking assistance with dredging permits. There is not interest.

2013: Students at WPI complete second Independent Qualifying Project which included a comprehensive weed survey of the main lake, mapping and developing an online program to track the presence of invasive weed growth.

2014: Fertilizers with phosphorus only available for new lawns.



Figure 1: Indian Lake, Looking North East

### **Deterioration of Lake Health**

Indian lake is the largest body of water located within the City of Worcester. The lake has offered the community, family activities, including two beaches, picnic and recreation areas, a public boat launch and tennis courts. Over the past 50 years, due to recent urban and residential development, watershed complications have dramatically increased, and proven problematic for the water quality of Indian Lake including its tributaries and inlets. The development has contributed to increased sedimentation and unwanted nutrients in the lake. The nutrients continually enter the lake from both upstream and urban runoff. The water impairment has led to an increase in nuisance aquatic plants and wildlife. Nonnative, invasive and unwanted plants that are impossible to eradicate have created on going challenges for lake management. This is the

third IQP that WPI has done in conjunction with the Indian Lake Watershed Association (ILWA). The lake will likely require constant vigilance from the community for the foreseeable future.

Indian Lake has been listed on a federal list of impaired water bodies since 1998. A Total Maximum Daily Load (TMDL) was created in 2001-02 based on the amounts of high phosphorous and nutrient loading. The state noted that a 47 percent reduction in phosphorous is necessary to help improve the waterway. Other problems that the lake faces are eutrophication (accelerated aging of a lake that is overloaded with nutrients), water clarity that does not meet state standards in public bathing beaches at a depth of 4 feet, and low dissolved oxygen levels that threaten aquatic life, color and turbidity of water. All of these known conditions have been instrumental in the continued deterioration of Indian Lake. High nutrient loading, poor circulation of oxygen and high water temperatures caused rapid growth (bloom) of blue-green algae (cyanobacteria). The high algae count resulted in the closing of Indian Lake due to the presence of cyanobacteria and sedimentation. The lake closed in July 9, 2014 and was reopened the fall of October 2014.

The federal government developed a series of laws governing water pollution in 1972, which was amended in 1977 and 1987. These laws set aside water quality standards for site specific allowable pollution loads for individual water bodies and their intended use. This laid the groundwork for bringing non-conforming water bodies into compliance. The Clean Water Act sets standards for drinking water and public waterways. Ideally water bodies would be evaluated against the standards and funds would be made available in order to bring the waterways and bodies into compliance. Water bodies that fail to meet the state's criteria are placed on the

303(d) list of impaired water bodies. The state then issues a Total Maximum Daily Load (TMDL), designed to help track and regulate to regulate and keep track of pollution. The report is designed to identify limits for maximum allowable pollution for the specific water body to maintain approval for intended use.

The goal of this study was to survey the Indian lake watershed and propose best practices that maintain the long-term health of the lake.

### **Survey**

A survey of the Indian lake watershed would inform the city (of Worcester) officials of issues on the lake and its watershed that they may be able to manage more efficiently. The last survey was conducted in 2002 and this report will serve as updated document highlighting the non-point source pollution contributing to the problem in Indian Lake. The study and survey focus mainly on the areas surrounding Indian Lake. The Indian Lake watershed is a very small portion of the Blackstone River watershed. There are several things that need to be addressed to bring Indian Lake to good health. The survey will be helpful for not only identifying problems but also actively getting the community involved in watching for issues and making changes that can help restore the lake. By educating the community on the effect they have on non-point source pollution and surveying the surrounding areas will result in significant improvements to the lake.

### **SMART LAKE Monitoring System**

An updated monitoring system would preserve the long-term health of the lake. We took inspiration from Lake George and the Blackstone River, two other impaired bodies of water in the region. Our guided recommendations can help keep the community up to date on the state of the lake. Also to this end, one of the goals of this study is to make any data collected in the future understandable to people without a background in environmental science.

The scope of this project included: Reviewing the documents published by the commonwealth of Massachusetts department of environmental protection surveying a Lake watershed and preparing an Action Plan'. There is a list of major resources within this document that aid in preparation for future plans or alternatives for surveys and strategies on taking action. These steps are involved,

1. Establishing survey areas, coordinating volunteers, issuing press releases (in cooperation with the ILWA);
2. Developing handouts on being good watershed stewards.
3. Analyzing data after the survey and organization of data as well as a comparison / contrast of the survey last conducted in 2002 survey.
4. Recommending an action plan for going forward.

## Methodology

### Watershed Survey

In order to motivate local citizens to participate in the water shed monitoring a presentation (figure 2) was given on both technical details people needed to complete the survey, and the reason each question was included on the survey. For example, participants were educated on, how runoff affects the lake, as well as how surfaces contribute to that problem. That presentation was given two days before the survey date. We also supplied sample copies of the survey sheet for volunteers to preview and familiarize prior to the day of survey.



Figure 2. Information session.



The first step in the project was the research of common water quality concerns and specific problems in this watershed's past. This was done through online government resources, and through previous local survey projects, respectively. This allowed for time to compile complete a list of likely concerns that the surveyors might encounter. The list consisted of: the slope at the shore, the type and amount of vegetation, the levels of erosion, evidence of excess addition of nutrients, sedimentation, and surface impurities.

From that list there were created two items for survey (Figure 3). The first was a survey, which contained each of the items in an easily understandable form, as well as a question about general land use. The second was a presentation intended to educate the public about each item on the list and how it impacts the health of the water.

General Categories of Land Use

- % Construction       % Commercial or Industrial  
 % Residential       % Forest/Wooded  
 % Agriculture       % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat       Moderate       Steep

The Shore is Vegetated With...

- Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet     5-50 feet     50-100 feet     Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%     25-50%     50-75%     75-100%

Is There Evidence of Soil Erosion?

- Yes       No

Evidence of Excess Nutrients

- Pet Waste       Fertilizer Use       Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating  
 Obvious Sedimentation

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas, mark them on the map, and take photographs if possible

Figure 3. The survey

Each question on the survey is intended to highlight the causes and effects inherent to lake health. First, what the land is being used for must be established. The impact of a factory is far different than the impact of a grove. The next five questions deal with the makeup of the shoreline. Thick vegetation is a good buffer against runoff and toxins, so large bands of trees or

bushes next to the water is a positive sign we instructed people to look for. Erosion of shorelines is damaging to both the land habitat and the water habitat. Surveyors were instructed to look for erosion, or signs that erosion is imminent, like steep slopes leading into water. Vegetation also secures the soil, fighting erosion. Shade near shores regulates water temperature.

The next question deals with common sources of nutrients. One of the most apparent problems in Indian Lake is excesses of nutrients.<sup>1</sup> Volunteers noted down possible sources of the nutrients phosphorus and nitrogen. Large scale fertilizer use is a big contributor that is also very apparent to casual observers when comparing lawns that do and do not use fertilizer. Then the survey instructs volunteers to search for damaged or clogged water infrastructure. If drainage is blocked, water will flow on the surface, picking up particulates, pollutants, and the oil that frequently coats roadways and parking lots.

The rest of the questions on the survey are lists of easily noticeable problems, categorized by the location in which they are found. Volunteers used the provided text box, pictures, maps, and checkboxes to indicate which of these they found. The frequency of these problem spots highlighted areas of the watershed in need of change.

On the day of the survey, the attendees were split into groups and assigned to large chunks of the watershed. Each area was numbered, and extended radially from the lake shore to the edge of the watershed. The groups spent 2-3 hours looking for evidence of the items we had taught them about, and then brought all the forms back to a central location.

We took the forms, and had both researchers individually grade each of the list items from 1-5 on each survey sheet. These were averaged and used to create the data presented in the “results

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<sup>1</sup> Indian Lake Phosphorus Reduction Study, pp. 1

section” in this report. The data is organized in a heat map, which not only shows which locations have the worst collection of problems, but also which problems were the most pervasive.

### **Water Quality Monitoring**

From the survey, we identified which problems were worst in the watershed, and where they were most prevalent. We also used some water monitoring ideas from our earlier research.<sup>2</sup> We listed qualities that couldn’t be measured with the naked eye by untrained observers. Oxygen levels, pH, and the presence of chemicals, for example. Then we looked at government regulations about water quality. From those, we could determine what state officials would care about if they were to do testing on the lake. For example: determining if the lake was safe for use. We made a list of everything that we wanted to have tracked over a long period of time.

