There is no small pleasure in sweet water - Ovid

Our Water, Our Lake

Pleasant Lake Project Portfolio

Completed by the CES Community-Based Project Team at Colby-Sawyer College

Students	**Instructors**
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Fall 2005 – Spring 2006

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CHAPTER 1

Portfolio Contents

Community and Environmental Studies Program Overview

The Community & Environmental Studies (CES) program at Colby-Sawyer College provides students with the opportunity to understand, integrate, and apply multiple disciplines and different ways of thinking with a high level of concern for the preservation and sustainability of the Earth and its resources. Our graduates are prepared and encouraged to act on their informed environmental concerns in their homes, places of work, and communities.

The CES program offers several essential features that provide students with a unique and exciting learning experience. First, the program is pre-professional and designed to provide students with the necessary "hands-on" skills one needs to step from college directly into the work force. The program is also designed to prepare students for graduate training in a number of fields. Second, many CES projects are linked very closely with the local community. Students interact directly with individuals and businesses in the local area and develop an important sense of community for themselves and their college. Third, many experiences in the program are student driven. Students play a key role in determining which questions and issues are important as well as the proper methods for addressing those issues.

The third year is the defining characteristic of the Community and Environmental Studies program. Rather than choosing from a series of 300-level course options, all students majoring in Community and Environmental Studies take CES 301/302: *Community-Based Research Project I & II* for 18 total credit hours during the third year. In addition to traditional classroom and laboratory exercises, students are immersed in an in-depth, yearlong analysis of a local environmental problem or issue with detailed fieldwork and extended site visits. This structure allows students to work at length on a complex problem while developing important skills in group-oriented tasks to a degree that is not obtainable in traditional courses.

Executive Summary

This portfolio is a collection of information and analysis about the characteristics and conditions of the Pleasant Lake Watershed. The purpose of compiling this information is to provide the Pleasant Lake Protective Association (PLPA) with useful information to be referenced for the creation of future management plans for the watershed. This portfolio was completed through a cooperative relationship between the Institute for Community and Environment at Colby-Sawyer College and the PLPA. Project work was supported through a small grant from the Wellborn Ecology Fund of the Upper Valley Region of New Hampshire Charitable Foundation. Included in this portfolio is a variety of information collected between September 2005 and April 2006 concerning the watershed.

The primary goal at the beginning of this project was to complete the *Comprehensive Lake Inventory* (Chapter 2) created by the New Hampshire Department of Environment. Now that the inventory has been completed for Pleasant Lake, it represents an array of in-depth questions and answers about many different characteristics pertaining to the lake system. It also provides an objective rating of the current status of Pleasant Lake.

The most complex questions in the inventory were questions which related to calculating the rate of development and the percentage of impervious surface in the watershed. These *Impacts of Development* (Chapter 3) questions sparked the need for further investigation as both topics are good indicators of lake health and ways to plan for future development and land use practices in the watershed. Looking into the impacts of development also involved the completion of a build-out analysis. The purpose of a build-out analysis is to, based on current zoning and development, predict how much future development would be possible in the watershed. The analysis was conducted based on a "worst case scenario" of development. When combined with rate of development, a build out analysis can provide a glimpse into the future of the watershed and can be a powerful tool for future management plans. After answering the impervious surface question in the inventory, we developed an experiment to analyze different surface types (asphalt, bluestone, gravel and grass). By understanding how different surfaces in the watershed effect rates of water runoff, it is possible to begin to understand the consequences of using such surfaces in a watershed.

Also included in this portfolio is data and analysis related to *Water Testing* (Chapter 4) conducted over the 2005-2006 winter season. The results were analyzed by comparing conductivity levels to levels of development in the sub-watershed for each inlet into Pleasant Lake. Flow measurements are also provided for mid-Fall 2005.

Lake Related Policy (Chapter 5) papers address current legislative initiatives which affect, or could affect Pleasant Lake in some way. Each addresses a topic of concern for the watershed and the PLPA.

The final section of the portfolio contains two *Communication Resources* (Chapter 6) that were developed for this project – a newsletter highlighting the major findings of the work completed this year and a flyer for the final project presentation.

Acknowledgements

At this time we would like to thank individuals and organizations that were very helpful to us in compiling this portfolio. Special appreciation goes to the Pleasant Lake Protective Agency (PLPA), our community partner, as well as the town of New London, and the New Hampshire Department of Environmental Services. Individually, we would like to recognize John Callewaert, Laura Alexander, Ben Steele, and Leon-C. Malan for their instruction and guidance throughout the past two semesters. We also individually recognize Kittie Wilson of the PLPA, whose contributions helped our class complete the *Comprehensive Lake Inventory* and made it possible for our class to present our third year project to the PLPA and others. Without the help and dedication of these organizations and individuals, our Third Year project would not have been possible.

CHAPTER 2

New Hampshire Comprehensive Lake Inventory

The main goals in completing the Lake Inventory were to:

1. Establish baseline information that objectively characterizes the watershed
2. Guide the collection of information to assess the status of the watershed
3. Creates a common understanding of watershed characteristics for the Pleasant Lake Watershed

The Inventory is organized into 10 attributes. Each attribute is designed to address a specific characteristic of the waterbody such as physical characteristics, water-dependent activities, etc. Within each attribute a series of questions focuses in on the characteristics important for that attribute. Many answers are scored on a 1-5 rating. Our group divided the attribute questions between the four of us. We were able to work off of our strengths and weaknesses to complete all 93 questions from the 10 attributes. Some of the attribute questions involved creating maps using Geographic Information Systems (GIS), and other questions included extensive field work. Three overarching themes guide the questions and overall score for the lake:

1. Unique or Outstanding Value: Contains many natural or culturally significant features.
2. Recreational Value: Supports a variety of passive and active recreational activities.
3. Susceptibility to Impairment: Concerns vulnerability to changes; threatened or stressed by one or more factors

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

How did Pleasant Lake score? Areas of Concern/Strengths for Categories:

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

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 attractive to residents and visitors and healthy for the biota.

It is important to note that the scores of an inventory can not be used in

comparison to the scores of other lakes. This is because each lake is scored on its unique characteristics. It's not an assessment to illustrate how multiple lakes compare but, rather, an assessment to see how a particular lake scores.

The Inventory was developed by:
NH Department of Environmental Services
NH Lakes Management Advisory Committee

Contact: Jackie Colburn, Lakes Coordinator
NH Department of Environmental Services
PO Box 95
Concord, NH 03303-0095
603-271-2959
jcolburn@des.state.nh.us

Attribute Tally Sheets

RECREATIONAL VALUE ***Attribute and Associated Questions***	*Recorded Value*	*Rec. Value*
ATTRIBUTE 1. **GEOGRAPHICAL, SPACIAL, AND DEMOGRAPHIC INFORMATION**		
C. Proximity to major transportation corridors (miles to nearest major roadway)	5	5
D. Total resident population w/in 30 mile radius (# of people)	3	5
ATTRIBUTE 2. **PHYSICAL WATERBODY CHARACTERISTICS**		
A. Surface water area (acres)	4	5
E. Shoreline configuration (i.e. shape)	1	5
F. Island presence/absence (# of islands)	2	5
ATTRIBUTE 3. **WATER QUALITY CHARACTERISTICS**		
F. Secchi disc transparency (meters)	3	5
ATTRIBUTE 4. **BIOLOGICAL / ECOLOGICAL CHARACTERISTICS**		
A. Algal abundance (ug/L of chl a)	5	5
H. Specialized habitats, breeding or rearing areas (# of areas, structures)	2	5
ATTRIBUTE 5. **RECREATIONAL CHARACTERISTICS**		
A. Average watercraft density on lake or pond (all types)	4	5
B. Type of watercraft use (% of total watercraft)	3	5
C. Private marine service / docking facilities (#)	1	5
E. Recreational fishing (i.e. types and # of game fish species pursued)	5	5
F. Occurrence of fishing tournaments / derbies (# / year)	3	5
G. Angler Usage (# anglers / acre)	1	5
K. Boat launches and access sites (#)	2	5
L. Other recreation and support facilities (#)	2	5
ATTRIBUTE 6. **RESTRICTIONS OR PROHIBITED USES**		
E. Power boat restrictions	5	5
F. Ski craft restrictions	1	5
ATTRIBUTE 9. **WATERSHED CHARACTERISTICS**		
A. Watershed development and land use (% developed, % undeveloped)	4	5
ATTRIBUTE 10. **VISUAL / AESTHETIC CHARACTERISTICS**		
A. Scenic or natural features of interest from waterbody (# of features)	5	5
TOTAL	61	100

A high score in this category indicates that the waterbody has a high recreational value.

UNIQUE OR OUTSTANDING VALUE ***Attribute and Associated Questions***	*Recorded Value*	*Out. Value*
ATTRIBUTE 1. **GEOGRAPHICAL, SPATIAL, AND DEMOGRAPHIC INFORMATION**		
B. Waterbody elevation (feet)	2	5
ATTRIBUTE 2. **PHYSICAL WATERBODY CHARACTERISTICS**		
B. Maximum water depth (meters)	3	5
J. Basin morphometry (# basins)	3	5
K. Waterbody origin (natural / artificial)	3	5
ATTRIBUTE 3. **WATER QUALITY CHARACTERISTICS**		
F. Secchi disc transparency (meters)	3	5
ATTRIBUTE 4. **BIOLOGICAL / ECOLOGICAL CHARACTERISTICS**		
C. Fish species diversity (# of species)	5	5
D. Avian species diversity (# of species)	5	5
E. Mammal species diversity (# of species)	5	5
F. Reptile & amphibian species diversity (# of species)	**4**	5
H. Specialized habitats, breeding or rearing areas (# of areas, structures)	2	5
K. Threatened and endangered plant/animal species and exemplary natural communities	4	5
ATTRIBUTE 7. **UNIQUE CHARACTERISTICS**		
A. Public drinking water supply (# households served)	1	5
B. Historic features in or around waterbody (#)	2	5
C. Educational facilities or sites (# and type)	1	5
E. Participant in VLAP, LLMP, or an alternative volunteer monitoring program	4	5
ATTRIBUTE 8. **SHORELAND CHARACTERISTICS**		
C. Protected land or land not available for development within the shoreland (% shoreland frontage)	2	5
H. Local land use regulatory measures	4	5
ATTRIBUTE 9. **WATERSHED CHARACTERISTICS**		
C. Protected land or land not available for development within the watershed (% of watershed area)	4	5
H. Local land use regulatory measures	1	5
ATTRIBUTE 10. **VISUAL / AESTHETIC CHARACTERISTICS**		
A. Scenic or natural features of interest visible from the waterbody (# of features)	5	5
TOTAL	63	100

A high score in this category indicates that the waterbody has many unique or outstanding values.

SUSCEPTIBILITY TO IMPAIRMENT ***Attribute and Associated Questions***	*Recorded Value*	*Sus. Value*
ATTRIBUTE 1. **GEOGRAPHICAL, SPATIAL, AND DEMOGRAPHIC INFORMATION**		
D. Total resident population w/in 30 mile radius (# of people)	3	5
ATTRIBUTE 2. **PHYSICAL WATERBODY CHARACTERISTICS**		
C. Mean water depth (feet)	2	5
D. Percent shoal area / littoral zone (% of waterbody <15')	2	5
I. Hydraulic flushing rate (time waterbody flushes / years)	3	5
ATTRIBUTE 3. **WATER QUALITY CHARACTERISTICS**		
D. pH	1	5
E. Total phosphorus concentration (mg/L)	2	5
F. Secchi disc transparency (meters)	3	5
I. Historic point source discharges	1	5
ATTRIBUTE 4. **BIOLOGICAL / ECOLOGICAL CHARACTERISTICS**		
A. Algal abundance (µg/L of chl a)	1	5
B. Algal community composition (% blue greens)	1	5
I. Exotic aquatic plant species (presence / absence and proximity to waterbody with an exotic)	3	5
J. Exotic aquatic animal species (presence / absence and proximity to waterbody with an exotic)	2	5
ATTRIBUTE 5. **RECREATIONAL CHARACTERISTICS**		
A. Average watercraft density on lake or pond (all types)	2	5
B. Type of watercraft use (% of total watercraft)	3	5
ATTRIBUTE 8. **SHORELAND CHARACTERISTICS**		
A. Shoreland development and use (% developed, % undeveloped)	3	5
C. Protected land or land not available for development within the shoreland (% shoreland frontage)	4	5
H. Local land use regulatory measures	2	5
ATTRIBUTE 9. **WATERSHED CHARACTERISTICS**		
A. Watershed development and land use (% developed, % undeveloped)	2	5
C. Protected land or land not available for development within the watershed (% of watershed area)	2	5
H. Local land use regulatory measures	5	5
TOTAL	47	100

A high score in this category indicates that the waterbody has a high susceptibility to impairment.

Inventory Reports

Attribute 1: Geographical, Spatial, and Demographical Information

Category:

Question A: Waterbody Location in the State.

Directions: The information for the majority of this question can be obtained by consulting a map with detailed information about the waterbody's location in the state and classification of the surrounding land. Note the scale of the map used.

Rationale: The relative geographic location of the waterbody forms the foundation necessary to complete a comprehensive inventory.

Process Followed: Referred to a map of Pleasant Lake from the NH GRANIT web-site, as well as referring to maps created using data from NH GRANIT.

