

BEAR LAKE HOMEOWNER GUIDEBOOK

Provided by your Bear Lake Preservation Association

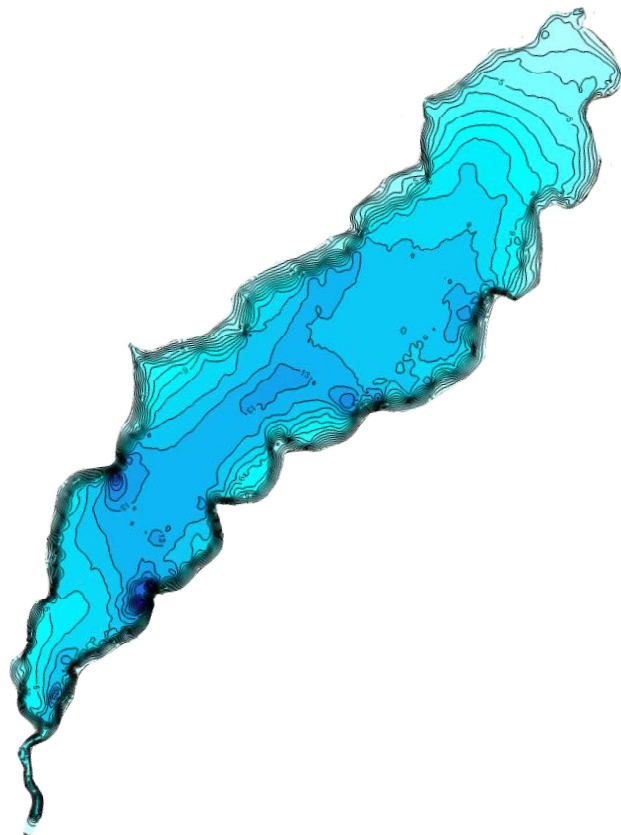


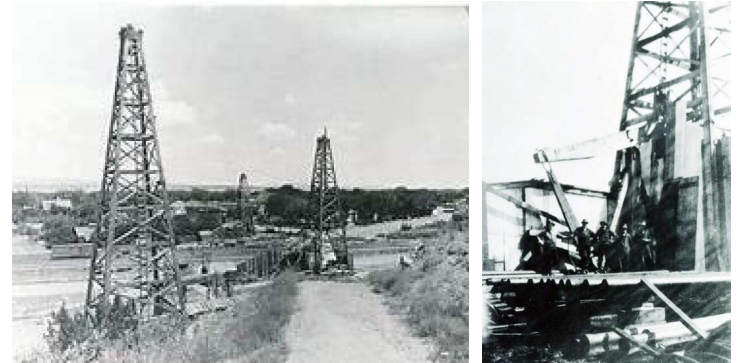
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BEAR LAKE: A New Age of Environmental Stewardship

