Pleasant Lake Watershed

Colby-Sawyer College

Volume 1, Issue 1

2006

Colby-Sawyer's Community & Environmental Studies Program

The Community and Environmental Studies program is geared to-

wards immersing students in analyses of environmental issues. This is done through a yearlong community-based research project called the Third Year Project.

This year, the Third Year Project involved working with the Pleasant Lake Protective Association (PLPA). The primary focus was to complete a comprehensive lake inventory for the Pleasant Lake Watershed in New London, NH.

The inventory is a 93 question planning tool developed by the New Hampshire Department of Environmental Services Lakes Management & Protection Program. The inventory identifies key indicators such as unique and outstanding features, recreational assets and susceptibilities to impairment. Extensive field work and a wide range of data collection and analysis methods are required to complete the inventory.

Once the inventory is completed a quantitative assessment of the lake (or score) can be compiled by assigning values to questions that address the indicators mentioned above.

In 2003, students in the Third Year Project completed a similar lake inventory for the Lake Sunapee Watershed. That inventory has proved very useful the work of the recently formed Sunapee Area Watershed Coalition. We hope that this project will build on the previous inventory and expand on key analyses such as the percentage of impervious surface in the watershed and the rate of development.

This years group from left to right:

Matt Urban, Carly Rademaker,

Laurel Kenna, Steven Hash.

The mission of PLPA is to preserve and protect the Pleasant Lake Watershed. The completion of the inventory will assist the association in carrying out its mission and addressing development pressure in the region. It is also anticipated that the inventory will be a useful tool to the New London Conservation Commission.

For more information on this project please contact:

John Callewaert
(603)-526-3973
jcallewaert@colby-sawyer.edu

A copy of the final project report will be available in July at:

www.colby- sawyer.edu/academic/ces

Follow the link to Community-Based Research Reports.

NEW HAMPSHIRE COMPREHENSIVE LAKE INVENTORY

Purpose:

- Establish "baseline" information that objectively characterizes the watershed.
- Guide the collection of information to assess the status of the watershed.
- Create a foundation that facilitates a common understanding of watershed characteristics.
- Serves as a planning and educational tool.

How does it work?

The Inventory is organized into 10 primary attributes. Each attribute is designed to address a specific characteristic commonly evaluated when developing a watershed management plan. Within each attribute there is a series of questions with a listing of multiple-choice answers for each question. Most answers are then scored on a 1-5 basis.

There are 3 categories in which the questions are split in to:

1. **Unique or Outstanding Value:** A lake scoring high in this category will have many unique, outstanding, natural or cultural features.
2. **Recreational Value:** A lake that scores high provides and/or supports a variety of passive and active recreational activities
3. **Susceptibility to Impairment:** A high score indicates the vulnerability to detrimental changes or impacts or is threatened or stressed by one or more factors.

How did Pleasant Lake score? Areas of Concern/Strengths by Category:

Unique or Outstanding Value: 63/100

Concern– Lack of Specialized Breeding Grounds

Strength– Fish, Avian, and Mammal Diversity.

Recreational Value: 61/100

Concern- Proximity to Major Transportation Corridors

Strength– Opportunities for Recreational Fishing

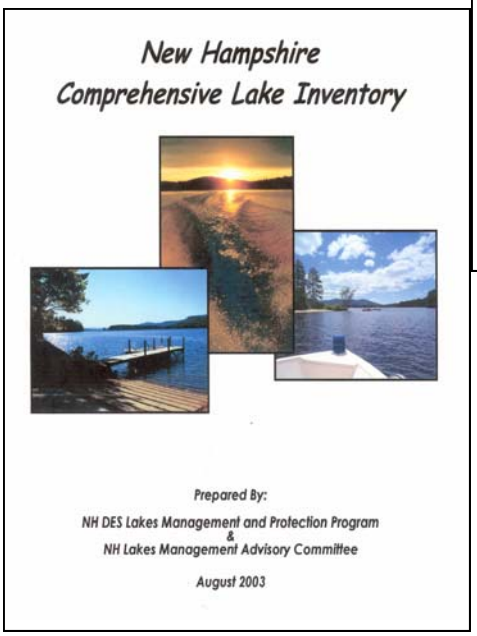
Susceptibility to Impairment: 47/100

Concern- Presence of Milfoil in nearby waterbodies

Strength– Water Quality Indicators

The overall score for an individual attribute is determined by adding the scores from each of the questions under each category. The score can then be compared to the total number of points available (100) for that particular attribute.