Findings and Analysis:
Town: New London
County: Merrimack
River Basin: Merrimack
Public lands: Deming, Cook Easement, Sargent, Spofford Easement, Webb, Colby Sanctuary, Yerkes, Low Plain Natural Area, Low Plain Natural Area –Thurston, Low Plain Natural Area – Shaker Pines, Baldwin Easement, Scytheville Park, and Elkins Beach.
Within or Adjacent to Public Lands: Sargent and Elkins Beach
State: New Hampshire
Straddles State Line: No
Latitude: 43 degrees North
Longitude: 71 degrees West

Sources:
"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 12 October 2005. < http://www.granit.sr.unh.edu/>

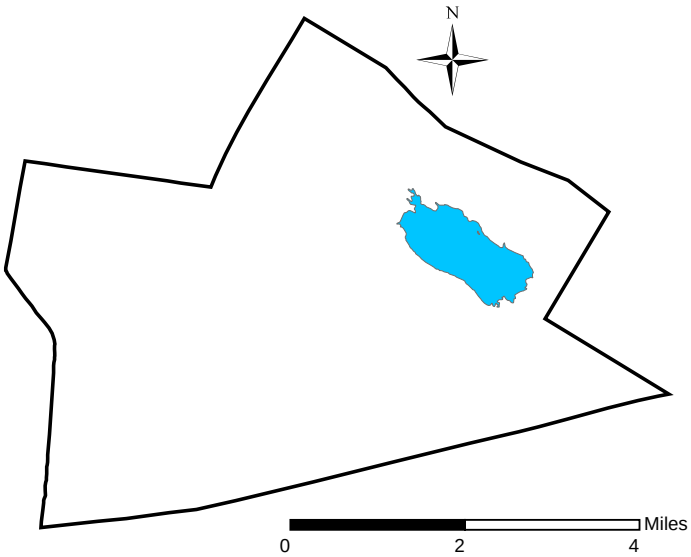
Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Waterbody Location in State

Attribute 1: Question A



Legend

New London Boundary

Pleasantlake

Colby-Sawyer College

Institute for Community & Environment
541 Main Street
New London, NH 03257
(603) 526-3444

Attribute 1: Geographical, Spatial, and Demographic Information

Category: Unique or Outstanding Value

Question B: Waterbody Elevation

Directions: Consult the New Hampshire Lakes and Ponds Inventory or an alternative reliable source.

Rationale: Elevation is a relative indicator of waterbody uniqueness. There are fewer high elevation lakes and ponds in New Hampshire than low elevation lakes and ponds.

Process Followed:
Referred to the DES copy of the Lakes and Ponds Inventory 2004: Lake Trophic Data for Pleasant Lake. 2

Findings and Analysis: 805 feet above sea level.

Evaluation Criteria:	**Score:**
1) <500 feet	1
2) 500 – 1000 feet	2
3) 1001 – 1750 feet	3
4) 1751 – 2500 feet	4
5) >2500 feet	5

Sources:
Department of Environmental Services: Lakes and Ponds Inventory, Lake Trophic Data – Pleasant Lake.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 1: Geographical, Spatial, and Demographic Information

Category: Recreation

Question C: Proximity to major transportation corridors.

Directions: Identify the nearest major transportation corridor to the waterbody. Determine the approximate distance, utilizing the most direct roadway route available to the general public, from the identified transportation corridor to the waterbody.

Rationale: The distance to a major transportation corridor provides an indicator of waterbody accessibility. Waterbodies in relatively close proximity to a major transportation corridor tend to receive heavier usage than waterbodies that require a higher level of travel effort to reach. In addition, for lakes or ponds that currently have a low level of development, their proximity to major roadways provides an indication of the potential for future development.

Process Followed: Used data from GRANIT and created a map. With the New London roads layers and the hydro layers turned on, the closest distance between the lake and I-89 could be measured in feet and then converted to miles with the ruler tool in ArcMap GIS.

Findings and Analysis: The closest and most direct route from Pleasant Lake to I-89 is about 2.88 miles. The route that has been chosen to be the most direct from the lake is: Elkins Rd., to Main St., to I-89. This short distance means that the lake is very accessible for travelers in close proximity traveling on the Interstate. Which means the lake is susceptible to high traffic numbers because of its location in relation to the Interstate.

Evaluation Criteria:	**Score:**
1) >30 miles from interstate highways	1
2) W/in 30 miles of interstate highways	2
3) W/in 20 miles of interstate highways	3
4) W/in 10 miles of interstate highways	4
5) W/in 5 miles of I-89, I-91, I-93, I-95, I-293, SR-9 (from I-91 to I-89), SR-101 (from I-93 to I-95), SR-16 (from Dover to Conway), SR3 (north of the notches), SR-28 (Allenstown to Ossipee), SR-4 (Concord to Durham)	5

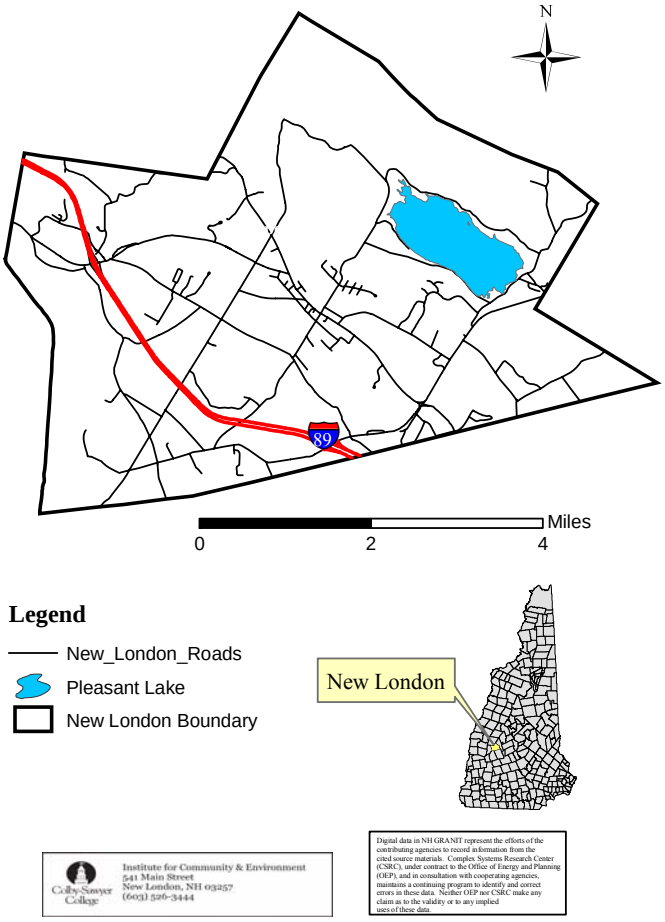
Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 12 October 2005. < http://www.granit.sr.unh.edu/>

Assessment of Question: The question is adequate as stated.
Date Completed: October 2005
Investigator: Matt Urban

Proximity to Major Transportation Corridors

Attribute 1: Question C



Attribute 1: Geographical, Spatial, and Demographic Information

Category: Recreation

Question D: Total resident population within a thirty (30) mile radius (year round).

Directions: Consult DES Lakes Program staff to estimate the total year round resident population within a 30-mile radius* of the waterbody's perimeter. In cases where the city, town, village, etc. does not fall entirely within the 30-mile radius (e.g. the 30-mile boundary splits a town in half), include that municipality's entire population.

* 30 mile radius - The direct distance from the waterbody's edge to the edge of the boundary.

Rationale: This question identifies the population base that could reach the waterbody within approximately 1-hour of travel. One hour is considered to be a conservative estimate of the amount of time people are willing to regularly travel to enjoy a lake or pond.

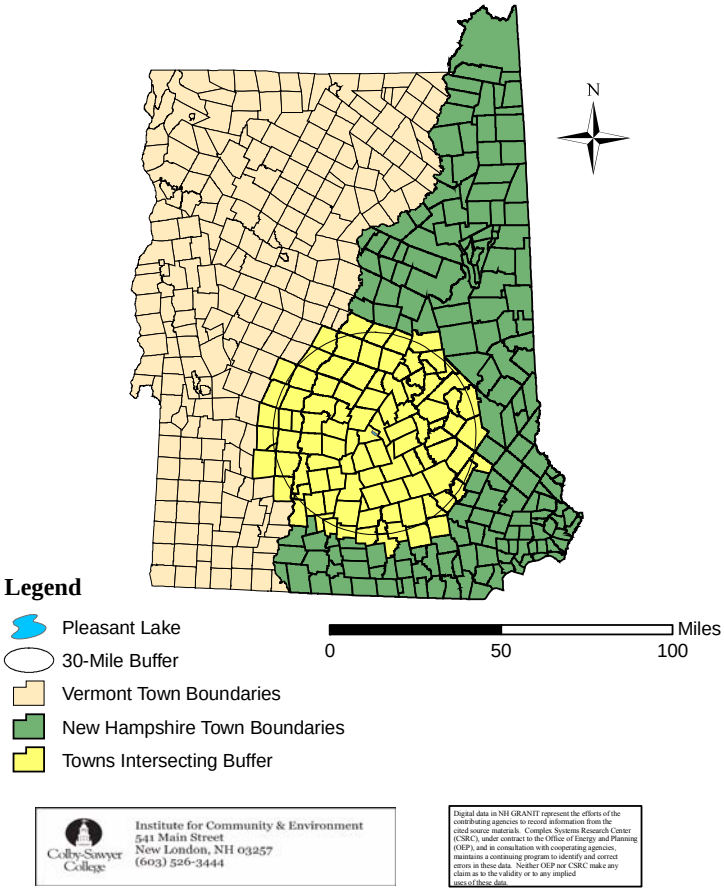
Process Followed: Created a map using GIS with information from both GRANIT and the site for Vermont's GIS data, VCGI. With this information, a thirty (30) mile buffer radius enables GIS to identify the towns within the boundary of the thirty mile radius. Then using the web site for the census bureau, populations could be for the corresponding towns.

Findings and Analysis: The total population for towns in the state of New Hampshire within the thirty (30) mile radius was 296,499 residents. The total population for the state of Vermont that was within the thirty (30) mile radius was 44,967 residents. The sum for the two states within the thirty mile radius was 341,466 residents. All the populations are based off of Census Bureau data, thus the accuracy of these totals many vary slightly from source to source. Due to the lakes location near the Interstate 89 the amount of recreation is going to be considerably high. This is good for tourism and the local economy. Also the town of New London has many seasonal residents, which is important because in the summer the population almost more than doubles. Nonetheless, with the population estimates that represent the possible influx of people that could travel to the lake within one hour's time can be cause for environmental concern regarding the impact on the waters quality do to extensive recreational use.

Evaluation Criteria:	**Score:**
1) <100,000 people	1
2) 100,000 – 250,000 people	2
3) 250,000 – 500,000 people	3
4) 500,000 - 1,000,000 people	4
5) >1,000,000 people	5

Total Year Round Resident Population Within 30-Mile Radius

Attribute 1: Question D



Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 12 October 2005. < http://www.granit.sr.unh.edu/>

"Population Finder." US Census Bureau Helping You Make Informed Decisions. US Census Bureau. 23 Oct. 2005 <http://www.census.gov/>.

"Vermont Center for Geographical Information." VGIS Data Warehouse. VCGI. 23 Oct. 2005 <http://www.vcgi.org>.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Total Population Within a 30 Mile Radius (Year Round)

VT Towns	Population
Baltimore	260
Cavendish	1,449
Hartford	10,698
Hartland	3,184
Norwich	3,587
Pomfret	994
Reading	728
Rockingham	5,175
Springfield	8,957
Thetford	2,761
Weathersfield	2,839
West Windsor	1,100
Woodstock	3,235
VT Total	44967

NH Towns	Population
Acworth	882
Alexandria	1,430
Alstead	2,019
Andover	2,190
Antrim	2,546
Ashland	1,987
Belmont	7,230
Bennington	1,450
Boscawen	3,813
Bow	7,961
Bradford	1,513
Bridgewater	1,055
Bristol	3,093
Campton	2,841
Canaan	3,400

Canterbury	2,222
Central Harbor	1,073
Charlestown	4,929
Chichester	2,482
Claremont	13,344
Concord	42,345
Cornish	1,756
Croydon	712
Deering	1,985
Dorchester	348
Dunbarton	2,484
Enfield	4,800
Francestown	1,575
Franklin	8,683
Gilmanton	3,455
Gilford	7,436
Gilsum	806
Goshen	801
Grafton	1,126
Grantham	2,442
Groton	469
Hancock	1,802
Hanover	11,124
Hebron	480
Henniker	4,817
Hill	1,082
Hillsborough	5,274
Hopkinton	5,602
Laconia	17,133
Langdon	637
Lebanon	12,655
Lempster	1,064
Loudon	4,997
Marlow	781
Meredith	6,493
Nelson	651
New Hampton	2,184
New London	4393
Newport	6,472
Newbury	1,888
Northfield	4,922
Orford	1,077
Orange	312
Pembroke	7,260
Plainfield	2,427
Plymouth	6,225
Rumney	1,451
Salisbury	1,236
Springfield	1,074
Stoddard	983
Sullivan	763
Sunapee	3,258
Sutton	1,754
Tilton	3,605
Unity	1,661
Walpole	3,704

Warner	2,949
Washington	1,010
Weare	8,542
Webster	1,777
Wentworth	789
Wilmot	1,298
Windsor	210
NH Total	296,499
Total for NH and VT	341,466

Attribute 1: Geographical, spatial, and Demographic Information

Category: Susceptibility to Impairment

Question D: Total resident population within a thirty (30) mile radius (year round).

Directions: Consult DES Lakes Program staff to estimate the total year round resident population within a 30-mile radius* of the waterbody's perimeter. In cases where the city, town, village, etc. does not fall entirely within the 30-mile radius (e.g. the 30-mile boundary splits a town in half), include that municipality's entire population.