We reviewed common water monitoring systems, on the commercial market, and in reports on other similar bodies of water. We tabulated the costs of systems that could measure the qualities we determined necessary. Those are included in this report.

Our next step was making this data accessible and understandable to members of the public without a background in ecological science. We created a prototype spreadsheet that updated to a series of graphs. On these graphs are marked safe areas for each measurement, so that problems could be identified at a glance. That system, or one like it, if kept updated, could be a great asset to public education. A link to that spreadsheet, along with pictures, is included in the results section of this report.

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<sup>2</sup> <http://water.epa.gov/type/watersheds/monitoring/monintr.cfm>

## Results

The volunteers covered most of the watershed of Indian Lake, recording problem areas and cataloging egregious threats to the lake health. We took the general categories of threat from the survey and rated each area for each threat category. The blue section details land use. Most of the watershed is residential, but some portions are largely commercial, and there is still some forested land in the watershed (figure 4a and 4b).

The red sections details threat categories. The darker the area, the worse that problem affects that area. Slope is a measure of the steepness at the shoreline. A very steep slope can lead to soil erosion. Shore Vegetation Strength is a measure of how thick the growth is around the shore. Tall trees or thick bushes contribute to good soil health. Shore Vegetation Distance is the distance that the vegetation extends away from the water. A long stretch of vegetation, even weak rooted grasses, helps filter out harmful chemicals in runoff. Shore Shade is important because long exposure to sunlight heats up the shallow water at the shore. The ecosystem operates optimally at specific temperatures, and even slight changes can upset the balance. Erosion is harmful to both the on land and in water habitats. It eats away at the shoreline and increases the amount of dirt and sediment in the water. Excess Nutrients is a measure of things like fertilizer, pet waste, and other sources of nitrogen. We track nitrogen because it is the sparsest or the nutrients algae needs. Since the other nutrients are abundant, nitrogen limits algae growth. Sedimentation is loose particles in the water. This is harmful for the same reason as lack of shade: it changes the temperature of the water. Additionally, it can carry more nutrients into the water. Surface irregularities are the things most people would notice about an unhealthy body of water. Muck, oil, and sheen. Damaged Infrastructure mostly consists of clogged drainage pipes that cause rainwater to run over streets, carrying harmful particles with it.

Area	A	B	C	D	E	F	G	H	I	J	K	L	M
<b><u>Land Use</u></b>													
Residential	4	4	5	5	5	5	1	0	3	3	5	5	4
Commercial	1	0	0	0	0	0	0	5	3	3	0	0	1
Forested	1	1	0	0	0	0	4	0	0	0	0	0	1
<b><u>Lake Health Problems</u></b>													
Slope	2	3	1	5	1	5	3	5	1	2	3	3	2
Shore Vegetation Strength	1	1	2	1	2	2	2	2	4	3	4	2	1
Shore Vegetation Distance	3	5	5	3	5	4	3	5	5	4	3	5	4
Shore Shade	3	1	1	1	1	2	3	2	5	3	3	1	4
Erosion	2	4	3	2	3	1	1	5	1	5	3	3	3
Excess Nutrients	4	5	3	2	1	5	1	4	4	3	5	2	3
Sedimentation Surface Irregularities	1	5	5	3	5	5	1	5	1	3	3	1	5
Damaged Infrastructure	4	2	2	2	5	2	2	2	5	2	5	1	2
TOTALS	22	29	23	21	25	27	21	35	31	30	30	19	29

Figure 4a: The darker the box and higher the number, the more prevalent the problem is in that area.

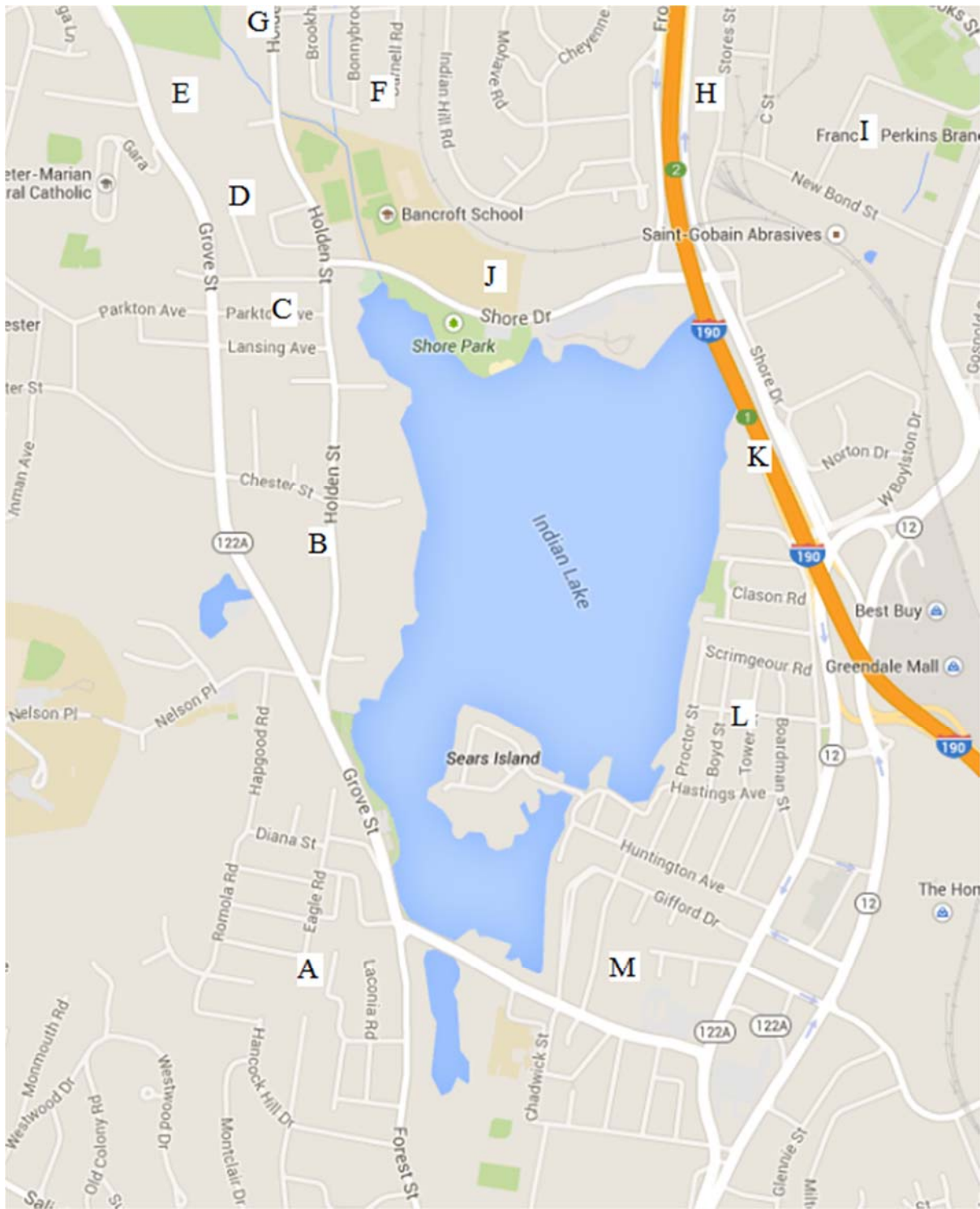


Figure 4b: Labelling the areas survey groups were sent to



Located on the map are the subdivisions of Indian Lake. The worst problems occur at areas H, I, and K, on the east side of the lake, extending from Grove Street up towards Quinsigamond Community College. There are a couple possible causes. First, Interstate 190 runs directly through that section of the watershed. It borders the lake directly, and any road that close to a body of water is harmful, especially one that large. Secondly, the survey takers identified several of those areas as having a large commercial section. The large parking lots, huge concrete buildings, and lack of vegetation create an area where runoff is unimpeded on its journey to the lake.

#### Area A: West side of Little Indian Lake

There is a damaged retaining wall in Morgan Park. There is soil erosion on the shoreline of the park where there is no stone. Across from Morgan Park on 122A, there is a clear cut hill that is eroding. The walls should be repaired and something should be done to stop the flow of sediment from the clear cut into the lake, such as a silt fence.

#### Area B: West shore of Indian Lake

There is a silt fence near 573 Grove that is failing. Full catch basins and storm drains are creating standing water. Regular maintenance is key for both.