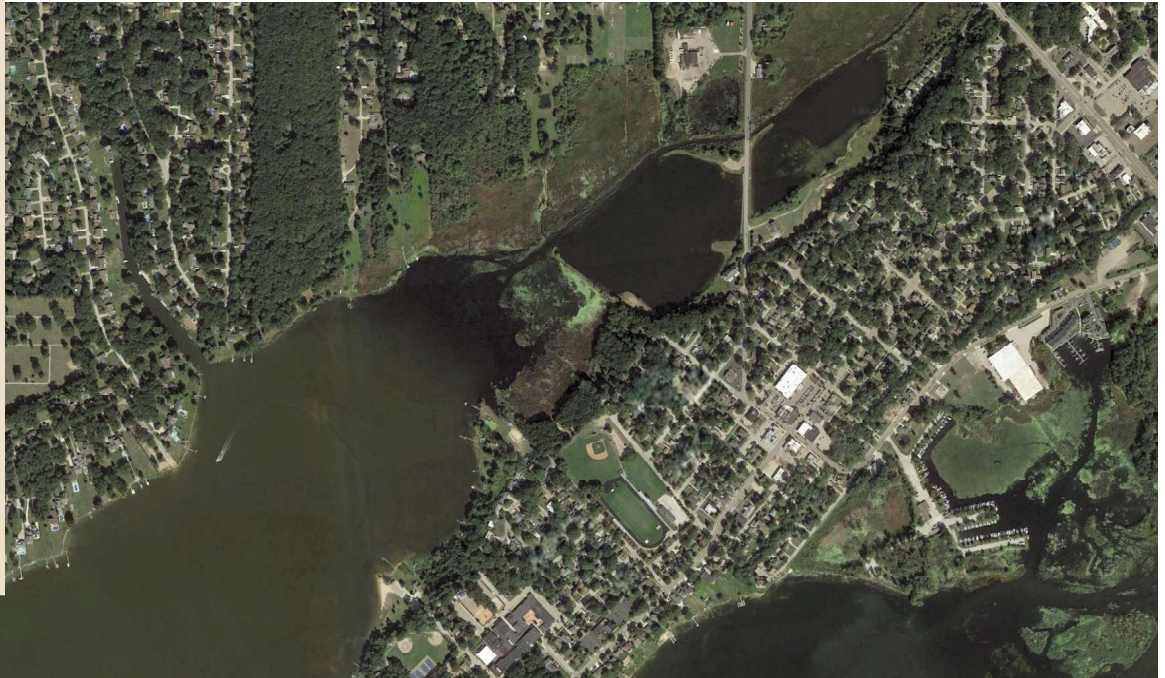
After nearly a century of environmental degradation, an ecological revival is underway in Bear Lake and its watershed. Inspired by recent clean-up efforts for Great Lakes Areas of Concern, public interest in a healthier Bear Lake has triggered a community response, a movement to restore balance permanently. Knowing recovery is still fragile, with much work yet to be done, community members seized the opportunity to form the Bear Lake Lake Board in 2017. After several civic meetings, a comprehensive lake restoration program has been initiated to improve the quality of Bear Lake. This investment will recover the aesthetic quality, ecological integrity, and economic vitality of a precious community resource.

The guidebook is intended to equip Bear Lake residents with a general understanding of a wide range of topics related to the protection and enhancement of water quality. What can lake residents do to protect and enhance the water quality of their lake? Plenty! As you proceed through this booklet, you will begin to understand the complexity of the elements of lake management and gain the information required to take charge of Bear Lake's destiny and the quality of the environment in which you live and play.



BEAR LAKE PHYSICAL CHARACTERISTICS

Lake Area..... 415 acres
Average Depth..... 9.9 feet
Max Depth 25.5 feet
Volume..... 1.26 billion gallons
Shoreline Length6.5 miles
Watershed Area..... 19,058 acres
Watershed Length..... 11.5 miles



COMMUNITY PROFILE

Region	Southwest MI
County	Muskegon
Metropolitan Area	City of North Muskegon/Laketon Twp.
Watershed	Muskegon River
Dominant Land Use	Forest/Urban
Population	11,150
Lake Type	Recreational

The Watershed Effect:

A watershed consists of all the land that contributes surface runoff to a specific body of water. The Bear Lake watershed lies just outside of the Muskegon River Watershed, with Bear Creek flowing in at the northeast, then discharging into Muskegon Lake via the Bear Lake channel. An important factor to consider is the ratio between the area of the lake's watershed and the surface area of the lake. Lakes with very large watersheds compared to its surface area, like Bear Lake, will receive surface runoff water with the potential for high nutrient loading. Any substance within the watershed that can be transported by water eventually reaches the lake and impacts water quality.

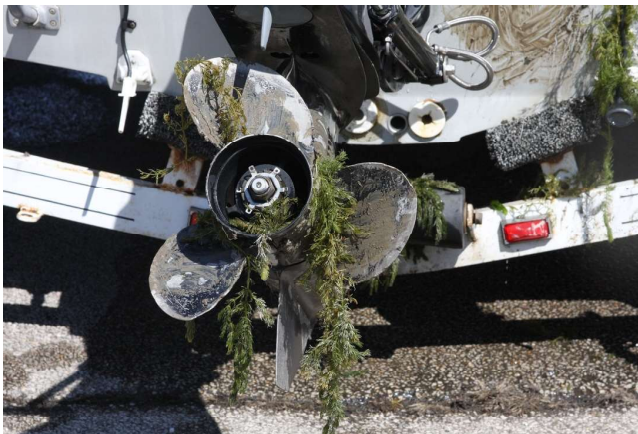
The Bear Lake watershed contains over 40% natural forests and 15% grass and shrub lands, which benefits lake water quality, however steady conversion to urban landscapes have occurred over the last 50 years. This leads to the importance of land use activities within the watershed. Any activity on the land that alters the natural vegetation will lead to increased surface runoff and erosion.



