The Baboosic Lake

Stormwater Improvement Project

A Final Report to

The New Hampshire Department of Environmental Services

Submitted by

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Baboosic Lake Association
PO Box 1106
Amherst, NH 03031

December 31, 2008

Funding for this project was provided in part by the New Hampshire Department of Environmental Services with funds from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Executive Summary

The scope of this project is large and this grant was what we considered the first in many steps (phase 1) to begin to repair Baboosic Lake. Baboosic Lake has been experiencing more frequent algae blooms, specifically cyanobacteria algae blooms. Through studies conducted, it has been determined that the primary cause of this and the general water quality degradation can be attributed to excessive Phosphorus loading, mostly from direct runoff.

Original Proposal Outcome Statement:

The ultimate outcome or goal is to reduce watershed phosphorus loading in an effort to reduce algal blooms and eliminate Cyanobacteria blooms to meet state water quality standards.

This will be accomplished through developing a watershed based plan and site-specific stormwater BMP implementation. The purpose of the watershed-based plan will be to prioritize phosphorus and sediment load locations and makes recommendations on methods to reduce these pollutants. The purpose of designing and implementing the landscape / stormwater BMPs will be to immediately engage in implementing watershed changes to reduce phosphorus and sediment loading.

We feel that our phase one was very successful. Our execution period was from February of 2006 through December 2008. The Baboosic Lake association consisting of 12 individuals was the primary organization responsible for the development and success of the first phase of our program. The initial objectives were to generate a campaign of public education through the development of a watershed homeowners guide, mailings and website tutorials. In addition, we wanted to identify the most problematic sites where significant amounts of water runoff were occurring and gain a plan to resolve or mitigate these problem areas. Our partner for this portion of the phase is Geosyntec Consultants.

Our initial estimate for the project total was $50,000.00, of which $30,000.00 was the grant and $20,000.00 was the required matching funds. The total expended was just over $52,000.00 of which the matching funds represented approximately $23,000.00. Worthy of mention is that the BLA exceeded the required match, of which approximately $3,000.00 has been documented and submitted with our closure documentation.

In closing we are pleased to report that we have met the initial targets as follows:

a). Designed, generated and conducted mailing of watershed homeowners guide.

b). Designed and implemented new web site for public education.

c). Directed efforts of Geosyntec and participated in site identification resulting in Watershed Based Plan.

d). Negotiated costs on site rectification designs obtaining additional site designs within original budget.

e). Implemented BMP's at 3 sites

Introduction

Baboosic Lake is a 221.9-acre natural lake situated on the boundary between the towns of Amherst and Merrimack, New Hampshire, with its watershed of 1536 acres extending into both towns. Constant water quality monitoring for the past twenty-five plus years reveals a continuing deterioration in water quality and clarity. Baboosic Lake has experienced declines in water quality in recent years, and has been included on the Draft 2008 List of Threatened or Impaired Waters That Require a TMDL for nuisance blooms of Cyanobacteria (hepataoxic blue-green algae), elevated Chlorophyll-a concentrations, and elevated levels of the bacteria Escherichia coli.

A Draft Diagnostic Study by NHDES in 2000 reported that Phosphorus loading is the primary contributor to a decline in water quality. The Study's Phosphorus budget lists watershed inputs as: (in declining order of magnitude) septic systems (48%), gulls (35%), direct runoff (11%), tributaries (3%) and atmospheric (3%).

As a result of excessive phosphorus loading through tributaries and direct runoff, algal blooms and more specifically Cyanobacteria blooms have become increasingly more frequent in recent years. Cyanobacteria blooms have lead to Baboosic Lake as being impaired and not meeting state water quality standards