Susceptibility to Impairment scored low, which indicates the lake has low vulnerability to damage. The other categories scored high; it is important for a lake to have these kinds of qualities to keep it desirable.



The Inventory was developed by:

NH Department of Environmental Services

NH Lakes Management Advisory Committee

Contact: Jackie Colburn, Lakes Coordinator.

jcolburn@des.state.nh.us

Table Of Contents:

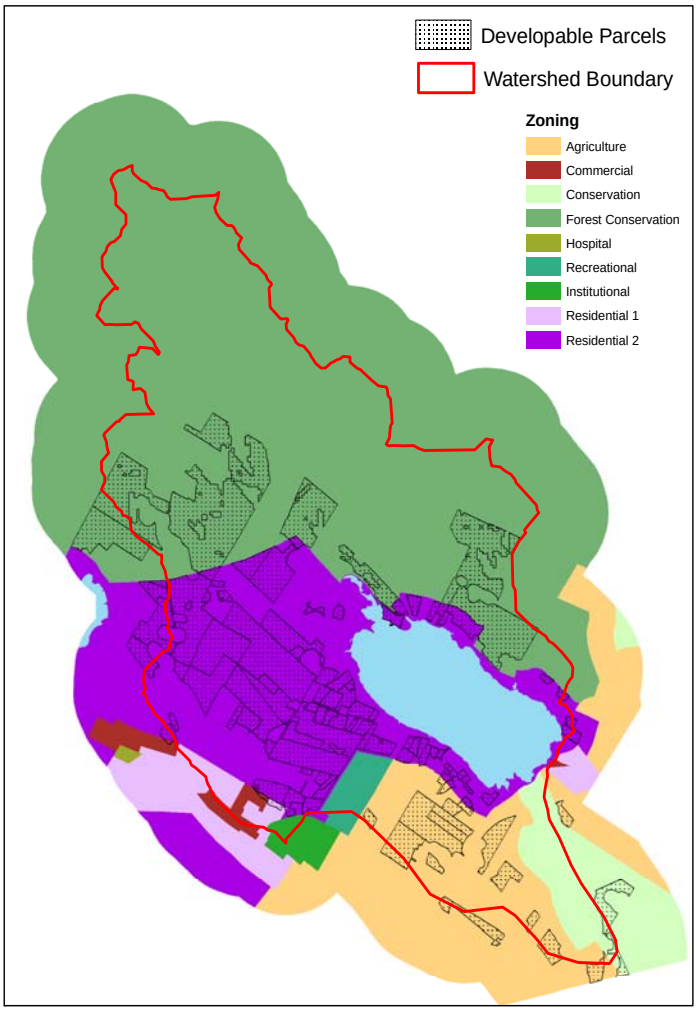
BUILD-OUT ANALYSIS & RATE OF DEVELOPMENT

Build-Out

The build-out analysis was not an original component of the inventory. It was added to compliment the information that was compiled regarding rate of development and impervious surfaces. The build-out analysis can be used to establish where development may occur. The build-out was based on the most current zoning regulations specifying each zoning category minimum lot size. To determine where development may occur, the build-out analysis utilizes the following data: zoning regulations, parcel boundaries, building footprints, wetlands, and steep slopes. From this information we were able to determine which parcels were already built-out, or zoned-out based on the criteria listed above. A build-out analysis should be created with the assumption that the greatest amount of impact that could occur will occur. The parcels are divided to their fullest potential while complying with current zoning ordinances. By adopting these assumptions, it becomes clear where possible areas of concern fall. This allows a town the ability to plan future conservation efforts and/or amending zoning regulations.