HOW ARE INVASIVE SPECIES HARMFUL?

- Invasive species cause ecological damage by re-shaping ecosystems and causing species extinctions, and reducing biodiversity.
- Invasive plants cause economic damages. They cost the American economy \$127 billion annually in damages and expenditures for control efforts.
- Invasive aquatic plants can impact human health by degrading ecosystems, which may lead to harmful algal blooms. People have also drowned after becoming entangled in dense mats of invasive aquatic weeds.
- Invasive aquatic weeds threaten recreational opportunities; degrading boating, swimming and fishing experiences.

What You Can Do Now!



PREVENT THE SPREAD OF INVASIVE SPECIES...

1. Clean, drain, and dry your boat, trailer and equipment.
2. Properly dispose of unwanted bait or plants in the trash.
3. Never transplant water garden plants in lakes, streams, or ditches.
4. Never dispose of aquarium species into lakes or streams.
5. Do not transport aquatic species or water from one lake to another.

Riparian Responsibility:



Bear Lake is an extremely valuable resource to its community. Much of the economy is directly connected to the quality of this surface water resource. Likewise, this resource provides a large tax base because of the desirability of developing commercial and residential property on the water. Any degradation of this resource will inevitably result in lower property values and decreased recreational value.

Where do we fit into the functions of a lake system? Everywhere. Human activity can have effects in all areas of a lake system. What we create, modify, or destroy in our development and land use practices within the watershed will have consequences that will be felt throughout the whole aquatic ecosystem.

PLEASE Do NOT...

1. To reduce waterfowl droppings, Do NOT feed the ducks and geese.
2. Do NOT feed the deer. Deer eat/kill beneficial trees and plants.
3. Do NOT fertilize your lawns, instead treat only for weed control.
4. Do NOT put leaves and grass clippings into the lake or tributaries.
5. Do NOT direct roof and parking lot runoff toward the lake.
6. Do NOT mow all the vegetation at the water's edge. Leave a buffer.
7. Do NOT purchase prohibited and restricted species. Check state laws.

Taking Action!

5 HIGH-QUALITY LANDSCAPE IMPROVEMENTS FOR YOUR LAKE:

1. Consider pervious pavement for your driveways and paths.
2. Install rain barrels or rain gardens to slow runoff.
3. Focus on creating a shoreline buffer with native plants that extends 25-50 feet on the shoreline away from the water.
4. Plant trees and shrubs above the ordinary high-water mark.
5. Replace concrete, rock, metal, and wood break walls with bioengineered soft-shore landscaping biologs, erosion control blankets, and vegetation.



6 SIMPLE THINGS YOU CAN DO:

1. Designate a portion (big or small) of your shoreline as a protected conservation area.
2. Call a local and state government representative and tell them how important Bear Lake is to you.
3. Consider donations to your Bear Lake Preservation Association, a 501-c3 tax deductible entity.
4. Speak up for your lake! Report illegal activities such as dumping, vandalism, or unpermitted construction.
5. Plant a tree somewhere within the watershed. They filter and clean water.
6. Do a rainy-day survey during the next heavy downpour to see how storm water is impacting your property.

Community Engagement and Political Action

Sooner or later it is necessary for lake residents to become politically active to achieve the goals and objectives of a sustainable lake management program. Political activity includes networking with a variety of people who are involved with land use management and water quality issues. There are many people working in federal, state, county, and township government agencies and non-profit organizations, who can be important resources for your lake management efforts. Getting to know these people, sorting through who can provide the most assistance, and developing relationships with key players is crucial to building a solid foundation of environmental awareness and stewardship for your lake community.



BEAR LAKE PARTNERS

1. Bear Lake Preservation Association
2. City of North Muskegon
3. County of Muskegon
4. Department of Environment, Great Lakes & Energy
5. Department of Natural Resources
6. GVSU Annis Water Resources Institute
7. Laketon Township
8. Michigan Lake Stewardship Association
9. Muskegon Conservation District
10. Muskegon Lake Watershed Partnership
11. West Michigan Shoreline Regional Development Commission

Past, Present and Future Progress



In 2004 the Muskegon Conservation District (MCD) completed a Bear Creek & Bear Lake Watershed Management Plan initiated 319 Clean Water Act nonpoint source pollution program to address water quality issues.