Reducing Cyanobacteria blooms and Chlorophyll-a concentrations in Baboosic Lake will require reducing the amount of phosphorus entering the lake from sources such as septic systems and stormwater runoff. In freshwater lakes, phosphorus is usually the most important nutrient determining the growth of algae and aquatic plants. As such, increases in phosphorus levels tend to be strongly correlated with decreased water clarity, increased algal abundance and other indicators of declining water quality. To reduce algal blooms and eliminate Cyanobacteria blooms phosphorus loading as a result of septic systems, gulls and stormwater runoff (tributaries and direct runoff) must be prioritized and addressed. Currently, a multi-phase community septic system project is underway, and with the transition out of the Amherst dump, the gull population has been significantly reduced. Pollutant load allocation will occur through the development of a watershed-based plan. Phosphorus load allocation, if not assessed directly, will be assessed indirectly through analysis of sediment loads. In addition several shoreline properties will be selected for stormwater best management practice (BMP) design and implementation targeted at reducing stormwater runoff rates and volumes through infiltration. This will likely occur through native vegetation buffer plantings, stream bank stabilization, vegetated swales along lake roads, and stormwater detention/infiltration areas within the watershed. A byproduct of this will be sediment load and therefore phosphorus load reductions. The outcome verification will occur through modeling pollutant load reductions, improvement in the VLAP water quality results, reduction of algal blooms and elimination of Cyanobacteria algal blooms. It should be noted that outcome verification will be based on implementation of projects having the greatest ability and feasibility to reduce pollutant loadings.

In addition to the watershed based plan and BMP design and implementation the BLA will lead an education campaign targeting landowners within the watershed about their individual impact on the watershed, stormwater runoff and the lake. Education will be accomplished through development and

distribution of a Waterfront and Watershed property owner's guide, landscaping methods to reduce and manage stormwater runoff

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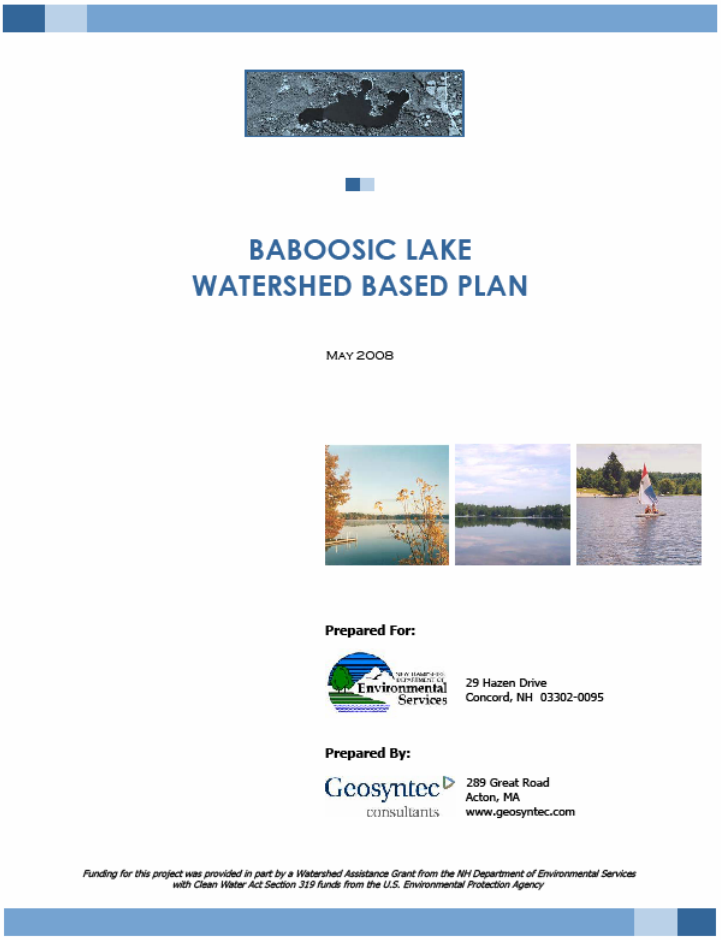
About the Baboosic Lake Association

In 1982 Baboosic Lake started its own water quality testing and is working closely with the NH Lakes Lay Monitoring Program. In 1986 the Baboosic Lake Association was formed to help with lake issues, inform and educate waterfront and watershed residents and to help protect and preserve Baboosic Lake. Our organization consists of 12 members all being watershed property owner of varied backgrounds. We have developed and maintain a very informative web site for the waterfront and watershed residents to use for information and guidance. We now have an email blast system in place to keep property owners abreast of current or urgent issues. We are also looking to supplement any state or federal funding we can get, with and grow, personal and corporate donations. The other factor, almost as important as funding itself, is that we are now focused on teaming with and are developing excellent relations with our towns. We have anew spirit of support and cooperation, which if nurtured, will prove to be very beneficial to Baboosic Lake. We also have negotiated discount rates for septic pumping with a local contractor to encourage people to keep their septic system pumped and maintained. We are currently negotiating with a couple of local hardware store's to obtain a discounted rate for phosphorous free fertilizer and to have the supplies delivered to the lake residents in early spring.