#### Area C, D, and E: North West shore of Indian Lake, including Bancroft School

There is a stream, crossing Chester St. and Grove St. that is stagnant, filmy, and has trash in it. It feeds directly into the lake. There are also several outflow pipes that are clogged. The stream needs to be cleaned of trash at the very least, and should be watched.

#### Area F: Near Brookhaven

The shoreline here is very steep into the lake, and it is eroding, leaving sediments in the water. It should be watched, in case it becomes worse.

Area G: Around Holden St.

Save for some clogged catch basins, this forested area is fairly safe for the lake.

Area H and J: Around 15 Ararat St.

Several retaining walls and silt fences are damaged in this area. The water here is murky, and there isn't much vegetation near the shoreline. Many of the catch basins are totally clogged. This area needs a great deal of work, because it is mostly commercial. The infrastructure needs repair, even simple repairs like replacing the silt fence. The shoreline would also benefit from having bushes or trees planted to stabilize the soil and combat runoff.

Area J: Around the YMCA

In this area, the erosion of the sand into the lake is problematic. There is some trash and debris that should be cleaned up. Also, there is some vegetation between the parking lots around the YMCA and the lake, but there could be more.

Area K: Huntington to Hastings Ave.

Surveyors reported a foul smell and sedimentation in the water here. There was also evidence of excess nutrients from pets and from lawns.

Area M: East shore of Indian Lake to Little Indian Lake

The outlet between Little and Big Indian Lake is clogged, and there is trash in the area around it. The catch basins are clogged around Little Indian Lake as well. There are direct paths for runoff to enter the waterways. A cleanup effort in this area would be helpful.

A summary. The raw surveys referenced here can be found in the appendix.

<b>Survey Area Identification Punchlist</b>			
<b>SURVEY #:</b>	<b>AREA:</b>	<b>LOCATION:</b>	<b>PROBLEM:</b>
18	15	Forest Street + I22A Intersection	Clogged Drains / Catch Basins
9, 10	8	Holden Street + I22A	Water discoloration/ Scum
1	1, 2	Along I22/ Across from Morgan Park	Lack of vegetation
3, 4, 5	2, 3	Morgan park shore line	Erosion
2	1, 2	North End of Waverly	Erosion
2	1, 2	Waverly/ Laconia	Erosion
5	2, 3	Left of 573 Grove Street	Damaged Silt Fence
9, 10	8	Holden Street	Re-Stenciled Storm Drains
4	2, 3	Kiver Pond	Dam disrepair
4	2, 3	Armenian	No vegetation
18, 19	15	Grove Street / across from Morgan Park	Clogged Drains /Re-Stenciled storm drains
7, 8	6, 7	Grove Street/ Forest street	Clogged Basin
3	2, 3	Nelson Place School (behind)	Clogged Basin/ Drains
6	6, 7	9 Kimball Street	Output (pipe) damaged
6	6, 7	Shoreham Road (end)	Grass Clippings/Clogged drains
6	6, 7	700 Grove Street – Stream	Blocked/trash/stagnant
12	9	66/68 Brookhaven	Fertilizer → Tributary /yard waste
		79/83 Darnell Street	Clogged Drains
11, 12, 13	9	15 Ararat Street	Broken sediment Fence/cloudy H2O/ low Vegetation
11, 12, 13	9	102 Shore Park	Clogged storm drains/ Natural overflow
17, 18, 19	15	Proctor/ Scrimqeur Road	Erosion/ abandoned boats
17	15	51/57 Proctor	Fertilizer application
14	9	YMCA	Soapy H2O
15	12	Huntington/ Lulia/Hosting ave	Sedimentation
11, 12, 13	9	Shore Drive	Clogged Basin
11, 12, 13	9	I90 exit	Clogged Basin

## **Smart Lake Systems: Suggestions for Water Quality Monitoring**

### **Education**

In order to take the next steps to better the water quality of Indian lake, residents and businesses who live and operate in the watershed need to be educated. Initiation of education programs to raise community awareness with information on watersheds and the impact individuals have on Indian lake is important as we take steps forward. The watershed information would suggest eco-friendly products for property maintenance, as well as topic such as;

- The importance of using proper chemicals and fertilizers when dealing with lawn maintenance
- Descriptions of native plants that are appropriate for the landscape
- The importance of vegetation alongside the banks and in-between the roads/parking lots, to prevent run off from ending up in the lake
- Non-point source pollution (education on the area of the watershed in general)
- The dumping of landscape waste into streams, waterways, or sewers that drain into the lake
- The reduction of excess dumping of waste (pet excrement, soap for car washing into sewers)

There are locals have a direct impact and effect on the future of Indian like. By training them and educating the community it would greatly reduce the negative effects individuals have on Indian Lake. This information should be sent out in the form of emails to parents of students attending Bancroft school, as well as other located in the watershed. Another way to spread the knowledge would be through flyers and/or notices that would be attached to water and sewer bills.

## Water Quality

The testing of the water quality in Indian Lake needs to be continued in order to set a benchmark for future growth and improvement of Indian lake. Water monitoring stations need to be set up in areas like the Ararat Brook and other waterways that feed Indian Lake. The water in the streams that feed into the watershed are constantly moving and mixing up and down, side to side, Pollutants that enter the lake via non-point source pollution are getting into these streams and being mixed into the water before they reach the lake. By time the polluted water reaches the lake it has already been thoroughly mixed, therefore making it more difficult to locate where the pollutants are coming from. For example in a given stream that pollutes the lake it does not necessarily mean the whole stream is bad. If pollution is entering the stream that feeds into the lake downstream more pollution may be seen at a given point, whereas further upstream or downstream the pollutants may be diluted with more water. The only issues that we run into is that in most cases there are more than one source of pollution affecting a stream.

Pollution gets divided into two classes depending on its source Point source and non-point source. Point source pollution comes from a clear identifiable point in which pollutants are being discharged into a body of water (pipes, factories, homes etc.) Non-point source pollution comes from the surface water runoff. It at times can be difficult to identify because it generally originates from a broad area. Examples consist of (urban runoff from; construction, city street, parking lots etc.).

The most toxic pollutants found in Indian lake range from household trash (bags, cans, etc.) to large amounts of phosphorus that contribute to several other issues. The increased phosphorus gives way for invasive species of plants and animals to overrun the lake and add to its degradation. Sediment and over nutrients is one of the major contributors to the current state of

Indian lake. The combination of the lakes shallowness, the summer heat, and presence of excess nutrients can lead to low levels of dissolved oxygen. The excess nutrients allow for other invasive species to enter the water such as bacteria, pathogens, pesticides, which can lead to low amounts of dissolved oxygen. Low dissolved oxygen is detrimental to the lake for several reasons. Plants and animals need oxygen to survive, so when there are low amount of dissolved oxygen, it result in the death of plants and animals causing pollution. Oxygen is a byproduct of photosynthesis, the process that plants use to make their cell tissue from oxygen and sunlight. Animals, bacteria, fungi, and fish all use oxygen to break down organic matter and sugars. When oxygen is in the air is referred to as oxygen gas, when it is in the water it is called dissolved oxygen. Since dissolved oxygen is consumed by aquatic animals, plants, and bacteria, the amount of dissolved oxygen can tell you how healthy the water is for these organisms. The factors that contribute to low dissolved oxygen are temperature, water circulation, and amount of organic material. Oxygen dissolves into water the same way that table salt does. The amount of oxygen present in a water body is directly related to the water temperature. As the water get cooler its ability to hold more oxygen increases. This is why during the summer months like June, July and august, there are generally lower levels of dissolved oxygen. The circulation of water within the lake is important for the diffusion of oxygen from the atmosphere into the lake. In general an increased in the flow rate of a water body, the amount of dissolved oxygen is increased as well. The amount of organic matter present also has major impacts on the lake. The amount of organic matter in the water affects dissolved oxygen by lowering it. The lower the amount of organic matter the lower the amount of dissolved oxygen.

## **The Water quality Action Plan**

The overall goal of the action plan is to improve water quality in Indian Lake and restore it to the functional community outlet it once was. There are a compilation of many efforts working to achieve this goal consisting of; Indian Lake Watershed Association Volunteers Program, Worcester Department of Public Works and Parks improving monitoring of storm drainage systems, continuous application for grants and other federal and state aid. Continued growth among the watershed associations, and partnerships with local and state officials as well as agencies is important to improvement of Indian Lake.