The MCD and Michigan Rural Water Association (MRWA) executed the Bear Creek Implementation Project Phase I & II from 2004-2014. Projects, totaling \$395,000, involved stream restoration, best management practices (BMPs), and public education activities.

The Muskegon Lake Watershed Partnership (MLWP) secured a grant to complete Bear Creek/Lake Upper Watershed Information and Education Plan to address storm water pollution prevention and increase public awareness.

A \$154,000 Bear Lake Non-Native Invasive Species Control Project grant, secured by West Michigan Shoreline Regional Development Commission (WMRDC) identified, prioritized and treated invasive species around the Bear Lake shoreline. Between 2015- 2017 funding provided treatments for 35 acres of invasive Phragmites, six landowner stewardship training sessions, and native plantings for North Muskegon students.





Ongoing research and investigative studies were conducted by GVSU Annis Water Resources Institute (GVSU-AWRI) to provide scientific validation and baseline data for future restoration and management decisions.

An \$8 million Great Lakes Restoration Initiative (GLRI) grant was secured by West Michigan Shoreline Regional Development Commission (WMRDC) to implement the Bear Creek Hydrological Reconnection & Restoration Project. Contaminated sediment and earthen dikes were removed to restore 34 acres of critical wetland habitat.



The Bear Creek/Lake Nutrient & Sediment Reduction Project was developed by the WMRDC to enhance the capacity of wetland processes in the upper Bear Creek watershed.

In 2016, community members joined together to create the Bear Lake Lake Board and selected a professional lake management consulting firm to develop and implement a lake basin management and restoration plan.

Lake Life: An Introduction to Limnology

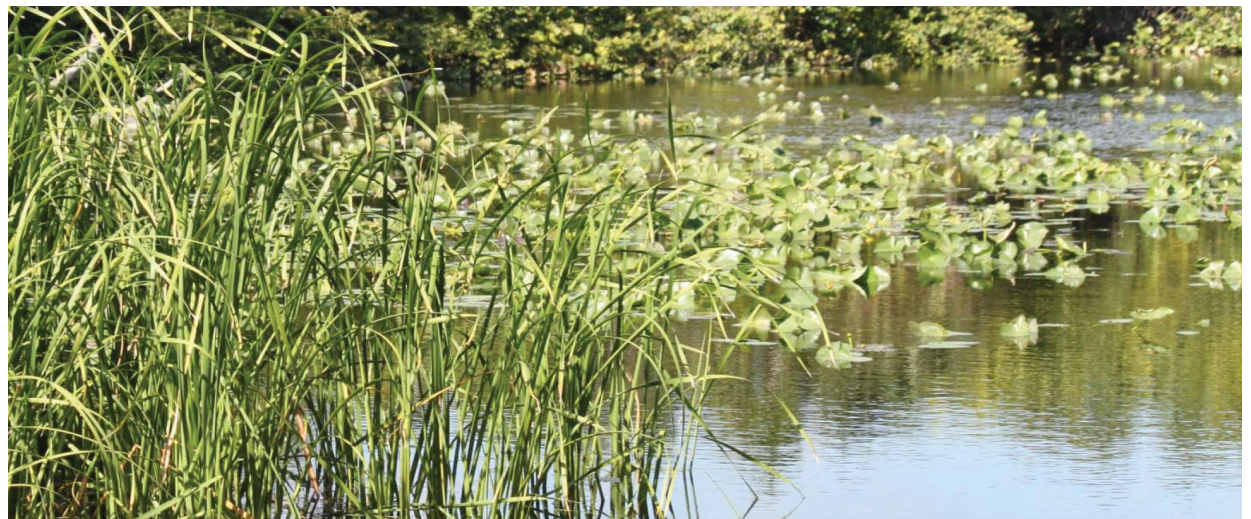
INTRODUCTION

A lake is a living system that is constantly changing. It is a system that depends on many factors which are interdependent, interrelated, and necessary to the whole process of growth in the aquatic community. Lake managers use a language of their own to describe lake systems known as limnology.