Geosyntec Report **(double click to expand)**



BABOOSIC LAKE
WATERSHED BASED PLAN

MAY 2008

Prepared For:

Environmental Services
29 Hazen Drive
Concord, NH 03302-0095

Prepared By:

Geosyntec consultants
289 Great Road
Acton, MA
www.geosyntec.com

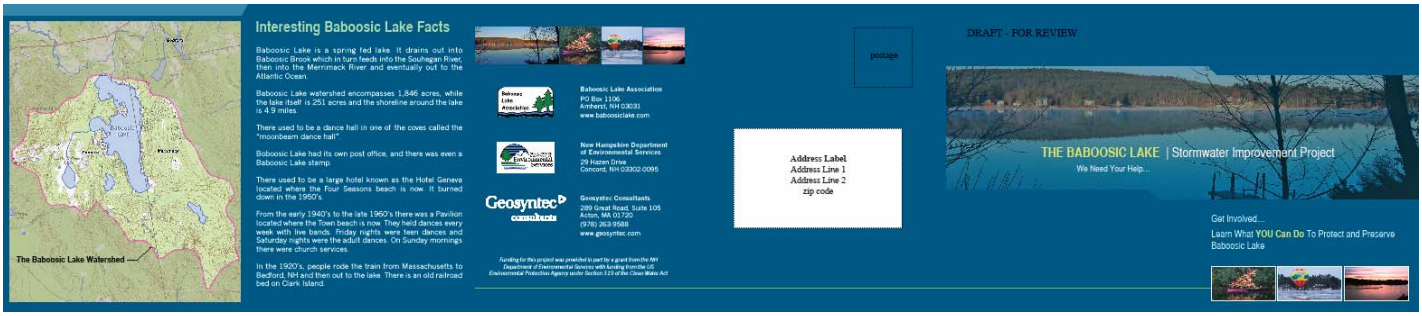
Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency

Project Goals and Objectives

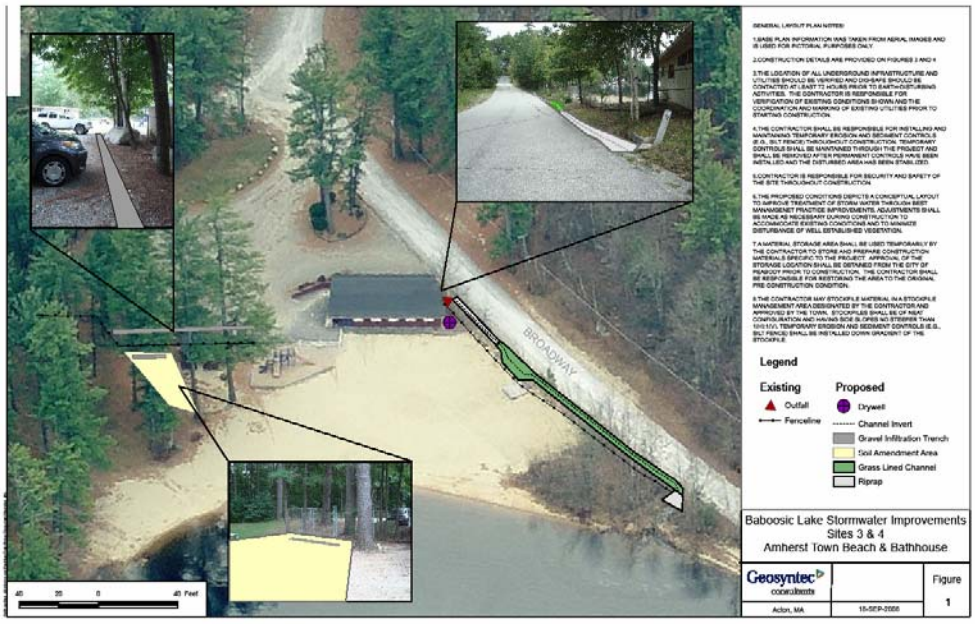
The ultimate outcome or goal is to reduce watershed phosphorus loading in an effort to reduce algal blooms and eliminate Cyanobacteria blooms to meet state water quality standards.