* 30 mile radius - The direct distance from the waterbody's edge to the edge of the boundary.

Rationale: This question identifies the population base that could reach the waterbody within approximately 1-hour of travel. One hour is considered to be a conservative estimate of the amount of time people are willing to regularly travel to enjoy a lake or pond.

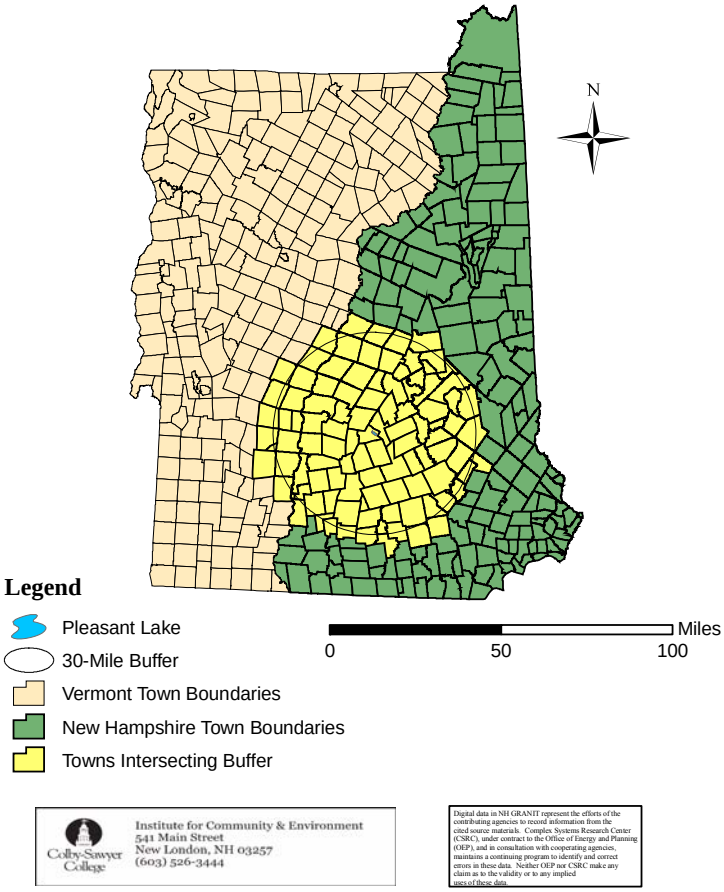
Process Followed: Created a map using GIS with information from both GRANIT and the site for Vermont's GIS data, VCGI. With this information a thirty (30) mile buffer radius enables GIS to identify the towns within the boundary of the thirty mile radius. Then using the web site for the census bureau, populations could be correlated with the corresponding towns.

Findings and Analysis: The total population for towns in the state of New Hampshire within the thirty (30) mile radius was 296,499 residents. The total population for the state of Vermont that was within the thirty (30) mile radius was 44,967 residents. The sum for the two states within the thirty mile radius was 341,466 residents. All the populations are based off of Census Bureau data, thus the accuracy of these totals many vary slightly from source to source. Also the town of New London has many seasonal residents, which is important because in the summer the population almost more than doubles. This information is demonstrating the greater chance of impairment to the water's quality due to the expansive growth of population. The population that has been represented has reasonable access to the lake; access that is estimated at about one hours traveling time.

Evaluation Criteria:	**Score:**
1) <100,000 people	1
2) 100,000 – 250,000 people	2
3) 250,000 – 500,000 people	3
4) 500,000 - 1,000,000 people	4
5) >1,000,000 people	5

Total Year Round Resident Population Within 30-Mile Radius

Attribute 1: Question D



Sources:

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Boscawen	3,813
Bow	7,961
Bradford	1,513
Bridgewater	1,055
Bristol	3,093
Campton	2,841
Canaan	3,400

Canterbury	2,222
Central Harbor	1,073
Charlestown	4,929
Chichester	2,482
Claremont	13,344
Concord	42,345
Cornish	1,756
Croydon	712
Deering	1,985
Dorchester	348
Dunbarton	2,484
Enfield	4,800
Francestown	1,575
Franklin	8,683
Gilmanton	3,455
Gilford	7,436
Gilsum	806
Goshen	801
Grafton	1,126
Grantham	2,442
Groton	469
Hancock	1,802
Hanover	11,124
Hebron	480
Henniker	4,817
Hill	1,082
Hillsborough	5,274
Hopkinton	5,602
Laconia	17,133
Langdon	637
Lebanon	12,655
Lempster	1,064
Loudon	4,997
Marlow	781
Meredith	6,493
Nelson	651
New Hampton	2,184
New London	4393
Newport	6,472
Newbury	1,888
Northfield	4,922
Orford	1,077
Orange	312
Pembroke	7,260
Plainfield	2,427
Plymouth	6,225
Rumney	1,451
Salisbury	1,236
Springfield	1,074
Stoddard	983
Sullivan	763
Sunapee	3,258
Sutton	1,754
Tilton	3,605
Unity	1,661
Walpole	3,704

Warner	2,949
Washington	1,010
Weare	8,542
Webster	1,777
Wentworth	789
Wilmot	1,298
Windsor	210
NH Total	296,499
Total for NH and VT	341,466

Attribute 2: Physical Water Body Characteristics

Category: Recreational Value

Question A: Surface water area.

Directions: The *New Hampshire Lakes and Ponds Inventory* provides the best and the most comprehensive source of information to answer this and many of the other questions for the section. The user(s) should contact NH DES Watershed Management Bureau to obtain a copy that has the most recent information for the water body

Rationale: Surface water area is an important consideration when developing a management plan, as larger water bodies will often require more complex strategies and innovative solutions for long-term protection or restoration of its natural resources. Also, it is important to recognize the water body's relative size as compared to other New Hampshire lakes and ponds.

Process Followed: Consulted the *New Hampshire Lakes and Ponds Inventory* Lake Trophic Data, Pleasant Lake.

Findings and Analysis: The surface area of Pleasant Lake is 605.90 acres.

Evaluation Criteria:	**Score:**
1) 10 – 50 acres	1
2) 51 – 100 acres	2
3) 101 – 250 acres	3
4) 251 – 1,000 acres	4
5) >1,000 acres	5

Sources:
New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category: Unique Outstanding Value

Question B: Maximum water depth.

Directions: Consult the New *Hampshire Lakes and Ponds Inventory* or an alternative reliable source to determine the maximum water depth.

Rationale: Knowing the lake or pond's maximum depth will provide an initial sense of its hydraulic cycle (i.e. water budget) and potential capacity to absorb excess nutrients.

Process Followed: Consulted the *New Hampshire Lakes and Ponds Inventory* Trophic Data for Pleasant Lake.

Findings and Analysis: The maximum water depth for Pleasant Lake was found to be 29.6 m

Evaluation Criteria:	**Score:**
1) 0 – 7 meters	1
2) 7.1 – 15 meters	2
3) 15.1 – 30 meters	3
4) 30.1 – 45 meters	4
5) > 45 meters	5

Sources:
New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question C: Mean Water Depth

Directions: Consult the *New Hampshire Lakes and Pond Inventory* or an alternative reliable source to determine the maximum water depth.

Rationale: A corollary to *Question B*. Some lakes or ponds may have a single deep spot, but are relatively shallow otherwise. Other lakes or ponds might be deep throughout the entire waterbody. It is important to recognize the overall depth characteristics of the waterbody, as it is an important attribute of lake productivity, water circulation, and extent of light penetration.

Process Followed: Consulted the *New Hampshire Lakes and Ponds Inventory* Department of Environmental Services Water Supply and Pollution Control Division – Biology Bureau Lake Trophic Data.

Findings and Analysis: The mean water depth of Pleasant Lake is 10.5 m.

Evaluation Criteria:	**Score:**
1) >18 meters	1
2) 9.1 – 18 meters	2
3) 5.1 – 9 meters	3
4) 1 – 5 meters	4
5) <1 meter	5

Sources:
New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category:

Question D: Percent shoal area/littoral zone (water depth <15 feet)

Directions: Consult the DES Lakes Program staff to estimate the area of the waterbody that is less than fifteen (15) feet in depth, not including islands or wetlands.

Rationale: A measure of the shallow, near shore regions of the waterbody, commonly referred to as the littoral zone, is the area where aquatic plant growth is the most abundant and where nutrients entering from the surrounding lands are highest. In addition, a waterbody's littoral zone provides important habitat for fish, aquatic vertebrates, and wildlife. In general, lakes and ponds with large littoral zones tend to have excessive plant growth compared to waterbodies the drop off fast and consequently have small littoral zones.

Process Followed: Using a Bathymetric contour chart prepared by the NH DES I traced the 15 foot contour line from the map using a tablet digitizer. Once the line was traced, I create a shape file to match the topography map downloaded from GRANIT showing Pleasant Lake. From this shape file I used X tools to erase the inner shape from the Lake boundary leaving the littoral zone as a separate layer. From this I used X tools in the ESRI program to calculate the area of littoral zone. Once, the littoral zone is calculated use this number and the total area of the lake to determine the percent littoral zone.

Findings and Analysis:

Area of Littoral zone (square feet): 5,195,487.09768
In Acres: 119.271972

Area of Pleasant Lake (square feet): 26,237,772.65039
In Acres: 603.3387888

Area of Littoral zone (sq.ft.) / Area of Pleasant Lake (sq. ft.) = Percent Littoral zone

$$\frac{5{,}195{,}487.09768}{26{,}237{,}772.65039} = 19.80\%$$

Evaluation Criteria:	**Score:**
1) <10%	1
2) 10 – 25%	2
3) 26 – 50%	3
4) 51 – 75%	4
5) 76 – 100%	5

Sources:
Robert Estabrook, NH Department of Environmental Services, Water Division, Watershed Management Bureau.

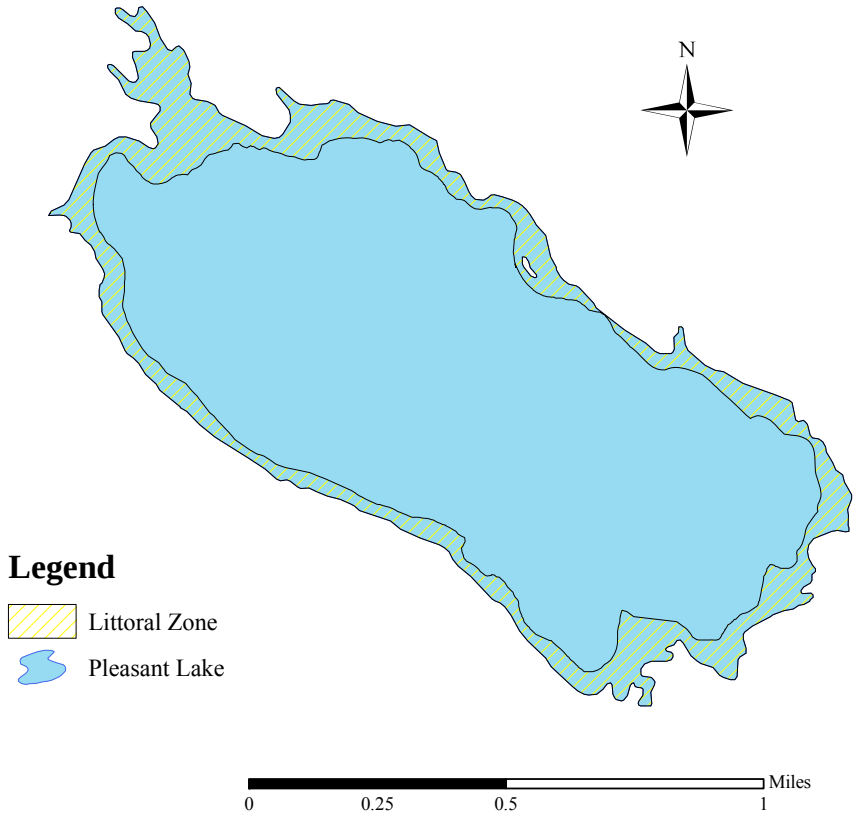
Assessment of Question: The question is adequate as stated.

Date Completed: March 2006

I**nvestigator**: Laurel Kenna

Percent Shoal Area/Littoral Zone

Attribute 2D



Attribute 2: Physical Water Body Characteristics

Category: Recreational Value

Question E: Shoreline configuration.

Directions: Consult the *New Hampshire Lakes and Ponds Inventory* to determine shoreline configuration.

Rationale: A ratio of shoreline length compared to water body surface area. A value equal to one equates to a lake or pond that is near a perfect circle in shape. As the ratio increases and the water body's shape becomes more irregular, there is an increase in the contact between land and water and a greater opportunity for nutrient enrichment. In general, larger shoreline configuration ratios will have a more extensive littoral zone area and frequent embayments.

Process Followed: Consulted the *New Hampshire Lakes and Ponds Inventory* Lake Trophic Data, Pleasant Lake.

Findings and Analysis: The shoreline configuration of Pleasant Lake was scored at 1.30 which means that it has a nearly round shape with few shoreline convolutions. This is a fairly regular shape. Compared to a lake or pond with a more regular shape Pleasant Lake will have less contact between land and water with less opportunity for nutrient enrichment. Lakes with a smaller shoreline configuration, like Pleasant Lake, will have a less extensive littoral zone area and less frequent embayments.