We propose that in order to reach the goal Worcester should act sooner than later, before the lake reaches a point where it can no longer be restored. Currently in New York, Lake George faces similar problems as Indian Lake such as storm water runoff, invasive species, salt, nutrients loading, and upland development. At Lake George they have made efforts to “protect the water quality and public enjoyment of Lake George to the maximum extent practicable by proactively preventing the introduction of new aquatic invasive species”. Lake George is said to be the “smartest lake” in the world given its current technology and efforts to maintain a popular vacation spot, and lucrative natural resource for the state of New York. Though we do not have the same budget as Lake George however by taking similar steps that Lake George did, Indian lake can make some drastic changes in order to make positive steps towards its improvement. The good news is that Indian Lake is only 0.6% the size of Lake George, so systems could be scaled down significantly.

## **PLAN for Indian Lake**

Based on the early success of Lake George we propose a two-fold plan for Indian Lake.

A. Implementation of a Waterwatchers program that will consist of a small group of concerned citizens and stakeholders who will be empowered to make decisions, and serve as the government liaison. They will also be charged with dissemination of information and outreach activities to the local community. This group maybe a subgroup within the ILWA of Worcester.

B. Harness science and technology for Watershed Monitoring & Assessment in real time. Instruments can now record almost any quality one might be interested in. Because we know what is currently harming Indian Lake, such as high nitrogen levels, we can use modern instrumentation to track these dangers.

### **A. Implementation of a Waterwatchers Program**

By empowering citizens to be active members in defending against storm water runoff, wastewater treatment, imprudent development, invasive species and resources protection the Waterwatchers program can be successfully maintained at Indian Lake. This allows the community to have a code of conduct relative to the following topics;

#### **The Waterwatcher would oversee:**

##### **1. Land use Review:**

The Waterwatchers of the Indian Lake should review in meeting their agenda and public notice to gauge the potential for negative impacts to the Indian Lake (and the ecosystem) and its water quality. When they meet the review and evaluate how applicable laws and regulations are to the like via a technical review. They then make recommendations in order to reduce the impacts of negatives influences on the lake. They then make presentations to local review boards and decision makers in order to raise awareness.



## **2. Compliance:**

The Indian Lake Waterwatchers oversee new projects are designed and presented to the area the keep in mind that the impact can potentially be harmful to the lake, if there is poor construction or oversight. The Waterwatchers oversee the field of compliance with approved plans, and respond to citizen inquiries about observed actions on the lake. They document compliance concerns and notify the appropriate agencies in order to take action.

## **3. Legal:**

At times some activities will be approved that are against the law. When the activities are approved or carried out they have negative that can have negative impacts on the Indian Lake and its water quality. In these cases, the Waterwatcher is willing and able to partner with affected community members to challenge such actions in court, giving them the ability to have a direct effect and take action.

## **4. Advocacy:**

The Indian Lake has the ability to protect its water quality, by relying on the use of scientific data, engineering principles and field observation techniques. Much of their advocacy requires educating and informing the elected officials, members of review boards, and the public about how their actions may affect water quality. They also put out e-news on how the quality of the lake is doing.

## **5. Outreach:**

In order for Indian Lake to be successful it is important to have stakeholders. The use of science and technology to document concerns and problematic areas in the lake. Watershed is able educate and inform with publications, community events, and professional level educational seminars. The Waterwatcher offers property owners, developers, boaters and agencies involved, science-based, common sense options to protect our precious natural resources.

## **B. Watershed Monitoring & Assessment:**

By consistently documenting the changes in the lake based off of the data collect they are able to maintain the lake. The Waterwatcher documents changes by monitoring chemical, physical and biological components of the streams that feed the lake. They also observe underwater changes including algal growth and other possible indicators of declining water quality. Overall giving them an inside look and view of the lake not only as a lake but as an Ecosystem.

### DIY water Quality:

A major part of Lake George's success was their ability to reach the community. By educating the community on the affects their actions had on the lake allowed for the project to flourish. They were able to reach the public through several environmentally safe Do it yourself (DIY) projects that are low impact development and eco-friendly. These projects provide fun and friendly ways for residents around the lake to get involved with lake protection. They have made efforts to educate the community on ways to make gardens that mimic nature's natural drainage patterns in efforts to reduce storm water runoff. Low Impact Development (LID) is promoted through training seminars for municipal review boards, technical reviews of project applications,

and an annual conference that provides continuing education credits to licensed design professionals. The DIY section of the water keepers offer teach home owners how to build shoreline and stream buffers, how to plant rain gardens that help treat and control storm water runoff, and how to design and maintain septic systems. DIY also details the importance of preserving wetlands and the serious consequences—to water and wildlife habitat of using fertilizers, harsh pesticides and herbicides. Together, DIY stewardship practices help reduce pollution entering Lake George while adding beauty and value. B educating the community around Indian Lake and entertaining similar programs, the ability to restore the lake increases. Slowly but surely all these steps have contributed to the improvements of knowledge that allows Lake George to maintain its beauty. All of these steps listed have ultimately made it possible for Lake George to be a part of the Jefferson Project. Rensselaer Polytechnic Institute, IBM, and the Fund for Lake George have teamed up to make Lake George the smartest lake in the world. With the steps above and some funding I think that future IQP's can turn Indian lake around with this being the start.

## **Appendix**

The appendix contains the raw survey forms, which may be helpful for future researchers and volunteers attempting to make a difference in this watershed.

Survey Area #

1+2

MORGAN PARK &  
FOREST ST.  
ON LITTLE INDIAN

General Categories of Land Use

- % Construction
  - 100% Residential
  - % Agriculture
  - 25% Commercial or Industrial
  - % Forest/Wooded
  - 50% Other PARK
- 25% RESIDENTIAL*  
*100% RESIDENTIAL*  
*25% COMMERCIAL OR INDUSTRIAL*  
*50% OTHER PARK*  
*122A HOLDEN ST.*

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

*FLAT TO MODERATE @ EDGE OF LAKE*

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

*MINIMAL*

Evidence of Excess Nutrients

- Pet Waste + *GOOSE*
- Fertilizer Use
- Green Lawns

*IN PARK*

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

- OUTLET INTO LITTLE INDIAN NEAR FOREST + 122A INT. FULL OF LEAVES @ THIS TIME*
- OUTLET HOLDEN ST + 122A SOME FOAM @ OUTLET*

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

- MOST HAVE ~~LEAVES~~ LEAVES*

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

*@ OUTLET HOLDEN ST. + 122A*

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

- SUDS @ HEADWALL INLET @ 122A+ HOLDEN ST. FORK
- RUN OFF FROM CLEARCUT ALONG 122A ACROSS FROM MORGAN PARK  
NOTHING TO CONTROL EROSION OFF HILL
- RETAINING WALL ACROSS FROM MORGAN PARKING LOT SILT FENCE  
ON TOP OF WALL IS FALLING APART
- MORGAN PARK FULL OF GOOSE POOP
- SECTIONS OF MORGAN PARK SHORELINE W/O STONE GRADING INTO LAKE

2

Survey Area # 142 LACONIA ST + WAYERLY

General Categories of Land Use

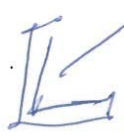
- 5% Construction
- 95% Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other

1 STREET BACK FROM LAKE

Shore Characteristics

The Slope of the Site is...  
 Flat  Moderate  Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated



How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet  5-50 feet  50-100 feet  Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%  25-50%  50-75%  75-100%

Is There Evidence of Soil Erosion?  
 Yes  No ~~Other~~ ~~Other~~ @ NORTH END OF WAYERLY

Evidence of Excess Nutrients  
 Pet Waste  Fertilizer Use  Green Lawns

Do You See any Pipes?  
Mark their general location, and describe what is going into or out of them  
\_\_\_\_\_  
\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?  
Mark their general location, and describe what is clogging them  
\_\_\_\_\_  
\_\_\_\_\_

Water Quality Concerns  
 Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation



## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

NORTH END OF WAVERLY  
 SITE WORK IN PROGRESS  
 ABUTTS CLEAR CUT HILL DOWN  
 TO MORROW PARK



## Survey Area # \_\_\_\_\_

### General Categories of Land Use

% Construction       % Commercial or Industrial  
 % Residential       % Forest/Wooded  
 % Agriculture       % Other \_\_\_\_\_