Findings: *Using current zoning regulations, total build-out in the watershed would result in an additional 73 acres to the existing 230 acres of impervious surface.*

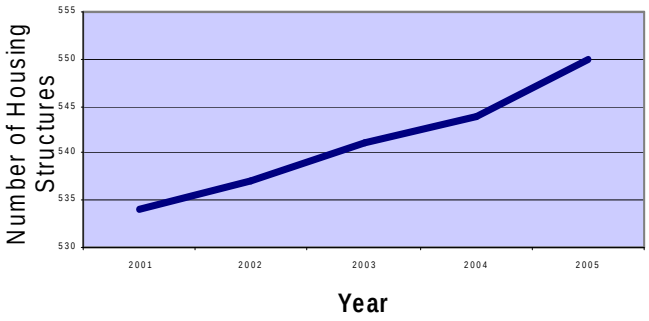
Build-out Analysis Map



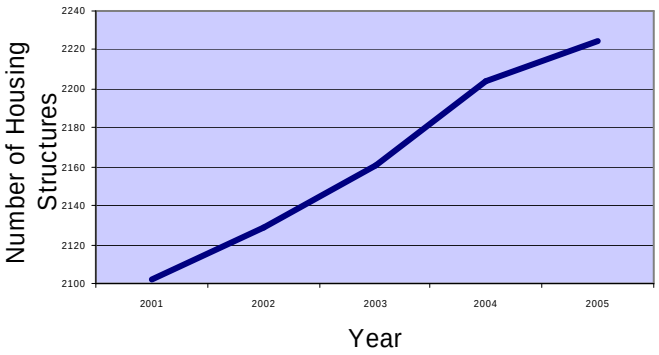
Rate of Development :

Knowing the rate of shoreland and watershed development in local communities can help prioritize planning goals and objectives. Establishing development guidance priorities provides the most efficient use of limited resources and proves beneficial in protecting the natural characteristics of the watershed.

Increase in Housing Structures for the Pleasant Lake Watershed



Increase in Housing Structures in New London



IMPERVIOUS SURFACE EXPERIMENT

Impervious Surface by the Numbers:

In a review of scientific studies[1] on the impact of impervious surface on water quality; the following ranking was developed:

- Less than 10% impervious: protected
- Between 10 and 30% impervious: impacted
- Greater than 30% impervious: degraded

Pleasant Lake Results:

Shoreland: 17.7%

Watershed: 3.5%

[1]Brabec, Schulte & Richards, *Journal of Planning Literature*, May 2002.

The impervious surface experiment was developed in order to gain first hand information about how water runoff is affected by different impervious surfaces.

The experiment began with a rough hypothesis:

1) Runoff will increase as slope increases.

2) Runoff will be affected by different surfaces.

We designed an experiment to test these hypotheses. We built an apparatus that could adjust slope and test various surfaces. We tested these four surfaces: Grass, Bluestone, Dirt-Gravel, and Asphalt.

We ran numerous trials with all four surfaces at three different slopes. We calculated what an actual two year rainfall event would be, and established the volume of water that would need to be dispersed over each surface during the course of an hour, with "rain" pulses every fifteen minutes simulating an actual rain event.

The slopes that were tested were chosen based on local zoning steep slope regulations which prohibit development on slopes greater than 25%. We set the test slopes at a 5%, 10 %, and 25% slope.

Our results showed that Grass and Bluestone had zero runoff at all three slopes. However, there was a significant amount of runoff from both Dirt-Gravel and Asphalt. Asphalt had the highest amount of runoff. The Dirt-Gravel had slightly less runoff. Both surfaces demonstrated that more runoff occurs as slope increases, supporting our hypothesis that there were differences in runoff for different surfaces.

Four Surfaces

Grass

Bluestone

Dirt-gravel

Asphalt

IMPERVIOUS SURFACE EXPERIMENT

The final Impervious Surface Riser and Platform.

Discussing how we will capture the runoff.