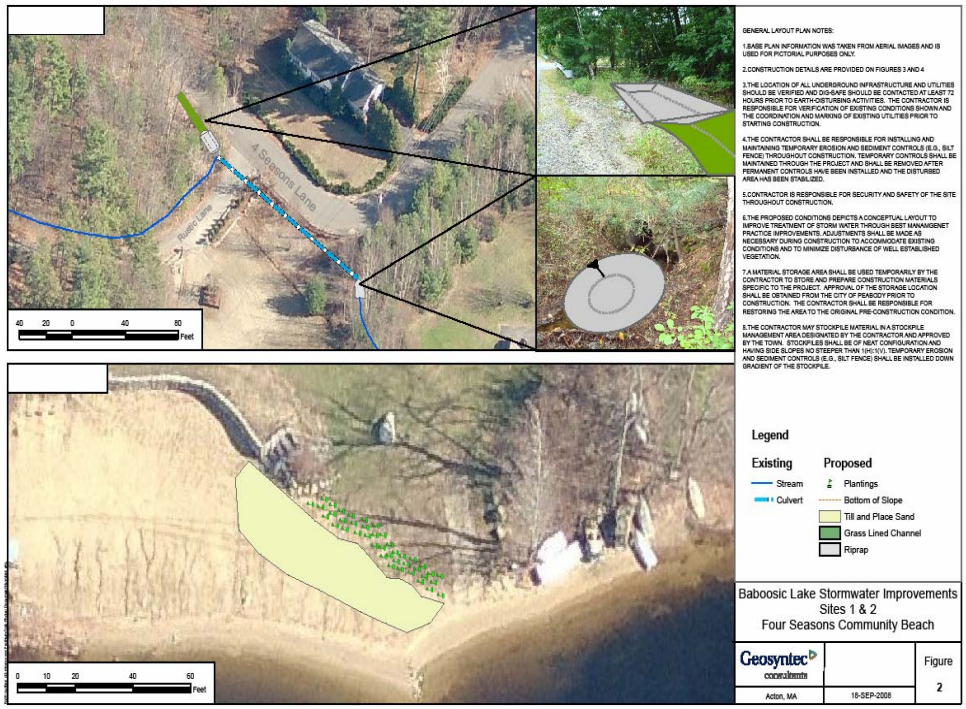
This will be accomplished through developing a watershed based plan and site-specific stormwater BMP implementation. The purpose of the watershed-based plan will be to prioritize phosphorus and sediment load locations and makes recommendations on methods to reduce these pollutants. The purpose of designing and implementing the landscape/ stormwater BMPs will be to immediately engage in implementing watershed changes to reduce phosphorus and sediment loading.

Waterfront and Watershed Brochure (double click to expand)



Site Design Plans (double click to expand)





<u>Site Location Map</u> (double click to expand)

Gravel Pit
Baboosic
Brook
Sand Pit
High Point
Walnut Hill
Clark Island
Washer Cove
Baboosic Lake
Little Baboosic Lake
Dream Lake
Gravel Pit

Newspaper Articles (double click to expand)

NEW HAMPSHIRE UNION LEADER
Friday, July 4, 2008

Lake study: 17 sites need work

◆Water run-off: Work has to be done to keep pollution out of Baboosic Lake, a group says.

By MARK OUELLETTE
Union Leader Correspondent

MERRIMACK — With a recently completed water quality improvement plan in hand, the Baboosic Lake Association is striving to make progress in its cleanup mission.

Baboosic Lake, a 222-acre body that crosses the Merrimack-Amherst border, was studied by Geosyntec Consultants of Acton, Mass..

Association Vice President Greg Gendron of Amherst said 17 properties were identified as sites where there is significant storm water run-off. Of the 17 sites, 13 are in Merrimack and four are in Amherst, said association President Richard Sullivan of Merrimack.

Sullivan said run-off has been a problem for homes in Merrimack because the properties tend to slop down to the lake.