Evaluation Criteria:	**Score:**
1) 1.0 – 1.5 (Round or nearly so with few shoreline convolutions)	1
2) 1.51 – 2.0 (Variable in shape with frequent shoreline convolutions or embayments)	2
3) 2.01 – 2.5 (Irregular shape; numerous small embayments; some large embayments; frequent shoreline convolutions)	3
4) 2.51 – 3.0 (Variable in shape w/ highly convoluted shoreline)	4
5) > 3.0 (Highly irregular shape; large and numerous embayments; almost continuous shoreline Convolutions)	5

Sources:

New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is adequate as stated.
Date Completed: October 2005
Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category: Recreational Value

Question F: Island(s) presence/absence.

Directions: Consult a USGS topographic map (*note the scale of the map you use*), land use maps, National Wetlands Inventory maps, and any natural resource maps on file in the town(s), or the *New Hampshire Lakes and Ponds Inventory* to determine the number of islands present

Rationale: The presence of islands provides additional habitat for shoreline birds and mammals. However, large islands (> 1 acre) are likely to attract residential developments, in turn, increasing the potential for non-point source pollutants. Estimate the size of the islands and note if they are developed or undeveloped.

Process Followed: Consulted

Findings and Analysis: There is one island on Pleasant Lake; it is a small island called Blueberry Island. The island is undeveloped and will not be developed as it is conservation land.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 – 3 islands	2
3) 4 – 8 islands	3
4) 9 – 15 islands	4
5) >15 islands	5

Sources:
Alexander, Laura. Personal Interview. October 2005.
"Waterbodies." GRANIT. University of New Hampshire. 30 September 2005. <http://www.granit.sr.unh.edu.>

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category:

Question G: Shoreland Wetlands

Directions: Consult a USGS topographic map, a National Wetlands Inventory Map, or conduct a trip around the lake to determine the extent of shoreline wetland area. Examination of your local tax maps may also assist in defining wetland areas. It may also be useful to contact local conservation commissions to see if wetland inventories have been done in the area. Note the scale of the map used.

Rationale: The presence of wetlands provides additional wildlife habitat, flood storage capacity, and pollutant retention ability. In addition to the total number of wetland area, you should also consider the size of the waterbody.

Process Followed: After applying a 250ft buffer to Pleasant Lake, which is the designated shoreline area, it was possible to count the number of wetlands within this area. There are six wetland areas that exist within this area. Two of these areas are connected so the final count of adjacent shoreline wetlands is five.
Wetland areas make up 8.7 acres of the shoreline area. Although these wetlands each lie within the shoreline area they also extend beyond the 250ft buffer zone used.
The wetland areas were found by analyzing the National Wetlands Inventory (NWI) data layer in ArcMap.

Findings and Analysis:
Number of Adjacent Wetlands: 5

Evaluation Criteria:

1) Few (0 – 3) adjacent wetlands
2) Moderate (4 – 6) adjacent wetlands
3) Numerous (>6) adjacent wetlands

Sources:
"National Wetlands Inventory." New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT). 30 May 2000. <http://www.granit.sr.unh.edu/>

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category:

Question H: Watershed area : Lake volume ratio

Directions: Obtain watershed area and lake volume estimates from the *New Hampshire Lakes and Ponds Inventory* or an alternative reliable source.

Rationale: This ratio provides an estimate of the extent of the surrounding land area contributing surface water runoff to the waterbody. A large watershed area to lake volume ration indicates that surface water runoff entering the waterbody incorporates more surrounding land than a waterbody with a small ration. This estimate provides an initial indicator of the importance of considering local land uses and their potential contributions of pollutants to the lake or pond. In addition, it provides another piece of information useful in characterizing the waterbody's hydrologic cycle.

Process Followed: Consulted the *New Hampshire Lakes and Pond Inventory* Trophic Data for Pleasant Lake.

Findings and Analysis: According to the Comprehensive Lake Inventory for Lake Sunapee completed by the Institute for Community and Environment at Colby-Sawyer College in 2004 the correct way to answer this question is by using the lake area, not the lake volume. Using this information the lake area for Pleasant Lake was found to be 245.20 ha, and the Watershed Area to be 3030.3 ha. Using these numbers the ratio was calculated as follows:

$$\frac{245.20}{3030.3} \approx \frac{12.36}{1} \approx 12.36:1$$

This ratio indicates that the surface water runoff entering the waterbody incorporates less surrounding land that a waterbody with a large ratio would.

Evaluation Criteria:

1) Ratio ≥ 51:1
2) Ratio 36:1 – 50:1
3) Ratio 26:1 – 35:1
4) Ratio 11:1 – 25:1
5) Ration ≤ 10:1

Sources:

New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is very important is beginning to see how greatly local land uses can contribute pollutants to the lake. Yet to be an effective piece of information the directions need to be amended to ask for the correct measurement, lake area, not lake volume.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question I: Hydraulic flushing rate.

Directions: Consult the *New Hampshire Lakes and Pond Inventory* to determine the hydraulic flushing rate.

Rationale: The question determines the rate at which a lake or pond flushes (i.e., a volume of water equal to the lake's volume which passes through the lake) per year. Waterbodies with large inflows and outflows relative to the lake volume have rapid flushing rates or flush quickly. Waterbodies with relatively small inflows and outflows relative to the lake volume have slow flushing rates or flush slowly. Flushing rates are important when considering the lag time necessary for protection or restoration efforts to be realized. In comparison, waterbodies with relatively slow flushing rates will generally exhibit a slower response to restoration or protection efforts than lakes or ponds with rapid flushing rates. Flushing rate is also important when considering nutrient sources, as waterbodies with slow flushing rates are generally influenced by nutrient cycles, while external nutrient sources are most influential to waterbodies with rapid flushing rates.

Process Followed: Consulted the *New Hampshire Lakes and Pond Inventory* Trophic Data for Pleasant Lake.

Findings and Analysis: The hydraulic flushing rate of Pleasant Lake is 0.70 yr^{-1}.

Evaluation Criteria:	**Score:**
1) > 2 $year^{-1}$ (times per year)	1
2) 1 - 2 $year^{-1}$ (times per year)	2
3) .5 - .99 $year^{-1}$ (times per year)	3
4) .2 - .49 $year^{-1}$ (times per year)	4
5) < .2 $year^{-1}$ (times per year)	5

Sources:
New Hampshire Lakes and Ponds Inventory, Pleasant Lake. *Lake Trophic Data*. Department of Environmental Services, 1997.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 2: Physical Waterbody Characteristics

Category:

Question J: Basin Morphometry.

Directions: Investigate the overall shape and design of your waterbody. Determine if it is generally one continuous open water area, (i.e. single basin or "bathtub") or if it can be broken up into distinct sections (multiple basins). This question can best be answered by studying a detailed map of the waterbody. You should attempt to identify where the major inlets and outlets are, note any substantial shoreline constrictions, and utilize your general knowledge of suspected water flow in the waterbody. If you have difficulty determining the basin morphometry, contact DES Lakes Program staff.

Rationale: This question is designed to help you recognize if there are one or many distinct basins in your waterbody. Lakes or ponds with multiple basins can behave like many different lakes in one. Ultimately, having a better idea about this attribute will help focus your development of general and targeted management strategies.

Process Followed: Used a hydrographic map, which gives the overall shape and water depths for bodies of water.

Findings and analysis: Pleasant Lake is a very regularly shaped lake and it contains one large basin located approximately in the center surrounded by steep shorelines, and on the western area of the Lake there is another smaller less defined basin.

Evaluation Criteria:	**Score:**
1) 1 Basin	1
2) 2-5 Basins	3
3) >5 Basins	5

Sources:

Water Supply & Pollution Control Division- Biology Bureau, the Department of Environmental Services. Lake Trophic Data. Department of Environmental of Services, 1997.

Department of Environmental Services. Bathymetric Map of Pleasant Lake, 2004.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category: Unique and Outstanding Value

Question K: Waterbody Origin

Directions: Contact DES Lakes Program staff to determine the waterbody origin.

Rationale: Answering this question should help increase the awareness of how your waterbody was formed. Naturally occurring lakes and ponds are usually less productive, have a similar watershed, and longer hydraulic residence times than human constructed impoundments. There may be other significant attributes likened directly to the waterbody's origin such as recreational, economic, or aesthetic values.

Process Followed: Referred to the most recent Lakes and Ponds Inventory for Pleasant Lake.

Findings and Analysis: According to this document, Pleasant Lake is a naturally occurring lake with a dam.

Evaluation Criteria:	**Score:**
1) Human constructed impoundment would exist as either a stream or river otherwise.	1
2) Naturally occurring waterbody with water level raised or controlled by damming	3
3) Naturally occurring lake or pond without human controlled water levels	5

Sources:

Water Supply & Pollution Control Division – Biology Bureau of the Department of Environmental Services. Lake Tropic Data. Department of Environmental Services, 1997.

Assessment of Question: The Question is adequate as stated.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category:

Question L: Stratification Characteristics

Directions: Consult the *New Hampshire Lakes and Ponds Inventory,* DES VLAP reports, UNH LLMP reports, or the most recent data source with a temperature by depth profile. Waterbodies that demonstrate a >5° F change in water temperature over a change of 6 feet or less in depth are considered to be "thermally stratified". Thermal stratification is most distinct in mid-summer; therefore the data should be collected sometime from late June through late August.

Rationale: Summer thermal stratification is common to most New Hampshire lakes and ponds. However, since it created distinct layers of water that do mix, it is important to recognize if this phenomenon occurs and the possible consequences. Low dissolved oxygen levels in the hypolimnion (bottom layer) can limit habitat available to fish due to some fish species sensitivity to temperature. On the other hand, a well oxygenated hypolimnion can provide a refuge for cold water fish species such as trout and salmon, as well as limiting the accumulation of nutrients. However, a well mixed lake (not stratified) will continuously cycle nutrients from the bottom sediments promoting a higher level of algal growth. Thermal stratification usually breaks down in the spring and fall as water temperatures in the upper (epilimnion) and lower layers turnover allowing the water from all depths to mix completely.

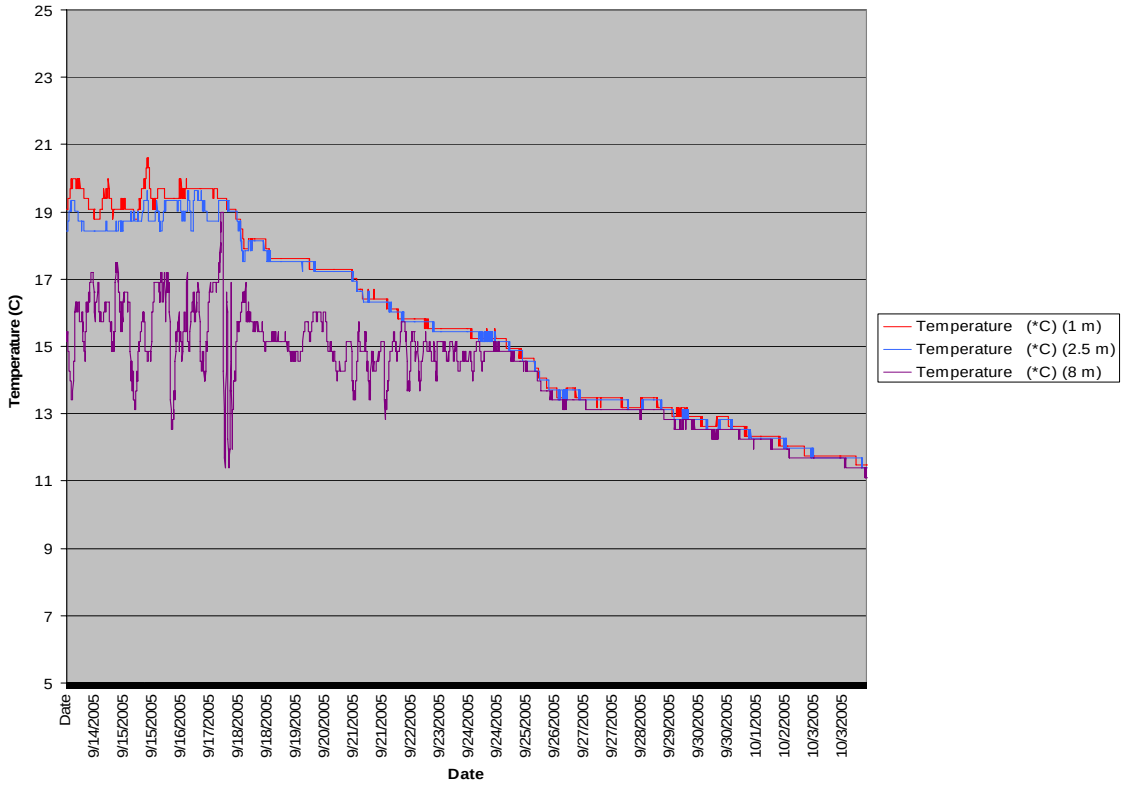
Process Followed: Consulted the most recent Lake Tropic Data sheet to determine the thermal stratification of the lake, and also collected Tidbit Data showing the lake's temperature changes to have more updated proof of stratification.

Findings and Analysis: Pleasant Lake is stratified during the summer months and turns over in October. By looking at the dissolved oxygen and temperature data collected for the thermal stratification we can see that the dissolved oxygen decreases as depth drops. The temperature gradually decreases in relation to depth as well, showing lower temperatures in greater depths.

Lake Trophic Data Sheet. July 1993.