### Shore Characteristics

#### The Slope of the Site is...

Flat       Moderate       Steep

#### The Shore is Vegetated With...

Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

#### How Far Back From the Shore Does the Vegetation Extend?

0-5 feet     5-50 feet     50-100 feet     Greater than 100 feet

#### How Much of the Shore is in Shade?

0-25%     25-50%     50-75%     75-100%

#### Is There Evidence of Soil Erosion?

Yes       No

#### Evidence of Excess Nutrients

Pet Waste       Fertilizer Use       Green Lawns

#### Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

\_\_\_\_\_

#### Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

\_\_\_\_\_

#### Water Quality Concerns

Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation

3

2/3

# Narrative Section

Morgan Park

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

- Morgan Park*
- Geese
  - ~~open~~ catch basin grates - Barnstable Rd.
  - Catch basin full - Grove St (across from Morgan Park)
  - Storm drains not stenciled Grove Street
  - Catch basin at the end of a driveway
  - Catch basin clogged behind (1 Hapgood Rd) new section of Nelson Place School
  - drain holes clogged in cement wall behind new section of Nelson Place School
  - water flow from behind softball field at assumption to Kiver Pond
  - excessive hay/grass clippings around Kiver Pond
  - skim on water in Kiver Pond

*2/3*

Survey Area # \_\_\_\_\_

General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

4

# Narrative Section

23

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

*storm drains*

Holdings restencil needed  
 NPond Stencil needed  
 Green lawns! North Pond  
 4 North Pond landscaped to  
 water's edge/wall - not sure if  
 wall keeps ~~from~~ runoff out from  
 lawn  
 Kiver Pond - dam disrepair, beaver  
 dam, scum near dam  
 hay along grove St  
 Parking Lot Armenian Church - no drains,  
 no berms, sloped to water



5

Survey Area # 213

General Categories of Land Use

- 5% Construction
- 10% Residential
- % Agriculture
- 5% Commercial or Industrial
- 15% Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

*grassy / soft shoreline*

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

*Grease Waste  
Morgan  
Park*

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

*yes*  
\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

*Kiver Pond*

Beth Proko  
meg mulhern  
Kim McCoy

Morgan + Delaney Proko

## Narrative Section

2/3

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

left of 573 Grove - Silt Fence above Wall coming down (2pic)

- Shoreham Rd - stormdrains fairly clear - standing water - not marked

Large drain into lake - not flowing (pic)

Excessive lawn clippings at waters edge (pic)

#9 (end of road)

#9 No berm from yard to water (pic) <sup>spike to homeowner</sup>

Full Catch basin Drummond/Holmes St

6 small stream from Grove → Kimball → Shovehan → Indian  
@9 Kimball St

Survey Area # C+7

General Categories of Land Use

100% Construction      \_\_\_% Commercial or Industrial  
100% Residential      \_\_\_% Forest/Wooded  
\_\_\_% Agriculture      \_\_\_% Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

mostly Flat      \_\_\_ Moderate      \_\_\_ Steep

The Shore is Vegetated With...

Exposed Roots  
 Shrubs or Grass  
 Trees  
\_\_\_ The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

0-5 feet      \_\_\_ 5-50 feet      \_\_\_ 50-100 feet      \_\_\_ Greater than 100 feet

How Much of the Shore is in Shade?

\_\_\_ 0-25%      \_\_\_ 25-50%      \_\_\_ 50-75%       75-100%

Is There Evidence of Soil Erosion?

Yes      \_\_\_ No

Evidence of Excess Nutrients

\_\_\_ Pet Waste      \_\_\_ Fertilizer Use       Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

Output in bad shape (old)

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

n/a

Water Quality Concerns

no Oily Sheen or Smell  
no Sewage  
yes Foam or Scum  
no Fishy Odor or Fish Kill  
\_\_\_ Algae or Aquatic Weeds  
no Floating debris  
yes Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

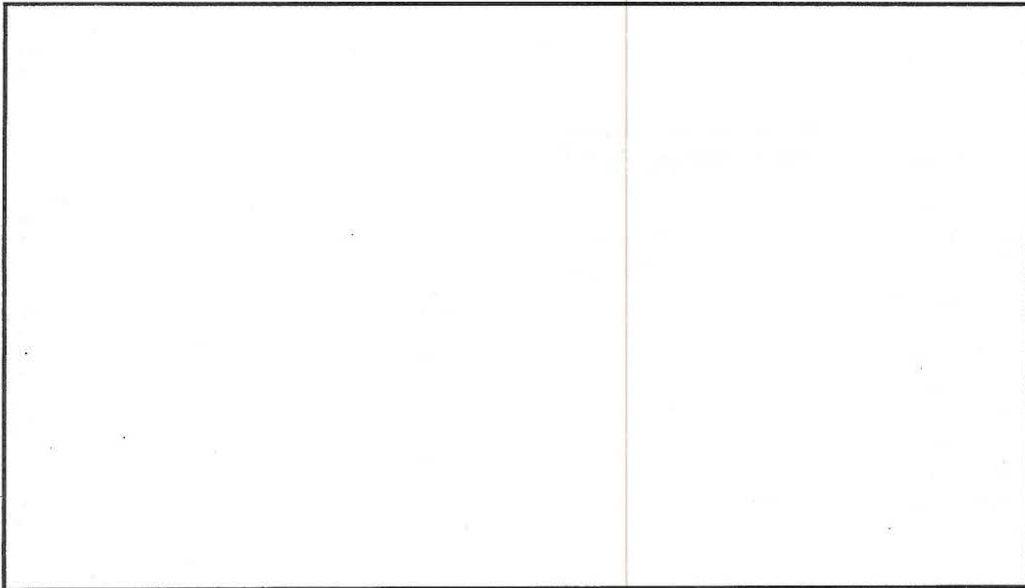
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas





7

# Survey Area # 6/7

*end of Shoreland Rd*

## General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

## Shore Characteristics

### The Slope of the Site is...

- Flat
- Moderate
- Steep

*grass clippings 4 ft going into lake*

### The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

### How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

### How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

### Is There Evidence of Soil Erosion?

- Yes
- No

### Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

*geese droppings*

### Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

*outflow bottom of Shoreland Rd*

### Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

*clogged leaves*

### Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

*geese droppings*

*mud*

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

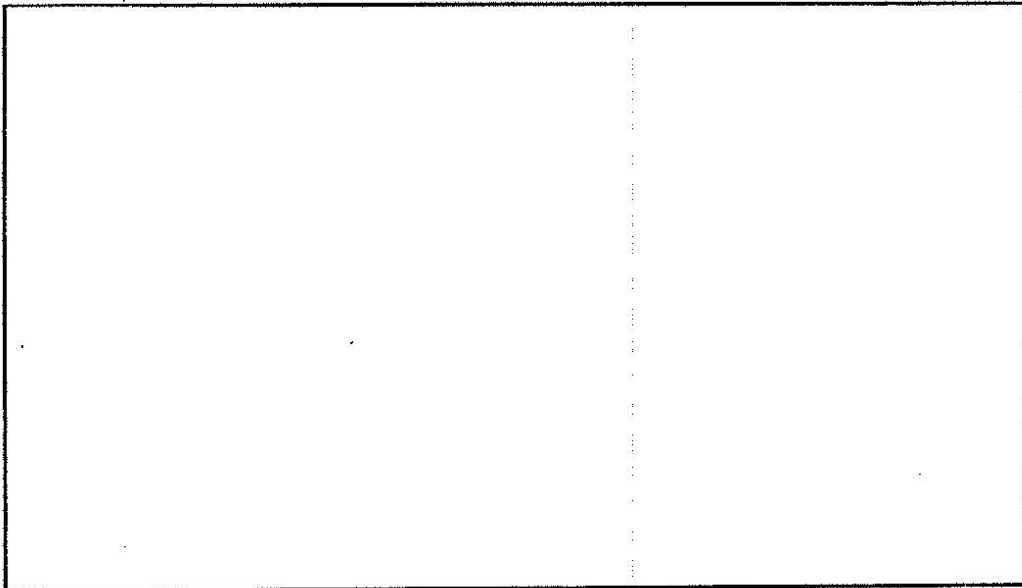
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas



Grove St @ 700 Block

Survey Area # 6/7

8

General Categories of Land Use

- % Construction
- 100 % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

slow moving

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation



9

Survey Area # Haldane St <sup># 66 + 6F</sup> Behind Soccer <sup>Brookhaven</sup>