In June 2006, the association was awarded a $30,000 Department of Environmental Services grant — $20,000 to have Geosyntec devise a watershed plan and $10,000 for design work.

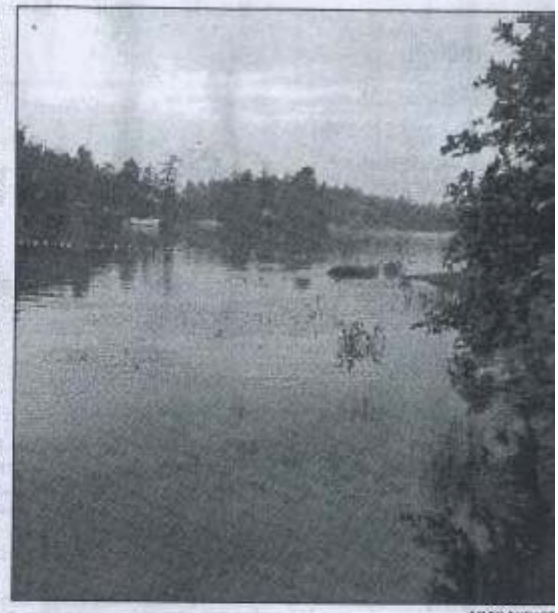
The estimated cost to eliminate problems at the 17 sites is $166,000, ranging from $5,000 to $10,000 per property, according to Andy Chapman, a coordinator for the state's Clean Water Program. Sullivan said the association is in the process of picking some sites that could receive upgrades.

Work could include placing stones where they could slow down run-off and establishing rain gardens and other methods to divert water away from the lake, Sullivan said.

When it comes time to do the site work, Gendron said he'd like to see local corporations donate materials and services and volunteers contribute labor.

Baboosic Lake has had algae blooms caused by high phosphorous levels, said Gendron, but he hopes one day the water will get a clean bill of health "so the state doesn't have to come in here and close our lake because it isn't safe. I take that personally."

The two towns have yet to decide when they will sit down to discuss the project, but association members say that whatever work is done will require more money.



MARK OUELLET

Above is a view of Baboosic Lake from the town beach in Amherst.

Nashaway Chapter of the Audubon Society of NH

43rd Annual Christmas Bird Count

From December 14, 2008 through January 5, 2009, tens of thousands of volunteers throughout the Americas will take part in an adventure that has become a family tradition among generations. Families and students, birders and scientists, armed with binoculars, bird guides and checklists will head out on an annual mission - often before dawn. For over one hundred years, the desire to both make a difference and to experience the beauty of nature has driven dedicated people to leave the comfort of a warm house in the middle of winter.

Each of the citizen scientists who brave snow, wind, or rain, to take part in the Christmas Bird Count make an enormous contribution to conservation. Audubon and other organizations use data collected in this longest-running wildlife census to assess the health of bird populations - and to help guide conservation action.

From feeder-watchers and field observers to count compilers and regional editors, everyone who takes part in the Christmas Bird Count does it for love of birds and the excitement of friendly competition -- and with the knowledge that their efforts are making a difference for science and bird conservation.

On Saturday December 27, 2008 the Nashaway Chapter of the Audubon Society of New Hampshire will take part in this annual adventure. If you would like to count birds in the field or at your feeders, contact Contact Richard Bielawski at 429-2537 or rbielawski@mac.com for more details. For more information visit: http://www.audubon.org/bird/cbc/history.html

Baboosic Lake Association Mobilizes Lake Improvement Plan

AMHERST - On Saturday, November 1st The Baboosic Lake Association in conjunction with the Four Seasons housing development broke ground on an infiltration trench running the length of the water frontage on the developments beach. The trench is to serve as a means to reduce water runoff and chemicals such as phosphates from reaching the lake. This was accomplished through purchased materials and donated labor according to Richard Sullivan, president of the Baboosic Lake Association. This is not the first site that work has commenced. Work at the Amherst town beach has begun as well as several other locations on and around the lake.