Depth (m)	Temp (°F)	*Dissolved Oxygen	Oxygen Saturation
0.1	57.5	9	109%
1	57.5	9	109%
2	57.5	8.7	104%
3	57	8.2	99%
4	54.5	8.3	94%
5	53	8.5	94%
6	51	8.9	94%
7	49.5	9.1	94%
8	47	9.5	93%
9	46	9.6	92%
10	43	9.4	84%
11	41	8.8	75%
12	39.5	8.6	70%
13	39	8.7	70%
14	38.5	8.7	69%
15	38.2	8.4	67%
17	38	8.4	67%
19	37.5	8.4	65%

Tidbit Data, September 14 through October 3, 2005



Evaluation Criteria:

1) Waterbody never or infrequently stratifies. If stratification occurs it is usually for <1 week.
2) Waterbody experiences summer thermal stratification
3) Waterbody never completely mixes

Sources:

Department of Environmental Services Biology Bureau, Lake Trophic Data Sheet. July 1993.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005

Investigator: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category:

Question M: Flood storage ability

Directions: Contact the Dam Bureau at the DES, which maintains a comprehensive database of private, and state owned registered dams. The waterbody's flood storage capacity should be based on the information contained in this database. An additional source of information is the Office of Emergency Management.

Rational: Flood Frequency is important to land owners along the waterbodies perimeters and recreational users. Lakes or ponds prone to flooding can significantly damage homes, boathouses, docks and boats. Frequent flooding can inundate nearby septic systems, limit public access, and impact overall recreational experiences. However, natural flooding may also benefit fish and wildlife. Understanding the lake or pond's flooding tendencies will help prioritize management goals and objectives.

Process Followed: Nancy McGrath at DES Water Division, Dam Bureau was contacted by e-mail and she sent the information as needed

Findings and analysis: Ms. McGrath confirmed that Pleasant Lake has a recreational storage level of 1,225 acre-feet, and a maximum storage capacity of 3,000 acre-feet allowing for high flood storage capabilities.

Evaluation Criteria:

1) Flash floods
2) Prone to flooding
3) Low flood storage
4) Moderate flood storage
5) High flood storage

Sources:
Nancy McGrath, NH Department of Environmental Services, Water Division, Dam Bureau. E-mail: nmcgrath@des.state.nh.us, Phone: (603) 271-3406. PO Box 95, 6 Hazen Drive, Concord, NH 03302-0095

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category:

Question N: Average water level alteration

Directions: If a dam exists, identify ownership of the dam. If DES owns the dam, the Dam Bureau will have this information. If the dam is privately owned or owned by another state agency, contact them to inquire about the average seasonal downdraw. If the lake or pond does not have a water control structure on it, then consider the average natural level of water fluctuation.

Rationale: The amount a lake or ponds water level is artificially manipulated can affect the amount of habitat available for fish and other types of aquatic organisms, lake accessibility, boating safety, and lakeside property desirability. However, artificial drawdown may also be necessary to reduce flooding frequency and property damage.

Process Followed: Nancy McGrath at DES Water Division, Dam Bureau was contacted by e-mail and she sent the information as needed.

Findings and Analysis: According to the operation & maintenance plan submitted by the Town of New London to the NHDES Dam Bureau, the summer lake level is maintained at the top of the board gate at elevation 802.7, in the fall around October 15 they drop the level to 801.7 by removing the top two boards.

Evaluation Criteria:

1) >8 Feet
2) 6.1 – 8 Feet
3) 4.1 – 6 Feet
4) 2 – 4 Feet
5) <2 Feet

Sources:
Nancy McGrath, NH Department of Environmental Services, Water Division, Dam Bureau. nmcgrath@des.state.nh.us (603) 271-3406. PO Box 95, 6 Hazen Drive, Concord, NH 03302-0095

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category:

Question O: Water Control Structure

Directions: Contact the DES Dam Bureau to identify the size, type, construction date, classification, owner, and date of last inspection. Additionally, note if flowage rights exist and, if so, the ownership of those rights.

Rationale: A comprehensive management plan should include this as basic information regardless of whether regular flooding is an issue. The plan should be designed to serve both as a guidance document and a catalog of general information. Tracking the water control device inspection schedule for the lake or pond will ensure its safety and document any repairs.

Process Followed: Nancy McGrath at DES was contacted through e-mail and she sent the necessary information.

Findings and Analysis

Construction Date: Unknown
Date of Last Inspection: May 20, 2003
Size: 11 Feet high, 360 Feet long, impounds 606 acres.
Type: Unknown
Classification: Class B significant hazard
Owner: Town of New London

Sources:
Nancy McGrath, NH Department of Environmental Services, Water Division, Dam Bureau. PO Box 95, 6 Hazen Drive, Concord, NH 03302-0095. nmcgrath@des.state.nh.us, (603) 271-3406.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

I**nvestigator**: Laurel Kenna

Attribute 2: Physical Waterbody Characteristics

Category:

Question P: Inlets (tributaries)

Directions: Consult a USGS topographic map(s) containing the waterbody. Identify and record the names and general locations, (i.e. mark them on or record their latitude and longitude), of all the perennial and intermittent streams and rives draining into the lake or pond being considered. It may be necessary to visit each river to verify its width.

Rationale: The inlets draining into the lake or pond serve as the primary transport mechanisms of nutrients and pollutants associated with the land uses within the watershed under consideration. Inlets also serve as important corridors fish and wildlife, and offer additional recreational opportunities.

Process Followed: Used the GRANIT steams network layer to identify perennial and intermittent streams into Pleasant Lake. Using ArcMap constructed a map that shows each inlet (tributary), its location, and its name. All the inlets did not have names and were labeled based on their proximity to the major roads, or areas around the lake.

Findings and Analysis: Refer to map.
Perennial (year-round):

1. Great Brook
2. Red Brook
3. White Brook
4. Lakeshore Drive Inlet A
5. Lakeshore Drive Inlet B
6. Great Plains Inlet C

Intermittent (seasonal):

1. Bunker Road Outlet 1
2. Bunker Road Outlet 2

Other known / documented water sources:

N/A

Evaluation Criteria:

1) Intermittent inlets only
2) A single perennial inlet <10 feet wide
3) A single perennial inlet >10 feet wide
4) Multiple (>1) perennial inlets <10 feet wide
5) Multiple (>1) perennial inlets >10 feet wide

Sources:
"NH Granit." 1999-2000. 1 Nov 2005. <http://www.granit.sr.unh.edu/.>

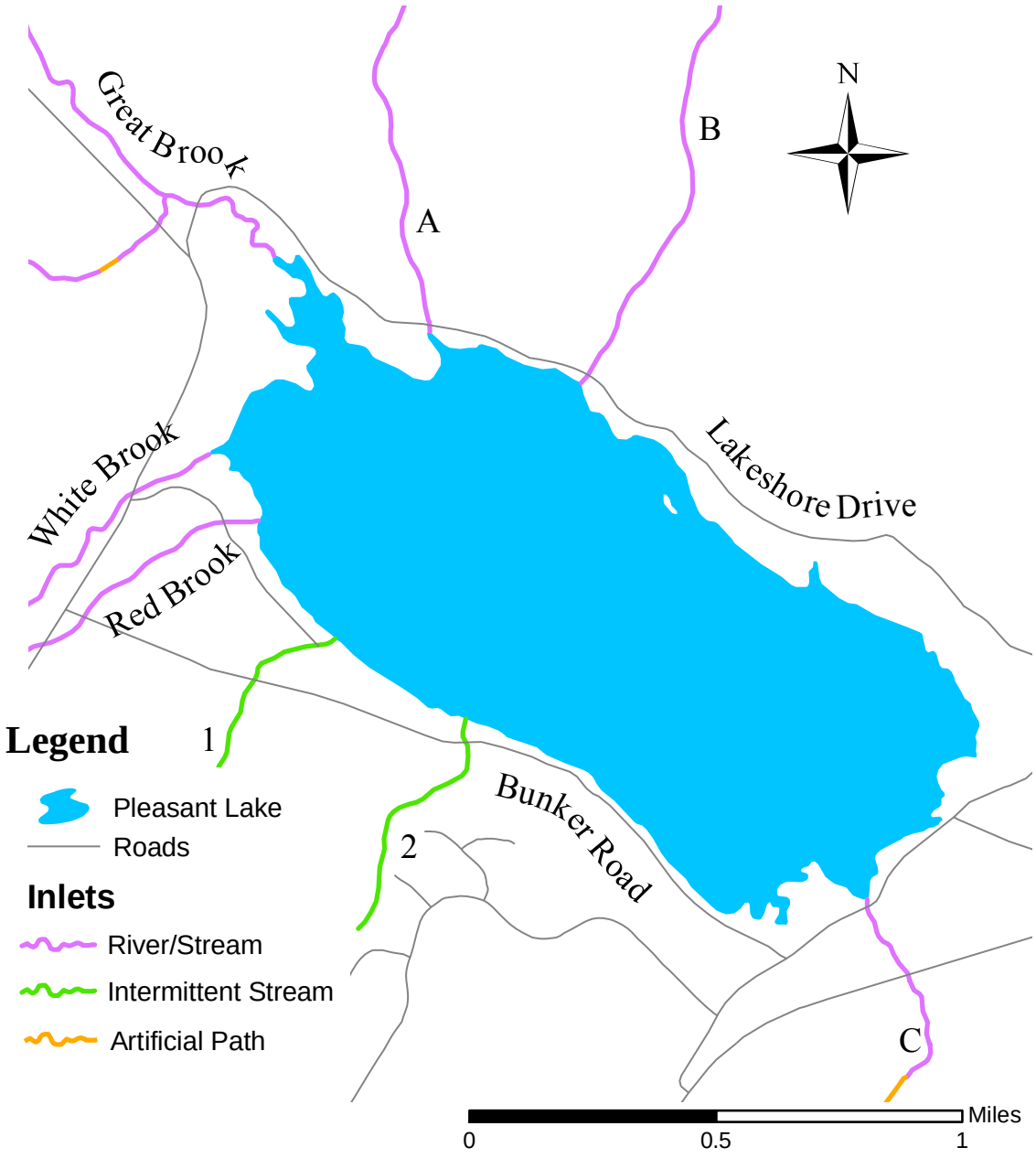
Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Inlets

Attribute 2: Question P



Colby-Sawyer College
Institute for Community & Environment
541 Main Street
New London, NH 03257
(603) 526-3444

Attribute 2: Physical Waterbody Characteristics

Category:

Question Q: Outlets

Directions: Consult a USGS topographic map(s) containing the waterbody. Identify and record the names and general locations, (i.e. mark them on or record their latitude and longitude), of all the streams and rivers draining out of the lake or pond being considered.

Rationale: The outlets draining the lake or pond serve as important transport mechanisms of available nutrients and pollutants. You should be aware of their general size and location. Outlets also serve as important corridors for fish and wildlife, and offer additional recreational opportunities.

Process Followed: Used the GRANIT steams network layer to identify and locate the outlet. Confirmed with Laura Alexander, a member of the New London Conservation Commission that there is only one outlet on the lake.
The outlet is currently un-named so if referred to the Low Plains Outlet based on it's location in the watershed.

Findings and Analysis: Refer to map.
Name(s):
Low Plains Outlet

Evaluation Criteria: There are no evaluation criteria for this question.

Sources:
Alexander, Laura. Personal Interview. 15 Nov 2005.
"NH Granit." 1999-2003. 1 Nov 2005.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Outlets
Attribute 2: Question Q

Colby-Sawyer College
Institute for Community & Environment
541 Main Street
New London, NH 03257
(603) 526-3444

Attribute 3: Water Quality Characteristics

Category:

Question A: Waterbody trophic status

Directions: Consult the *New Hampshire Lakes and Ponds Inventory*. This document uses a technique that incorporates multiple water quality parameters developed by DES and provides an over all classification system. Alternative Methods are acceptable, but you should note that the parameters used in determining the lake or pond's trophic status.

Rational: A Waterbody's trophic status is essentially a measure of its productivity or the amount of organic matter that it produces. The three basic categories in order of decreasing productivity are eutrophic, mesotrophic, and oligotrophic. The addition of unnaturally high amounts of nutrients, primarily phosphorus or nitrogen, can artificially increase lake or pond productivity. Recognizing and maintaining or restoring your waterbody's natural trophic state is important when developing specific actions for a management plan.

Process Followed: Consulted the *New Hampshire Lakes and Ponds Inventory.*

Findings and Analysis: Pleasant Lake is classified as being oligotrophic. It is noted as being a quintessential oligotrophic lake: Large, deep, crystal-clear lake with rocky/sandy shoreline and very little plant growth. The water clarity in this lake is due to low nutrient levels and not to acid conditions, which is the case in many New Hampshire lakes.

Evaluation Criteria:

1) Eutrophic
2) Mesotrophic
3) Oligotrophic

Sources:
New Hampshire Department of Environmental Services - Watershed Management Bureau. New Hampshire Lakes and Ponds Inventory. 1995 ed.

Assessment of Question: question adequate as stated.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category:

Question B: Alkalinity or Acid Neutralizing Capacity (ANC)

Directions: Consult the *New Hampshire Lakes and Pond Inventory*, DES Volunteer Lay Lakes Monitoring Program LMP) reports, or an alternative reliable source to determine the alkalinity.

Rationale: Alkalinity (or ANC) is a measure of the ability for water to neutralize acidic inputs. New Hampshire lakes and ponds have historically had low alkaline waters due to the granite bedrock. This makes them particularly susceptible to acid precipitation.