As do most things in nature, lakes follow a path from formation through transition and death. Through the processes of sedimentation of dead organisms and erosion, lakes slowly fill in over the span of thousands of years. This very slow process is called natural eutrophication and is the inevitable result of time. Human activity, however, can greatly accelerate this process and change the nature of a lake's water quality in the span of a few decades. This human-induced process is called cultural eutrophication. Water quality changes follow this pattern of cultural eutrophication, moving from clear, nutrient-poor waters to murky, nutrient-rich waters.

NUTRIENTS

Nutrients are one of the basic requirements that plants need for growth, along with water and sunlight. If we think of nutrients as fertilizer, it is easy to understand their function in the lake system. Aquatic plants and algae respond quickly to small changes in the amount of nutrients present in the water, so it is very important to understand both the concentration of nutrients in lake water and in tributaries to the lake. The two most important nutrients are phosphorus and nitrogen. Both occur naturally in enough quantity to allow a lake to function as a healthy system; however, through man-made changes in land use, their transport to the lake is increased. Too much fertilizer causes too much plant and algae growth; consequently, the lake changes to a more eutrophic condition than its original state. This causes problems for lakeshore residents, from the growth of dense beds of aquatic plants, to blooms of blue-green algae that create surface scum and foul odors, negatively impacting physical appearance and recreational suitability.



PLANKTON

Plankton forms the basis of the entire food chain within a lake ecosystem. Without a healthy plankton population, there would be virtually no fish and other animals in our lakes. Plankton can be put into two main groups, algae and zooplankton. Algae are free-floating, non-rooted green plants that use nutrients as fertilizer. Through the process of photosynthesis, oxygen is given off by the algae into the water column, which is necessary for fish survival. Algae respond quickly to changes in nutrient levels, temperature, and light intensity, and population explosions can occur in a short period of time. The algae that create nuisances for people are usually the filamentous green and the bluegreen forms. These usually occur in mid to late summer and appear as long floating strings, mats, or large areas of very green, murky water. When conditions are ideal, their populations can soar to bloom proportion within a few days and may persist for several weeks before conditions change.



AQUATIC PLANTS

Plants are essential to a healthy lake and their mere presence should not be regarded as a nuisance. Aquatic plants are broken down into two basic groups:

1. Emergent vegetation grows near shore and stands up out of the water.
2. Submergent vegetation grows in deeper water below the surface.

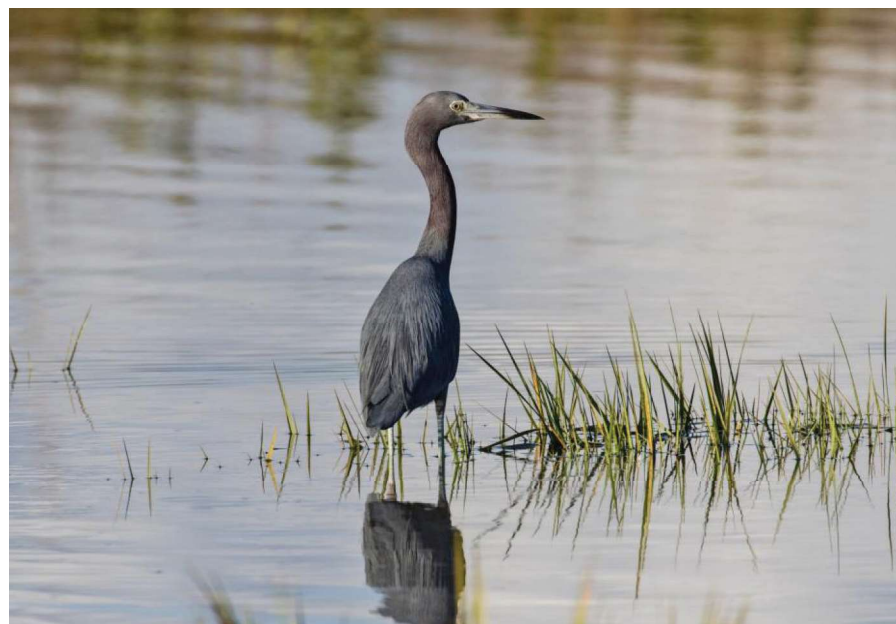
BENEFITS OF AQUATIC PLANTS

- Provide excellent food, cover and spawning grounds for game fish, bait fish, and insects.
- Supply building material for nests and shelter.
- Buffer shorelines against wave action, preventing shoreline erosion.
- Filter pollutants and suspended sediments from surface waters.
- Capture, store and utilize nutrients that would otherwise be available to support algal blooms.