The BLA was awarded a grant through the NH Department of Environmental Services and the federal government back in 2006. Working with the DES and an approved engineering firm the BLA has designed an informative brochure, had an analysis done of the lake and the engineering firm has provided the BLA with a publication listing the major contributors of problems for the lake. We are now in process of implementing those recommendations. The BLA has also recently qualified for, and fully anticipates gaining additional funding this year to continue the implementation of the project recommendations. To handle things on a cost effective basis, the BLA is trying to utilize volunteer labor and donations of materials and money.

This is becoming an exciting time because we are starting to see the results of our efforts. This is the first year in about four years that we have not had a major algae bloom while other NH lakes still experienced significant occurrences. We firmly believe that the efforts of the town of Amherst to work with the BLA and also their efforts in driving the implementation of the community septic system, have provided a significant basis for water quality improvement. The BLA is actively seeking volunteers for support in labor, material or monetary donations to assist us in our efforts to improve Baboosic Lake. If you would like to donate any of the above you may go to the website at www.baboosiclake.com or you may call Richard Sullivan, president at 424-6347 or Greg Gendron, vice president at 672-8473.

www.amherstcitizen.com

Announcements

WEDDING

Mr. and Mrs. Daniel Holbrook

On Saturday, September 27, Miss June Worster, daughter of Winston and Tina Carter of Amherst was married to Mr. Daniel Holbrook. The groom is the son of David Holbrook of Brookline and Debbie Demers of New Boston.

The double ring ceremony was performed by Frederick Gray Jr. Justice of the Peace at The Hampton Beach State Park.

The bride was given in marriage by Winston Carter, her stepfather.

The maid of honor was Katherine Shirey. Other bridal attendants were Jaimee Carter and Jesse Carter, nieces of the bride. The flower girl was Nicole Stevens niece of bride and the ring bearer was Dylan Stevens.

Ushers were Derek Hugger, Adam Dziki, and Christopher Medico, friends of the groom.

A reception was held at The Hampton beach state park

Please send Engagement and Wedding announcements (forms available at www.amherstcitizen.com) to Editor: *The Amherst Citizen*, PO Box 291, Amherst, NH 03031. Also, enclose a S.A.S.E. for return of color or B&W photos.

WEDDING

Mr. and Mrs. Bradford M. Ship

Miss Meghan Elizabeth Salvas, Arlington, VA, daughter of Maggie and David Salvas, Amherst was married to Mr. Bradford M. Ship, Arlington, VA on August 2, 2008.

Mr. Ship is the son of Christine and Carl Ship of Needham, MA.

The double ring ceremony was performed at the Unitarian Universalist Church of Nashua by Rev. Steve Edington.

Attending the bride as the maid of honor was Alexis Fach, Amherst, friend of the bride. Serving as attendants were Bridget O'Conner, Hanover, Sarah Maher, Trumbull, CT, Lynne Delise, Belmont, MA, and Julia and Emma Kim, Stratham. The ring bearer was William Delise of Belmont, MA. Katie Hogan, cousin of the bride, served as the vocalist.

The best man was Erin Koen, New York City. The groomsmen were Alex Ship, Needham, MA, brother of the groom, Patrick Salvas, Amherst, brother of the bride, and William Decker, Dallas, TX. Todd Rockwood, Arlington, VA and Park Ridell, Boston, MA served as ushers.

The reception was held at Sky Meadow Country Club, Nashua. The couple honeymooned in Puerto Vallarta, Mexico and reside in Arlington, VA.

The bride is a 1999 graduate of Souhegan High School. She holds a B.A. in English from Assumption College and a Masters in teaching from Northeastern University. She is a 5th grade teacher at Mary G. Porter Traditional School in Woodbridge, VA.

The groom is a 2001 graduate from Needham High School. He received a B.S. in civil and environmental engineering from Lafayette College in Easton, PA and a Masters in engineering management from Dartmouth College. He is employed by PB Consult in Washington, DC.

Birth Announcement

Aaron and Danielle Humphrey of Pittsburgh announce the arrival of their daughter, Lydia Jane Danielle Humphrey, born October 12, 2008 at 1:40 pm, in West Penn hospital, Pittsburgh, PA. She weighed 7 lbs 13 oz and was 20 inches long. Maternal grandparents are Colonel Alan and Carole Phaneuf of Carlisle, PA. Paternal grandparents are Dan and Barb Humphrey of Mount Vernon, Ohio. Maternal great-grandparents are Maurice and Jeanne Phaneuf and Georges and Evangeline Nadeau, both of Nashua. Paternal great-grandparents are Cloise and Ruth Jones of Centerburg, Ohio.