Process Followed: Used information provided in the most current *New Hampshire Volunteer Lake Assessment Program Report.*

Findings and Analysis:

Station Name	Year	Min. ANC	Max. ANC	Mean ANC
Deep Spot	2004	3.4	3.4	3.4
Outlet	2000	2.9	5.2	3.8
Chandler Brook	2000	3.1	5.2	4.1
Bunker Road	2000	2.7	4.9	3.8
White Brook	2000	2.8	4.8	3.8
Turtle Cove	2000	2.1	5	3.2
PL 6	2000	2.7	5.1	3.7

Evaluation Criteria:

1) <0 (acidified)
2) 0 – 2 mg/L (extremely vulnerable)
3) 2.1 - 10 mg/L (moderately vulnerable)
4) 10.1 – 25.0 mg/L (low vulnerability)
5) >25.0 mg/L (not vulnerable)

Source:
New Hampshire Department of Environmental Services, 2004. *New Hampshire Volunteer Lake Assessment Program Report.*

Assessment of Question: The Station labels were slightly unclear and when looking at the data there seemed to be missing sample dates for some years, where some stations had data and not others.
Date Completed: October 2005
Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category:

Question C: Calcium concentration

Directions: Consult the *New Hampshire Lakes and Pond Inventory,* DES VALAP reports, UNH LLMP reports, or and alternative reliable source to determine the calcium concentration.

Rational: Calcium carbonate, in rock forms such as limestone, readily dissolves in water and is an important compound contributing to a waterbody's alkalinity. Calcium concentration may also be used to gauge a lake's susceptibility to invasion by zebra mussels require calcium for shell growth and need levels of at least 9 mg/L for colonization.

Process Followed: Located and consulted the *New Hampshire Lakes and Pond Inventory* to find the calcium concentration.

Findings and analysis: The most recent analysis found in the *New Hampshire Lakes and Pond Inventory* took place in July of 1993. The Calcium concentration listed was 2.6 mg/L.

Evaluation Criteria:

1) < 1.0 mg/L
2) 1.1 – 4.0 mg/L
3) 4.1 – 8.0 mg/L
4) 8.1 – 12.0 mg/L
5) > 12 mg/L

Sources:
State of New Hampshire Department of Environmental Services: Water Supply and Pollution Control Division- Biology Bureau. New Hampshire Lakes and Ponds Inventory, Vol 4.

Assessment of Question: The most recent data was for July of 1993, which is relatively old analysis of the calcium concentration. Data may be less reliable because of the date of collection.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question D: pH

Directions: Consult the *New Hampshire Pond Inventory*, DES VLAP reports, or an alternative reliable source to determine the pH. If the waterbody regularly stratifies be sure that the data was collected from the epilimnion (i.e. the layer of water extending from the surface to the thermocline).

Rational: A lake or ponds pH is an important factor affecting the type and amount of aquatic life it can support. Highly acidified (pH < 5.0) waterbodies are not suitable for the survival of most fish species, but are not harmful to humans. Documentation of the lake or pond's pH may help in assessing its sensitivity to atmospheric deposition or acidic compounds. However, some waterbodies may have naturally low pH (~6.0) levels due to organic (humic and fulvic) acids that result from the breakdown of plant matter.

Process Followed: Consulted the most recent New Hampshire Volunteer Lake Assessment Program report.

Findings and Analysis:

Station Name	Year	Min.	Max	Mean
PL - Bunker Rd	2002	6.76	7.13	6.98
PL -Chandler Brook	2004	6.6	6.95	6.79
PL - Deep Spot Epilimnion	2004	6.26	6.88	6.71
PL- Deep Spot Hypolimnion	2004	5.9	6.26	6
PL- Deep Spot Metalimnion	2004	6.01	6.56	6.21
PL - Outlet	2004	6.6	6.94	6.74
PL - 5A	2001	6.5	6.8	6.65
PL - 6	2001	6.78	6.78	6.78
PL - Turtle Cove	2004	6.77	6.99	6.85
PL - White Brook	1998	6.32	6.32	6.32

Evaluation Criteria:		**Score:**
1)	> 6.0 (Satisfactory; minimal to no impairment to aquatic organisms)	1
2)	5.0 – 6.0 (Endangered; toxic to some aquatic organisms)	3
3)	< 5.0 (Critical; toxic to most fish species)	5

Sources:

New Hampshire Volunteer Lake Assessment Program, *Interim Report* Pleasant Lake, New London NH. Department of Environmental Services, Watershed Division 2004.

Assessment of Question: The question is adequate as stated

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question E: Total Phosphorus Concentration

Directions: Consult the *New Hampshire Lakes and Ponds Inventory,* DES VLAP reports, UNH LLMP reports, or an alternative reliable source to determine the total phosphorus concentration. If the waterbody regularly stratifies be sure the data was collected from the epilimnion (i.e. the layer of water extending from the surface to the thermocline).

Rationale: Phosphorus limits the growth of algae and rooted aquatic plants in the majority of New Hampshire lakes and ponds. Inputs of unnatural phosphorus loads can significantly impact water quality by stimulating excessive algal growth. Identifying unnatural phosphorus inputs and potential remedies is important in the development of a comprehensive management plan.

Process Followed: Consulted the most recent Volunteer Lake Assessment report to determine the Total Phosphorus concentration.

Findings and Analysis:

Station Name	Depth	Year	Min	Max	Mean
PL- Deep Spot	Epilimnion	2004	0.005	0.007	0.006
PL- Deep Spot	Hypolimnion	2004	0.005	0.001	0.007
PL- Deep Spot	Matalimnion	2004	0.006	0.008	0.007

Evaluation Criteria:	**Score:**
1) <0.005 mg/L (Ideal)	1
2) 0.005-0.010 mg/L (Low)	2
3) 0.011 – 0.020 mg/L (Average)	3
4) 0.021- 0.040 mg/L (High)	4
5) >0.040 mg/L (Excessive)	5

Sources:

Assessment of Question: These readings were collected in 2004. Since Pleasant Lake's water regularly stratifies, the phosphorous reading should be collected from epilimnion (the water layer from the surface to the thermocline). According to the New Hampshire Volunteer Lake Assessment Program Laboratory Analysis Data Sheet, the measurements were originally given in ug/L and then were converted into mg/L. For instance, 7 ug/L is equivalent to .007 mg/L.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Recreational Value

Question F: Secchi disc transparency

Directions: Consult the *New Hampshire Lake and Pond Inventory*, DES VLAP reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rational: A secchi disc measurement provides an indication of overall water clarity. Lakes or ponds with heavily stained or muddy waters will generally have low secchi disc measurements. Likewise, waterbodies with high concentrations of suspended algae will also have low secchi disc readings.

Process Followed: Consulted the most recent *New Hampshire Volunteer Lake Assessment Program* report

Findings and analysis:

Station Name	Year	Min.	Max.	Mean
Deep Spot	2000	5	7.5	6.33
	2001	6	10	8.1
	2002	6	9	7.36
	2003	6.5	9	7.7
	2004	5.8	7	6.45

Evaluation Criteria:	Score:
1) < 1 meter	1
2) 1.0 - 4.0 meters	2
3) 4.1 - 8.0 meters	3
4) 8.1 – 12.0 meters	4
5) > 12.0 meters	5

Sources:

New Hampshire Volunteer Lake Assessment Program. "Interim Report for Pleasant Lake New London." NH DES, Water Division – Watershed Bureau, 2004.

Assessment of Question: Question is adequate as stated

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Unique or Outstanding Value

Question F: Secchi disc transparency

Directions: Consult the *New Hampshire Lake and Pond Inventory*, DES VLAP reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rational: A secchi disc measurement provides an indication of overall water clarity. Lakes or ponds with heavily stained or muddy waters will generally have low secchi disc measurements. Likewise, waterbodies with high concentrations of suspended algae will also have low secchi disc readings.

Process Followed: Consulted the most recent *New Hampshire Volunteer Lake Assessment Program* report

Findings and analysis:

Station Name	Year	Min.	Max.	Mean
Deep Spot	2000	5	7.5	6.33
	2001	6	10	8.1
	2002	6	9	7.36
	2003	6.5	9	7.7
	2004	5.8	7	6.45

Evaluation Criteria:	Score:
1) < 1 meter	1
2) 1.0 - 4.0 meters	2
3) 4.1 - 8.0 meters	3
4) 8.1 – 12.0 meters	4
5) > 12.0 meters	5

Sources:

New Hampshire Volunteer Lake Assessment Program. "Interim Report for Pleasant Lake New London." NH DES, Water Division – Watershed Bureau, 2004.

Assessment of Question: Question is adequate as stated

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question F: Secchi disc transparency

Directions: Consult the *New Hampshire Lake and Pond Inventory*, DES VLAP reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rational: A secchi disc measurement provides an indication of overall water clarity. Lakes or ponds with heavily stained or muddy waters will generally have low secchi disc measurements. Likewise, waterbodies with high concentrations of suspended algae will also have low secchi disc readings.

Process Followed: Consulted the most recent *New Hampshire Volunteer Lake Assessment Program* report

Findings and analysis:

Station Name	Year	Min.	Max.	Mean
Deep Spot	2000	5	7.5	6.33
	2001	6	10	8.1
	2002	6	9	7.36
	2003	6.5	9	7.7
	2004	5.8	7	6.45

Evaluation Criteria:	Score:
1) < 1 meter	5
2) 1.0 - 4.0 meters	4
3) 4.1 - 8.0 meters	3
4) 8.1 – 12.0 meters	2
5) > 12.0 meters	1

Sources:

New Hampshire Volunteer Lake Assessment Program. "Interim Report for Pleasant Lake New London." NH DES, Water Division – Watershed Bureau, 2004.

Assessment of Question: Question is adequate as stated

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category:

Question G: Hazardous material spill events(s)

Directions: Visit the NH DES One Stop Database to examine the Remediation and Initial Response Spill Sites list for past records of hazardous material spills into or nearby the waterbody.

Rationale: Many of New Hampshire's roadways that pass near or over portions of lakes, ponds, or streams increase the possibility of accidental spills of hazardous materials from transport vehicles. In addition, for lakes or ponds which have marine service facilities on them or businesses nearby, accidental spillage of hazardous materials into the waterbody is of great concern. In completing this inventory, you should identify any past spills that have occurred and document if the problem persists.

Process Followed: Visited the NH DES One Stop Database and Searched for Remediation and Initial Response Spill Sites list for past records of hazardous material spills for New London NH.

Findings and Analysis: After reviewing the DES One Stop Database, the only spill event which would be a concern towards the Pleasant Lake Watershed would be mentioned Rt. 11. Nevertheless this spill event was not at a specified location on Rt. 11 and was listed as non impactful towards human health or water quality.

Evaluation Criteria:

1) Spill with current detectable water quality impacts
2) Spill with water quality impacts that were detectable < 3 months ago
3) Spill with water quality impacts that were detectable 3 – 12 months ago
4) Spill with water quality impacts that were detectable >12 months ago
5) No known spill events or spill without any detectable water quality impacts

Sources:
New Hampshire Department of Environmental Services, One Stop
<Databasehttp://www.des.state.nh.us/OneStop.htm>

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category:

Question H: Other Water Quality Concerns

Directions: Contact the DES Lakes Program staff to determine if the waterbody has any unique pollutants that could be problematic.

Rationale: It is possible that pollutants such as pesticides, herbicides, petroleum byproducts (MTBE), mercury, dioxin, or even excessive siltation could compromise the water quality of the lake or pond. Document these occurrences and monitor their status.

Process Followed: Contacted Robert Estabrook, from the NHDES Watershed Management Bureau.

Findings and Analysis: There have been no reported unique pollutants or problematic occurrences that the NHDES is aware of. Other then a state wide fish consumption advisory which has been instated on every freshwater body in the state, due to mercury levels in fish.

Evaluation Criteria:

Problem Identification: N/A
Suspected Source of Problem: N/A
Status of Problem: N/A
Source of Information: NHDES Watershed Management Bureau

Sources:
Robert Estabrook, NHDES Watershed Management Bureau.
Email: restabrook@des.state.nh.us

Assessment of Question: The question is adequate as stated

Date Completed: November 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question I: Historic point discharges

Directions: Contact the NH DES Watershed Management Bureau for any listings for the waterbody in the *Classification and Priority listing of New Hampshire Lakes Volume 1.*

Rationale: Although a point source polluter may not presently exist on the lake, a historic source point source discharge (i.e. sewage outfall) may have contributed an additional phosphorus load or other notable pollutants to the waterbody in the past. If so, it is possible the pollutants may continue to be bound to the bottom sediment and could continue to play an important role in the internal nutrient cycle of the waterbody, Identification and awareness of these historic anthropogenic inputs can be important when devising a non-point source nutrient reduction strategy.

Process Followed: Contacted Robert Estabrook of NH DES, Watershed Management Bureau.

Findings and Analysis: A review of the *Classification and Priority Listing of New Hampshire Lakes,* 1981 study listed one mile of salted highway (rt. 11), in the Pleasant Lake Watershed as a non-point source of pollution. However, no specific spill sites are listed.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 or more; Discharge discontinued at least 20 years ago	2
3) 1 or more; Discharge discontinued at least 10 years ago.	3
4) 1 or more ; Discharge discontinued at least 5 years ago.	4
5) Discharge presently exists	5

Sources:

R.H. Estabrook. 1981. Classification and Priority Listing of New Hampshire Lakes. Vol. I and II, Parts 1-6. Staff Report No. 121. NHWSPCC.

Assessment of Question: The results of this question are significant in determining a watershed's level of susceptibility to impairment. Sources of pollution are often recognized during their "contamination period" and forgotten about after they are not of use or the concern as a potential source of pollution has not been recognized. Historical point source discharges are important to establish in order to implement a plan of action to contain and prevent present and future contamination. By knowing point source polluters, their location, and what types of contaminants have been added to the

environment, the process of understanding their consequences and how to limit exposure can prevent associated health problems, in both organisms and the environment.

Date Completed: October 2005

Investigator: Laurel Kenna

Attribute 3: Water Quality Characteristics

Category:

Question J: Presence in the 305 (b), 303 (d) or Unified Watershed Management (UWA) report.