Brookhaven

General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...  
 Flat     Moderate     Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet     5-50 feet     50-100 feet     Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%     25-50%     50-75%     75-100%

Is There Evidence of Soil Erosion?  
 Yes     No

Evidence of Excess Nutrients  
 Pet Waste     Fertilizer Use     Green Lawns

Do You See any Pipes?  
Mark their general location, and describe what is going into or out of them  
No

Do You See Any Full or Clogged Catch Basins?  
Mark their general location, and describe what is clogging them  
No

Water Quality Concerns  
 Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation



## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

66+68 Brookhaven, yard waste,  
Fertilizer, Sediment and algae releasing into  
tributary

6 Survey Area # Holden St

General Categories of Land Use

% Construction       % Commercial or Industrial  
 % Residential      80% Forest/Wooded  
 % Agriculture       % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...  
 Flat       Moderate       Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet       5-50 feet       50-100 feet       Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%       25-50%       50-75%       75-100%

Is There Evidence of Soil Erosion?  
 Yes       No

Evidence of Excess Nutrients  
 Pet Waste       Fertilizer Use       Green Lawns

Do You See any Pipes? yes  
 Mark their general location, and describe what is going into or out of them  
yes Fork Branch Holden St

Do You See Any Full or Clogged Catch Basins?  
 Mark their general location, and describe what is clogging them  
yes Fork Br Holden St

Water Quality Concerns

Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- yes Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

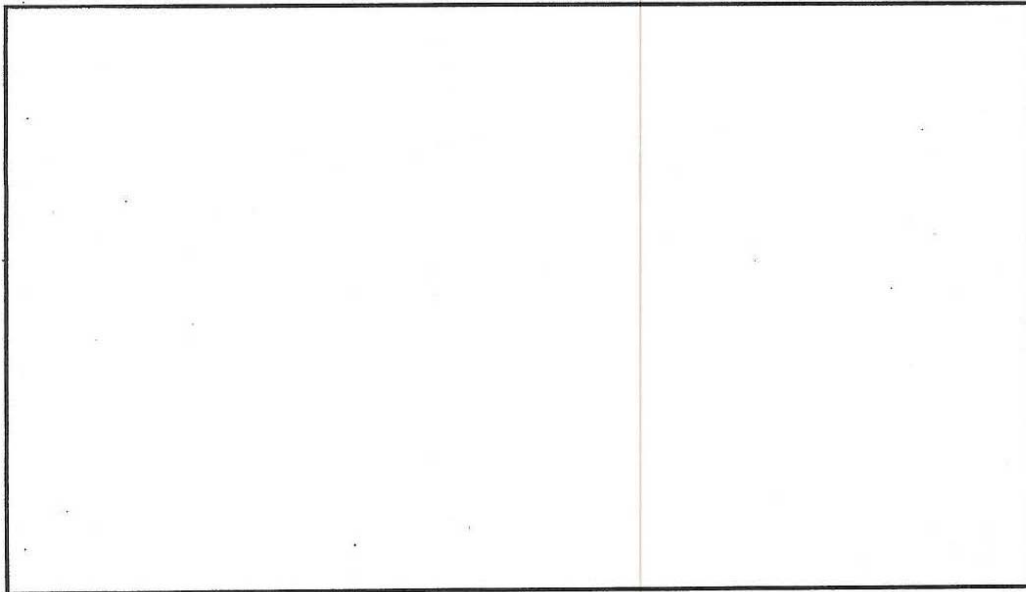
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas





9 Survey Area # 15 Ararat

General Categories of Land Use

% Construction       100% Commercial or Industrial  
 % Residential       % Forest/Wooded  
 % Agriculture       % Other \_\_\_\_\_

*15 Ararat*

Shore Characteristics

The Slope of the Site is...  
 Flat       Moderate       Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet       5-50 feet       50-100 feet       Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%       25-50%       50-75%       75-100%

Is There Evidence of Soil Erosion?  
 Yes       No

Evidence of Excess Nutrients  
 Pet Waste       Fertilizer Use       Green Lawns

Do You See any Pipes?  
Mark their general location, and describe what is going into or out of them  
Pipes Running in

Do You See Any Full or Clogged Catch Basins?  
Mark their general location, and describe what is clogging them  
Clogged Catch Basins Access from 79 Duaneville  
At end of Culter Slick

Water Quality Concerns  
 Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

*Silt fence Ripped and falling.  
Retaining wall falling in stream  
Cloudy water*

12

9 Survey Area # Across from 15 Ararat

General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

7

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

Yes Across from 15 Ararat

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

Poor

NOTES on BACK

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

\* Behind 66 + 68 Brookhaven - Yardwaste/GARDENS/slope of Hill  
 \* Across from 79 ~~Brookhaven~~ - clogged storm drain + 83 Parnell  
 \* Next to 15 Ararat - cloudy water/low vegetation near street/Broken  
 sediment pipe  
 \* Clogged Drain Across from 15 Ararat St  
 \* Vegetation/Ducks/cloudy water - Pond Across from Ararat Inlet

13

Survey Area # 9

Lou Anne  
Blanche

General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other Bancroft school opposite Shore Park

Shore Characteristics

The Slope of the Site is...

- Flat
  - Moderate
  - Steep
- from playing fields and Indian Hill*

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns *Beautiful no weeds*

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

- E of entrance opp black chimney
- 2 drains to over flow basin - opp admissions
- lg drain (culvert) between school + annex

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

- drain - at w exit clogged with leaves
- street drain partially clogged between school + annex
- annex - clogged catch basin near side walk
- street drain

Water Quality Concerns

- Oily Sheen or Smell
  - Sewage
  - Foam or Scum
  - Fishy Odor or Fish Kill
  - Algae or Aquatic Weeds
  - Floating debris
  - Obvious Sedimentation
- SHORE DRIVE - catch basins near 190*
- 190 Exit - 1 catch basin*
- 102 Shore Park Parking lot has 4 (2 simi clogged) leaves*
- Natural over flow basin between 102 and annex*

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

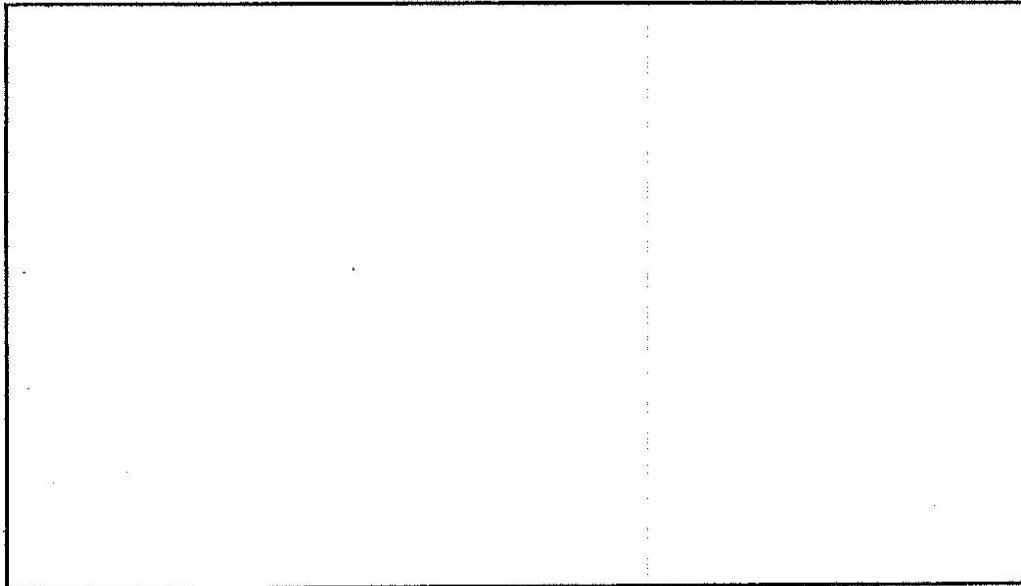
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas



14

# Survey Area # 9

*Loa Anne  
Branche*

## General Categories of Land Use

- % Construction
- % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other institutional

## Shore Characteristics

### The Slope of the Site is...

- Flat
- Moderate
- Steep

### The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated YMEA

### How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

### How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

### Is There Evidence of Soil Erosion?

- Yes
- No

### Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

### Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

### Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

### Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds - only rice + cat tails
- Floating debris
- Obvious Sedimentation



## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
 At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

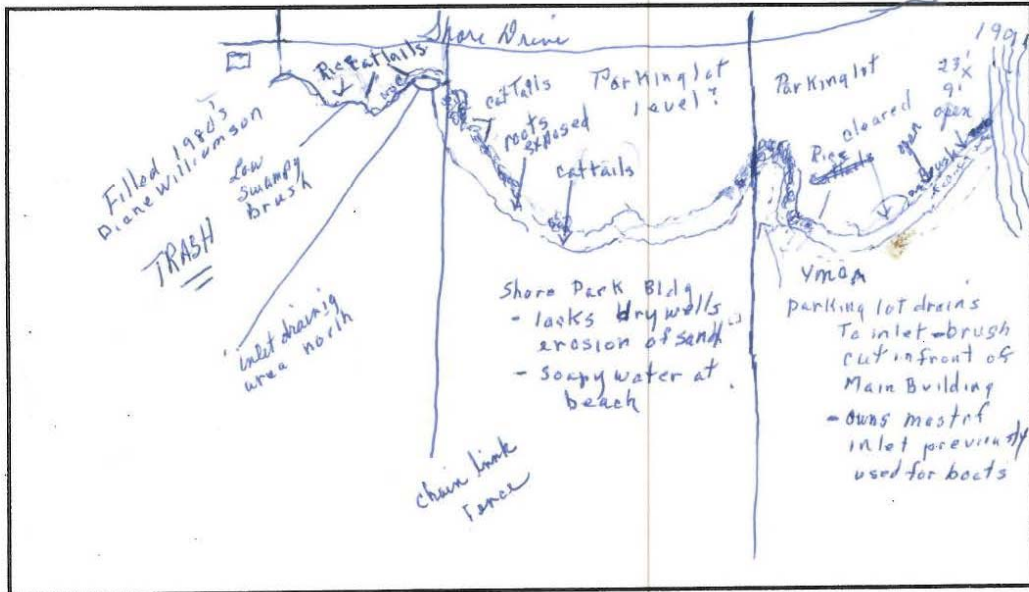
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways - ymca - recent cutting
- Cloudy, discolored, or smelly water - "soapy" water shore Park
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water) } shore park
- Direct paths for runoff to enter waterways

Describe problem areas





15

12

Survey Area # Huntington-Lulia-Hastings Ave <sup>Lee</sup>

General Categories of Land Use

Poplar St. Pics 1-7

- % Construction
- 100 % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...  
 Flat  Moderate  Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
 The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet  5-50 feet  50-100 feet  Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%  25-50%  50-75%  75-100%

Is There Evidence of Soil Erosion?  
 Yes  No

Evidence of Excess Nutrients  
 Pet Waste  Fertilizer Use  Green Lawns

Do You See any Pipes?  
Mark their general location, and describe what is going into or out of them  
\_\_\_\_\_  
\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?  
Mark their general location, and describe what is clogging them  
\_\_\_\_\_  
\_\_\_\_\_

Water Quality Concerns  
 Oily Sheen or Smell  
 Sewage  
 Foam or Scum  
 Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
 Floating debris  
 Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

16

# Survey Area # 12/13/15 "SHORE BOAT"

*Lu/ea*

## General Categories of Land Use

- % Construction
- 100 % Residential
- % Agriculture
- % Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

## Shore Characteristics

### The Slope of the Site is...

- Flat
- Moderate
- Steep

### The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

### How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

### How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

### Is There Evidence of Soil Erosion?

- Yes
- No

### Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

### Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

\_\_\_\_\_

### Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

\_\_\_\_\_

### Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible  
At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

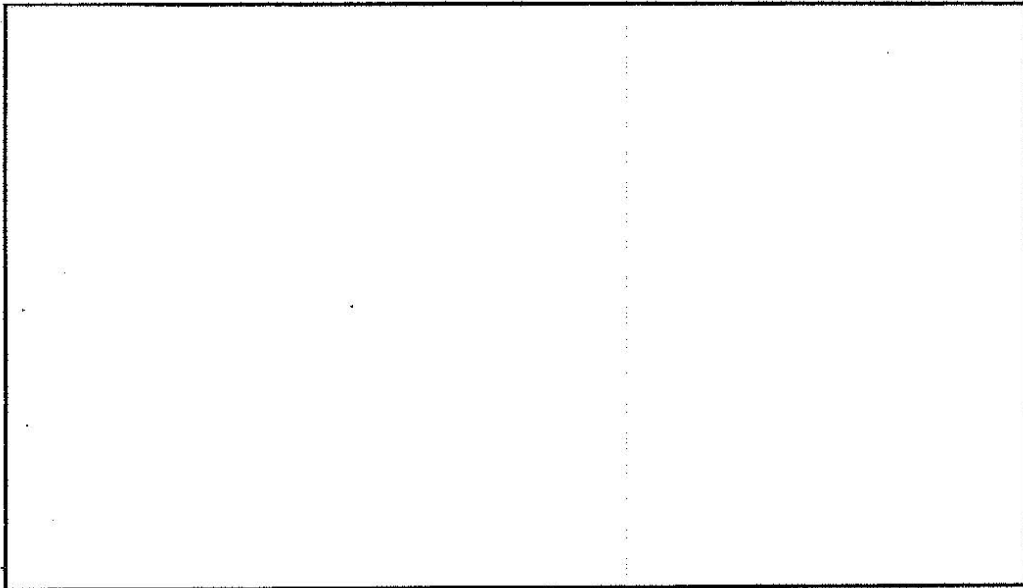
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas



17

12/3/15

Survey Area # \_\_\_\_\_

Hastings Ave <sup>hwy</sup> Pic 58-8-17

General Categories of Land Use

- % Construction
- 95% Residential
- % Agriculture
- 5% Commercial or Industrial
- % Forest/Wooded
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

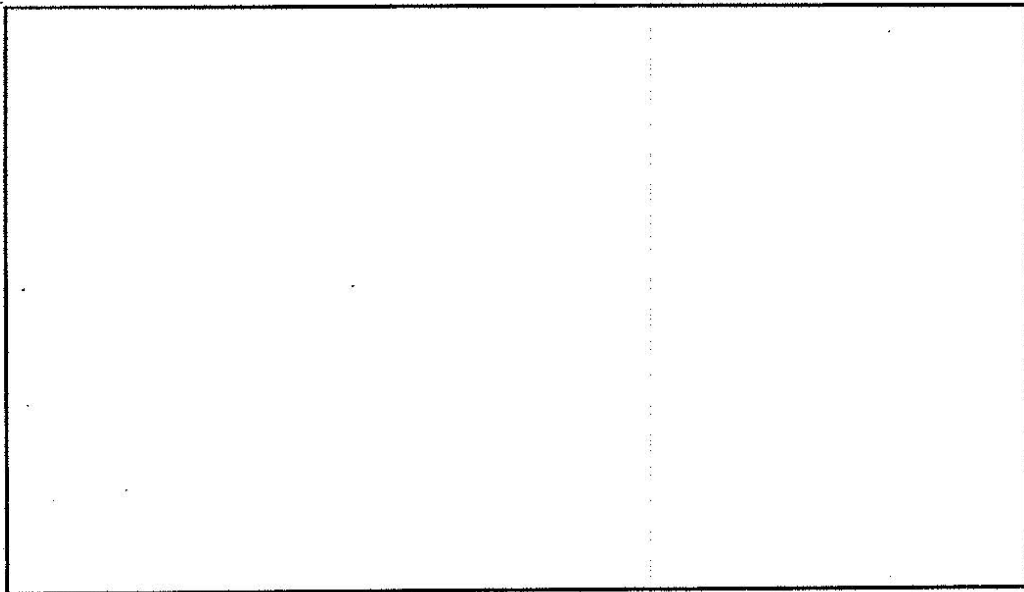
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas



17

Survey Area # 15 *Proctor/Scrimgeour RD*

General Categories of Land Use

<u>2</u> % Construction	<u>0</u> % Commercial or Industrial
<u>86</u> % Residential	<u>12</u> % Forest/Wooded
<u>0</u> % Agriculture	<u>  </u> % Other _____

Shore Characteristics

The Slope of the Site is...  
   Flat     Moderate       Steep

The Shore is Vegetated With...  
 Exposed Roots  
 Shrubs or Grass  
 Trees  
   The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?  
 0-5 feet     5-50 feet       50-100 feet       Greater than 100 feet

How Much of the Shore is in Shade?  
 0-25%       25-50%       50-75%       75-100%

Is There Evidence of Soil Erosion?  
 Yes       No

Evidence of Excess Nutrients  
   Pet Waste     Fertilizer Use       Green Lawns

Do You See any Pipes?  
Mark their general location, and describe what is going into or out of them  
\_\_\_\_\_  
\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?  
Mark their general location, and describe what is clogging them  
\_\_\_\_\_  
\_\_\_\_\_

Water Quality Concerns  
   Oily Sheen or Smell  
   Sewage  
   Foam or Scum  
   Fishy Odor or Fish Kill  
 Algae or Aquatic Weeds  
   Floating debris  
 Obvious Sedimentation



## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
  - Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
  - Improperly disposed of trash, organic debris, and pet waste
  - Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
  - Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
  - Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

Near the Indian lake church there are lots of weeds and drains that have been washed out. Lots of weeds have grown out showing evasive vegetation

Harrington RD to Clayson RD only has one drain.