Birth Announcement

Oh what a blessing, oh what a joy,
Phil & Isabelle Breeding of Amherst have another boy!
Charles Phillip Breeding was born October 12th,
A tall 21 3/4 inches and 8 lbs 6 oz of perfect health.
Southern NH Medical Center was where it all took place,
And at 4:59 pm Charles revealed his precious face.
Big sister Sophia who just turned 4,
And big brother James who just turned 2,
Are so excited to recieve him, it's too good to be true!
Charles' grandparents also are as proud as they can be,
Jacques & Denise Cattiaux of Hollis, NH
and John & Rita Breeding of Galashiels, Scotland
Love their growing family tree.
So a great big thanks to Dr. Witt for her expertise and care,
And for our doula Karen, a priceless guide, none can compare.
But most of all we thank our God for His blessings that abound,
Especially the gift of children, such joy that we have found.

Charles Phillip Breeding

Peabody Mill Environmental Center

Fall Programs through December 2008

PO Box 1045 603-673-1141
Amherst, NH 03031 www.pmec.org

Leave No Child Inside- School Vacation Day Programs

Are you wondering what your children will do on their school vacation days? Send them to the PMEC where they'll spend the day learning about and enjoying nature! Content topics vary from day to day depending on weather. Enjoy indoor & outdoor activities such as Hiking, Fishing, Animal Tracking, Nature Crafts, Songs, Stories, and Games! Bring snack, drink(s), and lunch (if staying all day). Dress your child in appropriate clothing including layers for outdoor activities. Please pack an extra set of clothing, shoes, and socks.

When: Wednesday 11/26 & Friday 11/28 (Thanksgiving Recess), Friday 12/26 & Monday 12/29 – Friday 1/2 (Winter Break).
Where: PMEC
Time: Half Day 9:00AM-Noon or 1:00-4:00PM
Full Day 7:30AM-5:30PM
Fee: $20 Half Day Amherst Resident, $30 Half Day Nonresident
$40 Full Day Amherst Resident, $50 Full Day Nonresident
$175 Full Week Amherst Resident, $185 Full Week Nonresident

Under the Moon Hikes

Join us for stories and a walk in the woods along easy paths that accommodate people of all ages. Let PMEC help you find your way around the night sky. Bring a flashlight to help you navigate uneven terrain.

When: Full Moon Hikes
Friday, 12/12 at 7:00PM
New Moon Hikes
Friday, 11/28 at 7:00PM
Saturday, 12/27 at 7:00PM
Where: Various Locations (see the PMEC website)
Fee: $6 Amherst Resident, $8 Nonresident
$15 Amherst Resident family (3+ people), $20 Nonresident family (3+ people)

Leave No Child Inside – An Evening in the Woods

Send your child to the PMEC to reconnect with nature! The Joe English reservation is an enchanting place at night. Your child will love outdoor activities such as star gazing, night hikes, and observing animal habitats. Once inside, children will enjoy snacks, games and crafts. Each child will come home with a nature themed craft. Children must be school aged. Please dress your child in appropriate outdoor clothing. Children grades K-8.

When: 12/12
Where: PMEC
Time: 6:00-9:00PM
Fee: $20 Amherst Resident/night, $30 Nonresident/night

GPS Rentals

Saturdays & Sundays 12-4PM or by request.

Have you always wanted to use a GPS, but don't even know how they work? Rent a GPS unit! Basic instruction is available. Rent in person during PMEC hours of operation.

Interested in renting mid-week? Call us at 673-1141 and we'll see if we can accommodate your request.

When: Saturday & Sunday
Time: 12:00-4:00PM
Fee: $10

Snowshoe Rentals

Saturdays & Sundays 12-4PM or by request. Available as soon as it snows.

Snowshoes are available in a variety of sizes for <30 lbs. to >220 lbs. If you can walk, you can snowshoe! Rent in person during PMEC hours of operation. Interested in renting mid-week? Call us at 673-1141 and we'll see if we can accommodate your request.