Directions: Consult the most recent 305(b) and 303(d) reports and the 1998 Unified Watershed Management report for the State of New Hampshire submitted by DES to the EPA. Note whether the waterbody is listed on any of these reports and the reason(s) why it was listed.
Please note: Since all surface waters in New Hampshire are impaired for fish and shellfish consumption due to elevated levels of mercury in fish/shellfish tissue, this impairment should not be included for this question.

Rationale: Each of these reports are designed to give a broad overview of water quality in New Hampshire. The criterion for listing in each of these reports varies among reports and from year to year. Therefore, while the listing of specific waterbodies on these lists provides some indication of potential water quality impairment, it does not indicate any particular level of severity. In any case take note if the waterbody is listed and why it is listed. In some cases, a listed waterbody is eligible for special funding opportunities to further protect or restore water quality.

Process Followed: Located the most recent 305(b) and 303(d) reports and the 1998 Unified Watershed Management report for the State of New Hampshire submitted by DES to the EPA.

Findings and Analysis: Pleasant Lake in New London NH was not listed on any of the above reports, except for a mention in the 305 (b) for Mercury levels in fish, but as instructed, since all fresh waterbodies in NH are listed as impaired because of these elevated levels, this impairment can not be included in the findings.

Evaluation Criteria:

1) Listed on 305 (b), 303 (d), or UWA report
2) Not listed on 305 (b), 303 (d) or UWA report

Sources:

New Hampshire Department of Environmental Services. New Hampshire final Unified Watershed Assessment, 2001.
Environmental Protection Agency. 305 (b) Report, 2005.
Environmental Protection Agency. 303 (d) Report, 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005
Investigator: Laurel Kenna

Attribute 4: Biological / Ecological Characteristics

Category: Recreation

Question A: Algal abundance (chlorophyll a level).

Directions: Consult the New Hampshire Lakes and Ponds Inventory or an alternative reliable source to determine the algal abundance.

Rationale: The algal abundance in a waterbody is function of water temperature, the amount of sunlight it receives, and nutrients it contains. In particular, nutrients (primarily nitrogen and phosphorus) are often critical in controlling algal growth. Lakes or ponds with naturally high quantities of nitrogen and phosphorus will have a much higher quantity of algae than waterbodies with low levels of these nutrients. In many cases, lakes or ponds subjected to unnaturally high quantities of nitrogen or phosphorus through runoff of excess fertilizer or leakage of faulty septic systems will experience nuisance algal growths. Therefore, it is desirable to determine what level of algal growth occurs in the lake or pond, and whether the observed levels are within the expected natural range for similar waterbodies.

Chlorophyll a is a photosynthetic pigment found in most algae. The measure of its abundance in a water sample provides an easy surrogate measure of the amount (but not the type) of algae present in a waterbody at the time of collection.

Process Followed: Referred to the 2004 VLAP report.

Findings and Analysis: The mean concentration of Chlorophyll a has fluctuated between 1.5 and 5.5mg/m3 since 1997. This is a good indication to the health and clarity of Pleasant Lake's water.

Evaluation Criteria:	**Score:**
1) >15.0 μg/L (nuisance amounts)	1
2) 10.1 – 15.0 μg/L (more than desirable)	2
3) 5.1 – 10.0 μg/L (more than desirable)	3
4) 3.0 – 5.0 μg/L (good)	4
5) < 3.0 μg/L (good)	5

Sources:

New Hampshire Volunteer Lake Assessment Program (VLAP). "Observations and Recommendations" (Interim Report), 2004.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Susceptibility to Impairment

Question A: Algal abundance (chlorophyll a level).

Directions: Consult the New Hampshire Lakes and Ponds Inventory or an alternative reliable source to determine the algal abundance.

Rationale: The algal abundance in a waterbody is function of water temperature, the amount of sunlight it receives, and nutrients it contains. In particular, nutrients (primarily nitrogen and phosphorus) are often critical in controlling algal growth. Lakes or ponds with naturally high quantities of nitrogen and phosphorus will have a much higher quantity of algae than waterbodies with low levels of these nutrients. In many cases, lakes or ponds subjected to unnaturally high quantities of nitrogen or phosphorus through runoff of excess fertilizer or leakage of faulty septic systems will experience nuisance algal growths. Therefore, it is desirable to determine what level of algal growth occurs in the lake or pond, and whether the observed levels are within the expected natural range for similar waterbodies.

Chlorophyll a is a photosynthetic pigment found in most algae. The measure of its abundance in a water sample provides an easy surrogate measure of the amount (but not the type) of algae present in a waterbody at the time of collection.

Process Followed: Referred to the 2004 VLAP report.

Findings and Analysis: The mean concentration of chlorophyll a has fluctuated between 1.5 and 5.5mg/m3 since 1997. This is a good indication to the health and clarity of Pleasant Lake's water. Under the category of Susceptibility, this shows that the lake is in good condition because it has a low score. This is an indication that the lake is not under nutrient abnormalities causing large algae blooms.

Evaluation Criteria:	**Score:**
1) >15.0 μg/L (nuisance amounts)	5
2) 10.1 – 15.0 μg/L (more than desirable)	4
3) 5.1 – 10.0 μg/L (more than desirable)	3
4) 3.0 – 5.0 μg/L (good)	2
5) < 3.0 μg/L (good)	1

Sources:

New Hampshire Volunteer Lake Assessment Program. "Observations and Recommendations (Interim Report), 2004.

Assessment of Question: For New London /Pleasant Lake it made more sense to refer to the New Hampshire Volunteer Lake Assessment Program (VLAP) rather than the NH Lakes and Ponds Inventory.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Susceptibility to Impairment

Question B: Algae Community Composition

Directions: Consult the New Hampshire Lakes and Ponds Inventory or an alternative reliable source to determine the algal community composition.

Rationale: While it is the algal abundance, (see Question A above), that causes the nuisance, the types of algae present and their relative percent abundance of the total algal community are also important when assessing the condition of the lake or pond. While many different species and classes of algae can form blooms (visible accumulations of algae), it is the blue-green algae, or Cyanobacteria, that are of particular importance. This class of algae is important for two reasons. First, blue-greens are the only algae that float to the surface and form paint-like scums, often accumulating along down-wind shores. Secondly, some types of blue-green algae contain toxins. These toxins can kill dogs and other animals and if consumed in quantity, can cause gastro-intestinal upsets from minor ingestions and can cause skin and eye, ear and nose irritations from bodily contact.

It is not unusual or unhealthy for blue-greens to be present in minor amounts, but when they become the dominant species present, the likelihood of nuisance blooms developing increases if sufficient nutrients are present. The most commonly observed blue-green algae in NH lakes include: Anabaena, Aphanizomenon, Microcycts, Coelosphaerium, Oscillatoria, Lyngybya and Gloeotrichia. All but Coelosphaerium and Gloeotrichia are known to have toxin-producing forms.

If you observe a paint-like or pea soup-like scum of algae along your shore, keep children and pets out of the water and notify NH DES so that the scum can be tested for the presence of toxins.

Process Followed: Referred to the 2004 VLAP report, Table 2. From the listed algae, I looked on the Internet to find information about the types of algae that were within Table 2.

Findings and Analysis:

- Dinobryon- 14 % Golden Brown Algae
- Chrysosphaerella- 16% Golden Brown Algae
- Tabellaria- 14% Green Algae (Diatom)

Since none of these Algae's are Blue-Green Algae it means that there is none presently found in the lake which is a good sign of a healthy lake.

Evaluation Criteria:		**Score:**
1)	<10% blue-greens	1
2)	10.0 – 30.0% blue-greens	2
3)	30.1 – 50.0% blue-greens	3
4)	50.1 – 70% blue-greens	4
5)	>70% blue-greens	5

Sources:

New Hampshire Volunteer Lake Assessment Program. "Observations and Recommendations (Interim Report), 2004.

"Phytoplankton (of fresh waters)." 1 July 2004. Soil and Water Conservation Society of Metro Halifax (SWCSMH). 31 Oct. 2005 <http://lakes.chebucto.org/phyto.html#Diatoms>.

"Classifications." Diatoms. 2004. UBIO. 31 Oct. 2005 <http://microscope.mbl.edu/scripts/protist.php?func=integrate&myID=P4378&system>.

Assessment of Question: For New London /Pleasant Lake it made more sense to refer to the New Hampshire Volunteer Lake Assessment Program (VLAP) rather than the NH Lakes and Ponds Inventory.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question C: Fish Species Diversity

Directions: Consult the New Hampshire Fish and Game Department to obtain a complete listing of the fish known to occur in the waterbody.

Rationale: The number of species of fish that inhabit a waterbody is strongly influenced by the variety of habitats that are present. In general, large lakes will have a greater diversity of fish species than small ponds. However, in certain instances a lake or pond may contain an isolated fish species or a wide range of habitat types capable of supporting an uncommonly high number of fish species making the community unique. An assessment of the fish community should include both game (naturally occurring or stocked) and non-game fish species.

Process Followed: Contacted the New Hampshire Fish and Game Department. Having asked about fish species present in Pleasant Lake, New London NH. John Viar responded via Email. John Viar is a Fisheries Biologist at the NH Fish and Game Department. His list for Pleasant Lake species was gathered by the NH Fish and Game Department by placing trap nets in 2000 and electro-fishing in 2004; which John was personally involved with.

Findings and Analysis:
This list consists of both Native and Exotic Species. However, stated by John Viar, some of the species that once were exotic have been there for so long and still self sustaining that they are now considered to be naturalized.

- NATIVE
- eastern brook trout
- yellow perch
- chain pickerel
- redbreast sunfish
- pumpkinseed
- common shiner
- American eel
- golden shiner
- common white sucker
- EXOTIC
- brown bullhead
- landlocked salmon
- smallmouth bass
- rock bass
- banded killifish
- rainbow smelt

Evaluation Criteria:	**Score:**
1) 0 – 2 species	1
2) 3 – 5 species	2
3) 6 – 8 species	3
4)9 – 12 species	4
5) > 12 species	5

Sources:

Viar, John. (jviar@nhfgd.org) "Fish Species" E-mail to Steve Hash to Matt Urban. 11 October 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question D: Avian Species Diversity

Directions: Consult the Bird Checklist in Appendix B for a listing of birds in NH which use lake and/or pond habitat. (Note: This checklist was developed using New England Wildlife: Habitat, Natural History, and Distribution, 1983.) Using the checklist, identify the avian species sited in and around the waterbody. Work with DES Lakes Program staff, NH Fish and Game, local conservation organizations or local birding groups/individuals to determine the best source of information to complete this question

Rationale: Birds that rely on water in some fashion, as a medium containing food or habitat, provide a link to the terrestrial environment. Lakes or ponds with many bird species indicate that there are some potentially unique qualities to the ecosystem of interest. Further, waterbodies with a diverse avian community may be popular bird watching sites for the public.

Process Followed: Contacted the Pleasant Lake Protective Association (PLPA) to provide us with a list of birds that have been spotted in and around the lake over the years. Also consulted the Bird Checklist in Appendix B for the list of species that use the lake habitat. Also referred to a list that was created by Laura Alexander, Leon Malan, and Ben Steel: Faculty with the community and environmental studies program at Colby-Sawyer College on June 1st, 2005.

Findings and Analysis:

- Mallard
- Bufflehead
- Common Loon
- Common Merganser
- Double Crested Cormorant
- Canada Goose
- Great Blue Heron
- Spotted Sandpiper
- Herring Gull
- Bald Eagle
- Osprey
- Red-winged Blackbird
- Tree Swallow
- Common Grackle
- Swamp Sparrow
- Eastern Bluebird
- Common Raven
- Belted Kingfisher

- American Crow
- American Goldfinch
- American Robin
- Baltimore Oriole
- Barn Swallow
- Barred Owl
- Blackburnian Warbler
- Black-throated Green Warbler
- Blue Jay
- Blue-headed Vireo
- Canada Warbler
- Chestnut-sided Warbler
- Chipping Sparrow
- Common Yellowthroat
- Dark Eyed Junco
- Eastern Phoebe
- Eastern wood-pewee
- Great-crested Flycatcher
- Hairy Woodpecker
- Magnolia Warbler
- Mourning Dove
- Ovenbird
- Red-breasted Nuthatch
- Red-eyed Vireo
- Red-winged Blackbird
- Song Sparrow
- Tufted Titmouse
- White-throated Sparrow
- Willow flycatcher
- Winter Wren
- Yellow Warbler
- Yellow-bellied Sapsucker
- Yellow-rumped Warbler

Evaluation Criteria:	**Score:**
1)0-5 species `	1
2)6-10 species	2
3)11-15 species	3
4)16-20 species	4
5)>20 species	5

Sources:

Pleasant Lake Protective Association (PLPA), "Avian Checklist". Contact: Kittie Wilson. Recipient: Matt Urban. 25 October, 2005.
Alexander, Laura:, Malan, Leon; Steele, Ben. Colby-Sawyer College), "Bird Sightings." Date of data collection. 1 June, 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question E: Mammal Species Diversity

Directions: Consult the Mammal Checklist in Appendix B for a listing of all mammals in NH which use lake and/or pond habitat. (Note: This checklist was developed using New England Wildlife: Habitat, Natural History, and Distribution, 1983.) Using the checklist, identify the mammal species sited in and around your waterbody. Work with DES Lakes Program staff, NH Fish and Game, or local conservation organizations to determine the best source of information to complete this question.