Lots of road erosion near pump station and abandoned boats by pump station

Fertilizer/Pesticide application at 51157 proctor RD.

- Raychelle Lyman, (508)-756-9653



General Categories of Land Use

- % Construction       % Commercial or Industrial
- % Residential       % Forest/Wooded
- % Agriculture       % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat       Moderate       Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet     5-50 feet     50-100 feet     Greater than 100 feet

How Much of the Shore is in Shade?

- 0-25%     25-50%     50-75%     75-100%

Is There Evidence of Soil Erosion?

- Yes       No

Evidence of Excess Nutrients

- Pet Waste       Fertilizer Use       Green Lawns

→ Hancock Hill Rd. <sup>Pic</sup> 5

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

\_\_\_\_\_

Do You See Any Full or Clogged Catch Basins?

Mark their general location, and describe what is clogging them

see (2)(3) on reverse side

\_\_\_\_\_

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

Little Ind. Lake behind Forest Grove Middle School Pic\*

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways
- Cloudy, discolored, or smelly water
- Sediment buildup
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas

- and inlet to cove in main lake*
- ① Outlet @ Little Indian Lake on Grove St. Clogged to sediment.
  - ② Catch Basin <sup>on Big Lake side</sup> just south of intersection Grove + Forest St. is clogged to sediment. (leaves)
  - ③ Catch Basin @ corner of Grove + Forest St. clogged to overflowing = leaves/sediment. City should clean this (pic #4)

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Survey Area # 15

Kevin  
O'SULLIVAN  
508 8533324  
LITTLE INDIA

General Categories of Land Use

- % Construction
- 50% Residential
- % Agriculture
- % Commercial or Industrial
- 50% Forest/Wooded / PLAY FIELDS
- % Other \_\_\_\_\_

Shore Characteristics

The Slope of the Site is...

- Flat
- Moderate
- Steep

The Shore is Vegetated With...

- Exposed Roots
- Shrubs or Grass
- Trees
- The Shore is Not Vegetated

How Far Back From the Shore Does the Vegetation Extend?

- 0-5 feet
- 5-50 feet
- 50-100 feet
- Greater than 100 feet

RESIDENTIAL SIDE  
SCHOOL SIDE

How Much of the Shore is in Shade?

- 0-25%
- 25-50%
- 50-75%
- 75-100%

Is There Evidence of Soil Erosion?

- Yes
- No (NOT BAD HOWEVER)

Evidence of Excess Nutrients

- Pet Waste
- Fertilizer Use
- Green Lawns

Do You See any Pipes?

Mark their general location, and describe what is going into or out of them

RESIDENTIAL SIDE FOREST + GROVE STS

Do You See Any Full or Clogged Catch Basins? NO

Mark their general location, and describe what is clogging them

Water Quality Concerns

- Oily Sheen or Smell
- Sewage
- Foam or Scum
- Fishy Odor or Fish Kill
- Algae or Aquatic Weeds
- Floating debris
- Obvious Sedimentation

## Narrative Section

Circle Any of These Problems You See, Mark Them on the Map, and Take Photographs if Possible

At Construction Sites, Look For:

- Exposed soil and erosion
- Absence of erosion control (Silt fences and hay bales)
- Sediment build up and cloudy water

On Roads, Look For:

- Absence of vegetation between road and waterways
- Storm drains, pipes, and catch basins that are clogged or feeding directly into waterways
- Damaged or eroding roads, pipes, or ditches. Washouts.

In Residential Areas, Look For:

- Lush lawns *RESIDENTIAL SIDE*
- Improperly disposed of trash, organic debris, and pet waste
- Evidence of septic system problems (Sewage odor, soggy lawn, lawn with green patch)

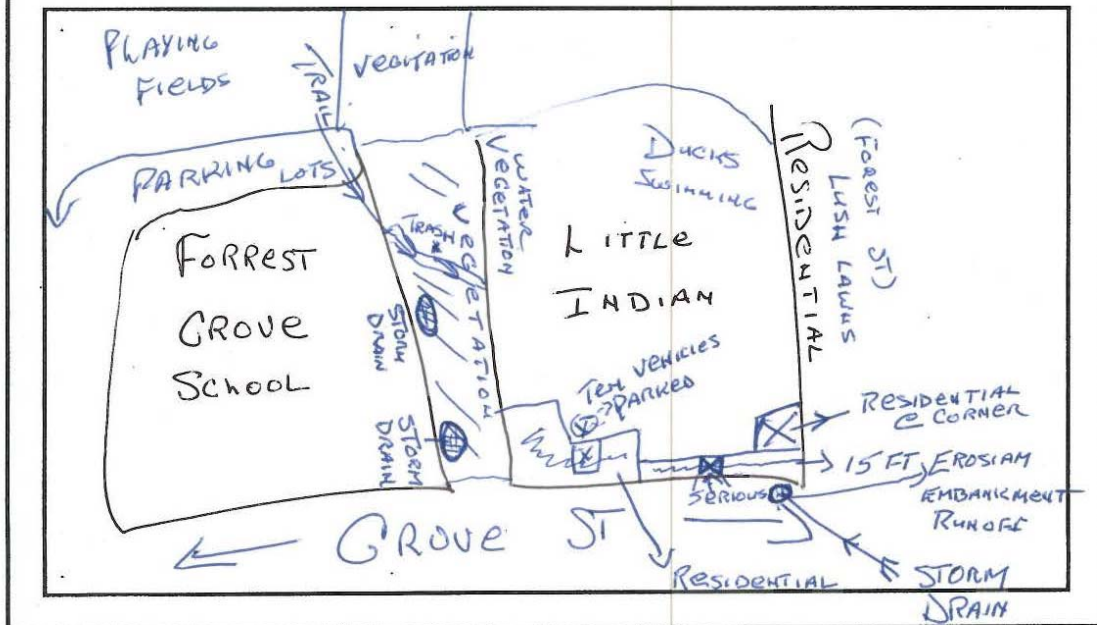
In Commercial or Industrial Areas, Look For:

- Altered or paved areas near waterways *(GROVE ST)*
- Green scum, oily sheen, or debris in water

In General, Look For:

- Clogged or damaged drainage
- Lack of vegetation around waterways *(NO)*
- Cloudy, discolored, or smelly water
- Sediment buildup *- ALONG SHORELINE*
- Evidence of erosion (gullies or rills on the surface of the water)
- Direct paths for runoff to enter waterways

Describe problem areas



## Works Cited

Brown and Caldwell. *Indian Lake Phosphorus Reduction*. 26 Feb. 2013. Study. Andover, MA.

Forbes, Emily. *How Are Watersheds Impaired?* 25 Oct. 2001. Web.

Indian Lake Watershed Association, and Mill Brook Task Force. *Watershed Survey of the Mill Brook Watershed*. Sept. 2002. Web.

"An Introduction to Water Quality Monitoring." *An Introduction to Water Quality Monitoring*. 02 Oct. 2012. Web. 17 Mar. 2015.

"Lake George Waterkeeper." *Lake George Waterkeeper*. Web. 17 Mar. 2015.

"New Project Aims to Make New York's Lake George the." *"Smartest Lake" in the World*. Web. 17 Mar. 2015.

"Watersheds." *Watersheds*. EPA. Web. 17 Mar. 2015.