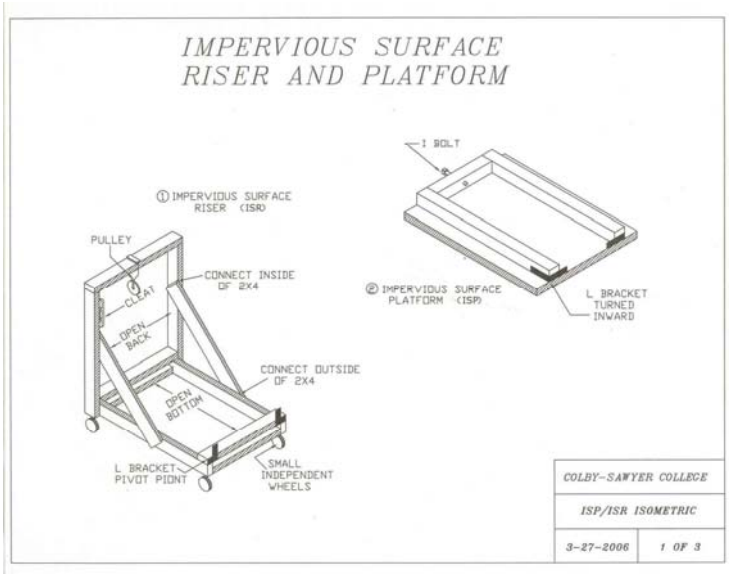
A trial run with the asphalt surface.

Testing our first rainfall event.

Using a rope and pulley attached to the back of the platforms, (seen here) we were able to adjust the slope to our desired heights.

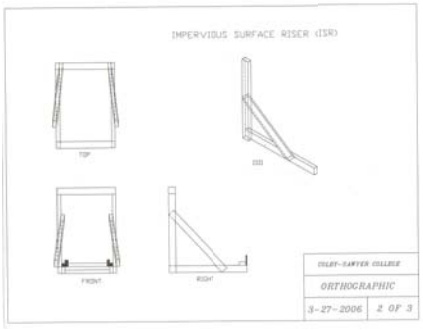
To maintain consistency we measure moisture levels before each trail.

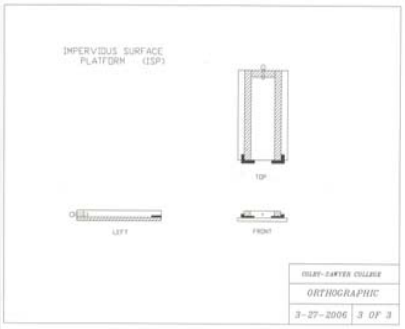
IMPERVIOUS SURFACE EXPERIMENT



These are some of the blue-prints made using Auto-CAD from sketches that were made during the designing process for the experiment.

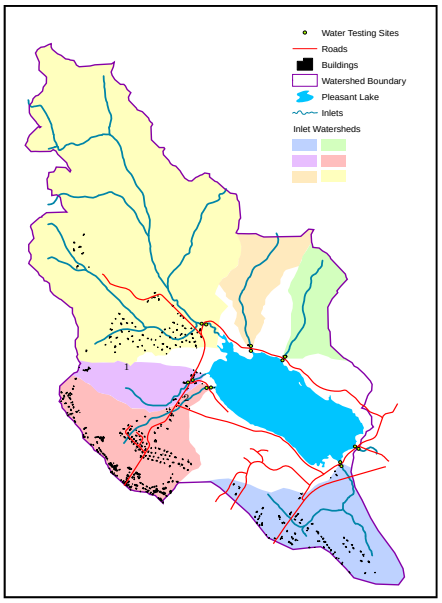
To the left: The Impervious Surface Riser (ISR), and the Impervious Surface Platform (ISP). When the two of these pieces come together as one apparatus we are able to manipulate slopes.





CONDUCTIVITY ANALYSIS

We found correlations between the amount of development in the watershed of each stream and its average conductivity over the winter season. Red Brook consistently had a much higher level of conductivity then the other streams. It also has a much higher amount of development in its watershed. More development could contribute to higher conductivity due to increased amounts of impervious surfaces which create more runoff. Although we are suggesting possible correlations between development and conductivity, more testing is required to support these conclusions.