When: Saturday & Sunday
Time: 12:00-4:00PM
Fee: $4 per person Noon-4PM or $10 for 24 hour rental.

Amherst Tree Lighting Ceremony

Please join us before the tree lighting ceremony at the Fire Station to create a nature craft and visit with PMEC staff and volunteers!

When: Sunday, 12/14
Where: Amherst Fire Station
Time: 2:00-4:00PM
Fee: Free

Monthly Creature Feature

How long can a beaver hold its breath for? What is the only bird that can fly backwards? Do frogs drink through their skin? Why do only the female mosquitoes bite? Learn the answers to questions like these and more during "Creature Feature" at the Peabody Mill Environmental Center.

This monthly program is geared towards people of all ages who want to see live animals up close and personal. Those brave enough might get the chance to hold or touch one of our featured creatures. A different local or exotic animal will be featured each Saturday.

When: Saturday 12/6
Where: PMEC
Time: 2:00-3:00PM
Fee: Free to Amherst Residents (donations accepted), $1 Nonresidents Scouting Programs

If you and your scout group love to spend a Saturday morning earning a badge, doing a "Try It", or just having fun learning about nature and the environment then let PMEC work with you to develop a program. The PMEC has talented naturalist and science teachers available to give your scouts a wonderful learning experience that they won't soon forget! If Saturday morning doesn't work out for your group, please call to see if we can schedule your program for another day.

Monthly Fireside Chats

PMEC is again hosting monthly fireside chats. These chats will explore diverse issues such as global warming, green living and the natural history of New Hampshire to name a few. These programs are geared toward adults.

Do you hate taking the garbage to the transfer station every week? Have someone else do the dirty work and help us earn some extra cash! Sign up for weekly trash removal through H2O waste disposal services and they'll give PMEC $20 every 3 months. Unlike most waste removal services, H2O even recycles! Be sure to mention Friends of PMEC when you sign up! More info is available at: http://byebyedump.com/pmec.htm or by calling 603-732-0961

The Friends of PMEC are collecting old cell phones and ink/toner cartridges to raise funds. Drop off boxes are located at the PMEC, the Amherst Town Hall & Amherst Library.

Please visit our website at www.pmec.org for more information. Register online at www.amherstrec.org. Registrations for PMEC programs will no longer be accepted at the Library or the Town Hall. All programs require pre-registration.

Clubs, Civic Organizations, Non-Profits please submit your publicity to *The Amherst Citizen*: news@amherstcitizen.com

Conclusions and Recommendations:

Based on having experienced the organization, administration and execution of this program along with the successes we have achieved, we can say that the BLA has learned a great deal. We are becoming more skilled at understanding the needs of the lake and how to present facts to people that make sense for the long - term health of the lake. It is our opinion that by demonstrating how we care sets a positive example for others to follow.

During the term of this grant we set goals and we are pleased that we were able to accomplish them. As stated earlier, the goal to identify the sources of runoff, evaluate and prioritize them based on loading was accomplished. The Watershed Plan was then developed in conjunction with Geosyntec, which detailed all of these sights, their estimated pollutant load and suggested schedule of priority. The plan also contained recommended solutions to these issues. Upon completion of the Watershed plan came the decision process for sight selection, BMP design and implementation. Through negotiation we were able to obtain three additional sight designs for the original budget, which was supposed to be three. Implementation of BMPS has commenced at three sites, only to be curtailed by the winter weather. Another success was the design and publication of the watershed homeowner's guide. Through many hours of creative design and review, the BLA came up with a very informative guide to assist people in understanding the needs of the lake and maintaining practices that will be beneficial to the lake and the surrounding watershed. In addition to these successes we achieved a couple more that are more than worthy of mention. We have begun to develop a working relationship with the town of Amherst and feel very positive about the ability to do the same with the town of Merrimack regarding a mutual interest in cleaning up and improving the lake. We have also made significant strides in getting our message out to the people of the towns. We have done the mailing of the watershed guide, appeared in a broadcast of the board of selectmen meeting on local television and developed and maintained a Baboosic Lake website.

In conclusion, we would like to make the recommendation that the program to improve Baboosic Lake be continued. We are encouraged by homeowner and the town's receptiveness to the program and are confident that we can make great strides with our future efforts.