It is very important to restore and maintain Bear Lake's natural vegetation because of its value to the overall health of the ecosystem. People often feel that aquatic plants are merely a nuisance and will go to great lengths to remove them. Removal may cause other problems in the lake to develop. It leaves more nutrients for algae to use and may cause a decline in water quality, as algal blooms can occur. Please be very careful before you decide to implement a program of weed removal on your lake. This activity requires a permit from the Department of Environment, Great Lakes, and Energy (EGLE), so please check with them before starting.

THE FISHERY

All lake residents have been asked, regarding their lake, “How’s the fishing?” Most lakes fall within the limits of a particular fisheries classification that usually corresponds to its trophic status. Generally, lakes that are very clear, deep, and well-oxygenated with a low trophic status will have a fishery consisting of a few species of forage fish, and a few species of predator fish, such as walleye and northern pike. Lakes, such as Bear Lake, that are relatively shallow, less clear, and more nutrient-rich, will have a larger number of forage species and many species of game fish such as walleye, northern pike, bass, and pan fish. They also may have large populations of rough fish, such as carp. Changes in the fish populations can impact water quality. Large carp populations devour beneficial aquatic plants and stir up sediment, releasing nutrients and decreasing water clarity.



TOP PREDATORS

At the top of the aquatic food chain are a variety of birds and mammals—including humans. Many valuable birds such as loons, eagles, herons, hawks, and cormorants depend on healthy lakes for their survival and will be negatively affected by poor water quality, especially when it involves petroleum or heavy metal contamination. People play an important role in the food chain of lakes. Our activities on the land are responsible for the overall water quality and our behavior in and on the lake can have serious long-term effects on the health of the aquatic environment. Development, poor land use practices, overfishing, unwise use of chemicals, and other short-sighted activities can all have harmful effects. Remember that everything is connected in nature, and, as a part of it, we have the power to create or destroy based on our perception of the problems that affect us.

Bear Lake's Current Aquatic Invaders



Curly Leaf Pondweed



Eurasian Watermilfoil



Phragmites



Purple Loosestrife

Bear Lake's Invasive Species Watch List



Starry Stonewort



Red Swamp Crayfish



Carolina Fanwort



Hydrilla

ACRONYMS

AOC - Area of Concern
AWRI - Annis Water Resources Institute
CIP - Capital Improvements Plan
CVTRS - City, Village, and Township Revenue Sharing
US EPA - United States Environmental Protection Agency
GLRI - Great Lakes Restoration Initiative
GVSU - Grand Valley State University
IBI - Index of Biological Integrity
MCD - Muskegon Conservation District
MDEQ - Michigan Department of Environmental Quality
MDNR - Michigan Department of Natural Resources
MRWA - Michigan Rural Water Association
MCPAC - Muskegon County Port Advisory Committee
MLWP - Muskegon Lake Watershed Partnership
MS4 - Municipal Separate Storm Sewer System
NPDES - National Pollutant Discharge Elimination System
NOAA - National Oceanic and Atmospheric Administration
NRCS - Natural Resources Conservation Service
PRP - Potentially Responsible Party
TSI - Trophic State Index
WMSRDC - West Michigan Shoreline Regional Development Commission
USACE - United States Army Corps of Engineers
USDA - United States Department of Agriculture

GLOSSARY OF TERMS

BMP (Best Management Practice): An ideal practice that leads to the best ecological and sustainable outcome

EGLE: Referring to the Department of Environment, Great Lakes, and Energy for the State of Michigan

Filamentous: Referring to long, thin strands of algae that can be linear or branched

Limnology: The study of the biological, chemical, and physical features of lakes and other bodies of fresh water

Invasive: Referring to a population level that is detrimental to the balance of an ecosystem

Nonpoint: Referring to diffuse pollution which may not have distinctive origins

Sedimentation: A process of soils that enter a water body from the surrounding lands contributing to decreased depth

Sustainable: Referring to a state of balance and ongoing ease of efforts

Watershed: An area which drains to a common point, most often a lake

Visit **www.laketontownship.org** for progress reports, meeting minutes, meeting dates, improvement plan, financial status, and more.
Click on the BLLB link!