Stream	Average Conductivity (µS/cm)	Structures/Acre in Watershed	% Road Coverage
Red Brook	175.40	.40	9.00
Low Plains Inlet	85.28	.13	2.00
White Brook	68.75	.06	9.00
Great Brook	27.14	.04	0.50
Inlet B	26.14	.003	0.01
Inlet A	20.25	.01	4.00

Best Practices and Recommendations

Conservation

- Over 36% of the Pleasant Lake Watershed is currently conserved. This compares with 16% for the town of New London and the recommended goal of the Society for the Protection of NH Forests of 25% for each town. Given that a significant amount of the watershed is already conserved, we recommend that in addition to land conservation, the association consider other strategies to protect the health of the watershed. Based on the study of the watershed this year, here are four ideas:

Driveway Surfaces

- If thinking about re-doing your driveway consider the following:
    - Asphalt, no matter the slope, has a significant impact on the environment.
    - Bluestone may be a better alternative. Bluestone is very porous and even at the highest slopes will allow water to percolate. However, we are unsure of the consistency of this surface over time and recommend that you have it checked every few years and possibly adding a new top layer. Bluestone shares similar visual appeal of asphalt and is usually less expensive to install.

Septic Tanks

- While we did not study septic systems as a part of this project, studies have shown that failed septic systems have a significant impact on water quality. Many reach their life expectancy at around ten years. We suggest that the association create a database that can be used to monitor septic systems within the watershed.

Stream Protection

- Based on our analysis of the conductivity data for streams in the watershed, it is clear that those streams with the highest conductivity are streams impacted by development. We recommend that the association work with local zoning boards to establish stream buffers on intermittent streams. This may be one of the best ways to ensure water quality in the lake.

Steep Slopes

- Our last recommendation is in regards to zoning, particularly for steep slopes. We feel that its important to make sure that the current zoning regulation stays in place. The current steep slope regulations prevent building on a slope above 25%.
- Why is this important?
    - Based on our runoff experiments we feel that development on such a steep slope would create heavy amounts of runoff. We would be concerned that the runoff could cause harm to the lake.

Photos by: Kittie Wilson

LAKE RELATED POLICY

NH State policies that may be of interest to the Pleasant Lake Protective Association

Milfoil —House Bill 1407

"The Departments of Environmental Services (DES) and Safety stated this bill intends to extend the collection of a temporary $3 increase in the boat fee registration fee and the Milfoil and Other Exotic Aquatic Plants Prevention Program beyond the prospective repeal date of January 1, 2008. The DES and Department of Safety assumed that under current law, revenue from boat registration fees and expenditures related to Milfoil and Other Exotic Aquatic Plants Prevention Program would terminate January 1, 2008 or half way through FY 2008. The DES and Department of Safety further assumed there will be 102,200 boat registrations in FY 2008 and FY 2009 and 102,500 in FY 2010. At $3.00 per boat registration and an effective date of January 1, 2008, revenue and expenditures are expected to increase by $153,300 in FY 2008, $306,600 in FY 2009 and $307,500 in FY 2010" (http://www.gencourt.state.nh.us/ie/).

This is a bill that is supported by the NH Lakes Association.

The current status of this bill: House- Passed: March 7th, 2006

Senate- Referred to Finance Committee: April 13th, 2006

Boat Speed —House Bill 162

This bill deals with setting a boating speed limit at forty-five miles per hour during the day, and twenty-five miles per hour at night (NHLA). The bill was first proposed solely for Lake Winnipesauke, but has been revised to include any public waters greater than ten acres.

This bill was supported by the NH Lakes Association.

The current status of this bill: House– Passed: February 2nd, 2006

Senate– Inexpedient to Legislate: March 16th, 2006

Even though this bill failed, the association could consider a different approach to controlling boat speed by following the process that was used to set a speed limit on Squam Lake. The following is the Department of Safety rule that was used by the Squam Lakes Protective Association. "The commissioner of safety shall, after receiving a petition signed by 25 or more residents or property owners of each affected town or towns in which a lake, pond or river is located and after notice and hearing, at which it appears that the public interest requires, adopt rules under RSA 541-A governing the maximum horsepower of boat engines and outboard motors or prescribe maximum speed limits for the operation of such boats or outboard motors applicable to or upon all or any portion of the public waters of this state (Title XXII)." (http://www.gencourt.state.nh.us/rsa/html/XXII/270/270-12.htm)

Loon Protection —House Bill 1140

Establishment of a committee to study the establishment and enforcement of protection zones for nesting loons.

This bill is supported by the NH Lakes Association.

The current status of this bill: House– Passed: February 22nd, 2006

Senate– Tabled: April 6th, 2006

Mercury —House Bill 1673

If passed this bill would require all coal-burning plants in the state to install scrubber technology on their plants by July 1, 2013. It also provides economic incentives for installations earlier than the set date and incentives for greater emission reductions. Should this bill be passed and the scrubbers installed it would provide an 80 percent reduction of mercury emissions in New Hampshire. This bill is supported by the NH Lakes Association.

The current status of this bill: House– Passed: March 22nd, 2006

Senate– In committee: April 17th, 2006

Pleasant Lake Protective Association (PLPA)

When the Pleasant Lake Protective Association (PLPA) was formed almost 40 years ago, it's statement of purpose included the responsibility to "watch over the conditions of and purity of the waters of Pleasant Lake" and "to assist in the development of policies pertaining to the control of the water level of Pleasant Lake." (~Dick Clayton)

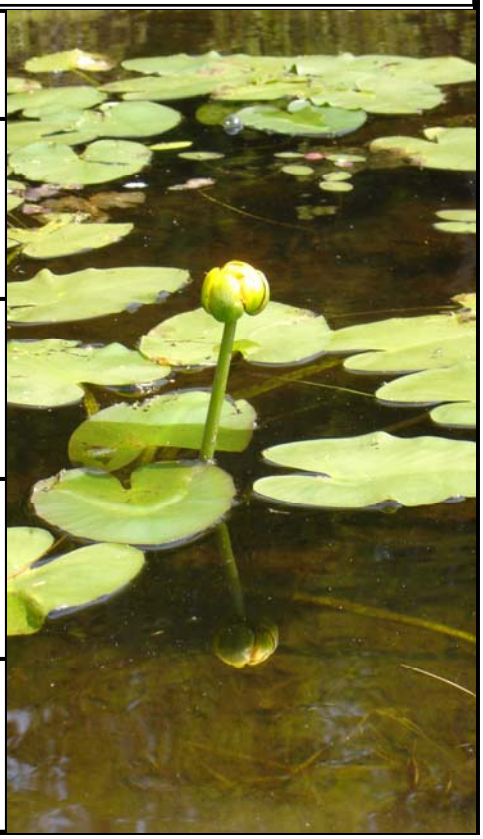
Throughout the entire project the PLPA have been wonderful to work with, and they have been quick to respond to all of our questions. The PLPA have demonstrated to the third-year project students what its like working in cohort with a community partner.

The PLPA continue to demonstrate what it takes to be successful stewards of a lake's watershed. They have managed and cared for Pleasant Lake for nearly 40 years and it shows. They love and respect everything the lake has to offer, and are willing to work hard to ensure that everyone who visits will respect it and enjoy it as well.

Photo by: Kittie Wilson

Group information

Group of 2006	*Major*	*Minor*	*Home Town*
Matt Urban	CES	Biology And Sociology	Littleton, NH
Steven Hash	CES	Biology	Holyoke, MA
Carly Rademaker	CES	Business	Buffalo, NY
Loey Kenna	CES	Business	Concord, NH



Institute for Community & Environment
Colby-Sawyer College
541 Main Street New London, NH 03257

Pleasant Lake Watershed

Mailing Address:

jcallewaert@colby-sawyer.edu
Phone: (603) 526-3444
Fax: (603) 526-3429
CES Website: http://www.colby-sawyer.edu/academic/ces/