Rationale: Mammals that rely on water in some fashion, either for food or habitat, provide a link to the terrestrial environment. Lakes or ponds with many mammal species indicate that there are some potentially unique qualities to the ecosystem of interest. Further, waterbodies with a diverse mammal community may be popular wildlife viewing sites for the public.

Process Followed: Contacted the Pleasant Lake Protective Association (PLPA) to provide us with a list of mammals that have been spotted in and around the lake. Also consulted the Mammal Checklist in Appendix B for the list of species that use the lake habitat.

Findings and Analysis:

- Black Bear
- Beaver
- Mink
- Moose
- White Tailed Deer
- Skunks
- Porcupines
- Raccoons

Evaluation Criteria:	**Score:**
1) 0-2 species	1
2) 3-5 species	3
3) 6-8 species	5

Sources:

Pleasant Lake Protective Association (PLPA), "Mammal Checklist". Contact: Kittie Wilson. Recipient: Matt Urban. 25 October, 2005.

Assessment of Question: The question is adequate as stated.
Date Completed: October, 2005
Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question F: Reptiles and Amphibian Species Diversity

Directions: Consult the Reptile and Amphibian Checklist in Appendix B for a listing of all reptiles and amphibians in NH which use lake and/or pond habitat. (Note: This checklist was developed using New England Wildlife: Habitat, Natural History, and Distribution, 1983.) Using the checklist, identify those species sited in and around your waterbody. Work with DES Lakes Program staff, NH Fish and Game, or local conservation organizations to obtain the information necessary for this question. Note: Reptile and amphibian community identification can be a time consuming process. For the purposes of this inventory, complete the checklist using local knowledge and the sources noted above. For a more intensive, accurate survey, consult Appendix C which provides further information on surveying salamander and frog communities.

Rationale: Reptiles and amphibians are common to all lakes and ponds of New Hampshire. The various types of animals in this group, with few exceptions, are fairly inconspicuous, being heard but not commonly seen. However, this does not diminish their importance to the ecological community. With some assistance and coordination among interested parties, a general assessment of the reptile and amphibian community is possible if there is not any current information available. Completion of this question is helpful in compiling a comprehensive catalog of the biological diversity residing in and around the lake or pond.

Process Followed: Contacted the Pleasant Lake Protective Association (PLPA) to provide us with a list of Reptiles and Amphibians that have been spotted in and around the lake. Also consulted the Reptile and Amphibian Checklist in Appendix B for the list of species that use the lake habitat. Consulted the "Frog Calling Survey," completed by Kittie, and John Wilson. In addition, an effort was made to utilize the salamander survey that is included in the Comprehensive Lake Inventory. However, due to flooding the survey was compromised and only two salamanders were indentified.

Findings and Analysis:

- Eastern Painted Turtle
- Snapping Turtle
- Bullfrog
- Green Frog
- Tree Frog
- Northern Leopard Frog
- Wood Frog
- Spring Peeper
- Blue Spotted Salamander
- Spotted Salamander
- Red-spotted Newt

Evaluation Criteria:	**Score:**
1) 0 – 2 species	1
2) 3 – 5 species	2
3) 6 – 8 species	3
4) 9 – 12 species	4
5) > 12 species	5

Sources:

Pleasant Lake Protective Association (PLPA), "Reptiles and Amphibians Checklist". Contact: Kittie Wilson. Recipient: Matt Urban. 25 October, 2005.

New Hampshire Comprehensive Lake Inventory, "Frog Calling Survey." Conducted by: Kittie and John Wilson. 29 June, 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category:

Question G: Aquatic Macroinvertebrate Community Composition

Directions: Contact the DES Lakes Program staff to obtain the information necessary for this question.

Rationale: Aquatic invertebrates are those organisms that primarily inhabit lakes, ponds, and rivers, and do not have a backbone. Similar to reptiles and amphibians, this group of animals is often overlooked when assessing lakes and ponds. Take time to capitalize on this opportunity to become familiar with the different types of aquatic invertebrates that inhabit the lake or pond.

Process Followed: Contacted, John A. Viar, New Hampshire Fish and Game Department (NHFGD) Fisheries Biologist. Via email inquired about macro-invertebrate community composition. Also, referred to a list of invertebrates that were found in Great Brook, the stream survey was conducted by Community and Environmental Studies (CES) students, on September 26, 2005.

Findings and Analysis: John Viar's list of known macro-invertebrates in the Pleasant Lake Watershed is from his personal studies on the lake. However, to the best of his knowledge, the NHFGD (or any other state agency) has never preformed a detailed survey of Pleasant Lake's macro-invertebrate community.

- Crayfish (Cambaridae)
- Freshwater mussel (Unionoida)
- Burrowing mayfly (Hexagenia)
- Phantom Midge (Chaoborus)
- Various dragonflies and damselflies – adults and nymphs (Odonata)
- Stonefly (Plecoptera)
- Caddisflies (Tricoptera)

Evaluation Criteria:

Major groups to be considered:

- Mussels / Clams
- Freshwater jellyfish
- Freshwater shrimp
- Crayfish
- Freshwater sponges / bryozoans

1) 0 groups present
2) 1 group present
3) 2 groups present
4) 3 groups present
5) 4 or more groups present

Assessment of Question: The recommended process to gather this information was to contact the DES. To the best of our knowledge the DES has not done any research in this area. Therefore, a list was developed that is not as in depth as an actual study that may have been done by state agency that has solid data.

Sources:

Viar, John A. (jviar@nhfgd.org) "Macro-invertebrate community composition" Email to Matt Urban. (murban@colby-sawyer.edu) Received, November 7th, 2005.

Date Completed: November 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question H: Specialized habitats, breeding or rearing areas

Directions: Contact the DES Lakes Program staff to identify the most effective and efficient method to obtain the information necessary to complete this question.

Rationale:
Some types of wildlife require specialized structures (i.e. beaver lodges) or breeding and rearing areas in order to be considered permanent residents (rather than transient) of a waterbody. Identification of these types of structures or areas (i.e. heron rookeries) in and around the lake or pond adds to its ecological significance. Also, an awareness of the general locations of these structures or areas is important when considering development or land use options.

Process Followed: Spoke to Laura Alexander, member of the New London Conservation Commission in order to identify the species within the watershed with known specialized habitats.

Findings and Analysis:

- Beaver- Lodges located in the Low Plains area. The lodges are currently being maintained in order to keep the beavers around.

- Common Loon- Located in the Northwest Cove of the lake. A man made platform was build to aid the nesting success for the loon.

Specialized habitats are unique because they are areas that species are dependent on for survival. With to much disturbance these habitats could be lost. The greater the area of land increases the chances of having more specialized habitats. If a small location has multiple specialized habitats it's a sign that the habitat there is very desirable and in good condition meeting multiple standards for numerous species. This would be an indication of a habitat that is doing very well, with minimal human disturbance.

Evaluation Criteria:	**Score:**
1) 0/1 unique habitat type, area, or structure	1
2) 2 unique habitat types, areas, or structures	2
3) 3 unique habitat types, areas, or structures	3
4) 4 unique habitat types, areas, or structures	4
5) 5 unique habitat types, areas, or structures	5

Sources:
Interview: Laura Alexander, New London Conservation Commission, December 2, 2005. With Matt Urban.

Assessment of Question: This question needs clarification. Specialized habitats in broad terms can be recognized even when examining common populations of species based on niches. This generalization of habitat niches is not the same as specialized habitats that are required by species that are dependent on the sites for breeding etc.

Date Completed: December 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Recreational Value

Question H: Specialized habitats, breeding or rearing areas

Directions: Contact the DES Lakes Program staff to identify the most effective and efficient method to obtain the information necessary to complete this question.

Rationale: Some types of wildlife require specialized structures (i.e. beaver lodges) or breeding and rearing areas in order to be considered permanent residents (rather than transient) of a waterbody. Identification of these types of structures or areas (i.e. heron rookeries) in and around the lake or pond adds to its ecological significance. Also, an awareness of the general locations of these structures or areas is important when considering development or land use options.

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- Common Loon- Located in the Northwest Cove of the lake. A man made platform was build to aid the nesting success for the loon.

A bird like the Common Loon is an attraction. This boosts recreation, which is dangerous for species that depend on specialized habitats. Encroachment could push the species out of the area. Without specialized habitats those species would not be able to exist in the immediate locations unless it can find nearby habitat that meets its specialized needs.

Evaluation Criteria:	**Score:**
1) 0/1 unique habitat type, area, or structure	1
2) 2 unique habitat types, areas, or structures	2
3) 3 unique habitat types, areas, or structures	3
4) 4 unique habitat types, areas, or structures	4
5) 5 unique habitat types, areas, or structures	5

Sources:

Interview: Laura Alexander, New London Conservation Commission, December 2, 2005. With Matt Urban.

Assessment of Question: This question needs clarification. Specialized habitats in broad terms can be recognized even when examining common populations of species based on

niches. This generalization of habitat niches is not the same as specialized habitats that are required by species that are dependent on the sites for breeding etc.

Date Completed: December 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Susceptibility to Impairment

Question I: Exotic aquatic plant species

Directions: Consult the Exotic Species Map/List from NH DES or contact the New Hampshire Fish and Game Department, or the UNH Center of Freshwater Biology to determine the exotic plants and animals that occur in the lake or pond as well as its proximity to the nearest waterbody with an exotic species.

Rationale: Exotic aquatic species refers to those plant or animal species that are not native to New Hampshire waterbodies. Currently there are 6 invasive aquatic plants known to occur in New Hampshire (see Worksheet for list). When introduced into a waterbody these plants tend to out-compete native plant species and form dense, unattractive growths. In addition, heavy growths of aquatic plants can contribute an excessive amount of decaying matter to the bottom of the lake, ultimately causing a reduction in the amount of dissolved oxygen.

In regards to exotic aquatic animals, there are numerous fishes, such as the smallmouth bass, that long ago became established in most of New Hampshire's waterways. However, more recent exotic animals known to upset the balance of the ecosystem should be your primary concern. Such species include the Japanese live-bearing snail and the zebra mussel. At the present time zebra mussels are not known to occur in any New Hampshire waterbodies. However, their planktonic larval stage coupled with heavy boater usage of our lakes and ponds from people throughout the northeast region make their introduction possible. If introduced and allowed to become established, zebra mussels could seriously affect the aquatic food chain, clog industrial and drinking water intakes, and cover submerged structures such as docks.

Process Followed: Contacted secretary of the Pleasant Lake Protective Association (PLPA), who then referred us to John Wilson, who is the captain for Pleasant Lake's team of Weed Watchers. John works in cooperation with Amy Smagula who is the Exotic Species Coordinator for the NHDES.
John was able to create a list that outlined the numerous exotic species and made note that none of the species exited in Pleasant Lake. Referred to DES's map of, Exotic Aquatic Plant Sites in New Hampshire to check for exotic species within a ten mile radius of Pleasant Lake.

Findings and Analysis:
Exotic Aquatic Plant Species- One exists in within a ten mile radius of Pleasant Lake. Variable Milfoil exists in Lake Sunapee at Georges Mills.

- Variable Milfoil (Myriophyllum heterophyllum)
- Eurasian Milfoil (Myriophyllum spicatum)
- Fanwort (Cambomba caroliniana)
- Water Chestnut (Trapa natans)

- Purple Loostrife (Lythrum salicaria)
- Common Reed (Phragmites austalis)

Evaluation Criteria:	**Score:**
1) Waterbody does not currently have an exotic plant, is beyond 10 miles of a waterbody with an exotic plant, and has low recreational use	1
2) Waterbody does not currently have an exotic plant, is beyond 10 miles of a waterbody with an exotic plant, and has moderate to high recreational use	2
3) Waterbody does not currently have an exotic plant, is within 10 miles of a waterbody with an exotic plant, and has low recreational use	3
4) Waterbody does not currently have an exotic plant, is within 10 miles of a waterbody with an exotic plant, and has moderate to high recreational use	4
5) Waterbody has an established exotic plant, regardless of the size of the infestation	5

Sources:

Wilson, John. Weed Watcher Captain for PLPA. "Exotic Plant Species" 17 October, 2005.

"Exotic Aquatic Plant Sites in New Hampshire Map". New Hampshire Department of Environmental Services, Watershed Management Bureau, Exotic Species Program. http://www.des.state.nh.us/wmb/exoticspecies/milfoil_list.htm Site accessed 17 October, 2005.

Lake Sunapee Watershed Portfolio, Community and Environmental Studies. Fall 2003/Spring 2004.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Susceptibility to Impairment

Question J: Exotic Aquatic Animal Species

Directions: Consult the Exotic Species Map/List from NH DES or contact the New Hampshire Fish and Game Department, or the UNH Center of Freshwater Biology to determine the exotic plants and animals that occur in the lake or pond as well as its proximity to the nearest waterbody with an exotic species.

Rationale: In regards to exotic aquatic animals, there are numerous fishes, such as the smallmouth bass, that long ago became established in most of New Hampshire's waterways. However, more recent exotic animals known to upset the balance of the ecosystem should be your primary concern. Such species include the Japanese live-bearing snail and the zebra mussel. At the present time zebra mussels are not known to occur in any New Hampshire waterbodies. However, their planktonic larval stage coupled with heavy boater usage of our lakes and ponds from people throughout the northeast region make their introduction possible. If introduced and allowed to become established, zebra mussels could seriously affect the aquatic food chain, clog industrial and drinking water intakes, and cover submerged structures such as docks.

Process Followed: Contacted John Wilson from the PLPA for information about exotic species, plants and animals. Contacted the New Hampshire Fish and Game Department (NHFGD) in regards to exotic fish species. John Viar is the NHFGD fisheries biologist.

Findings and Analysis:

- Japanese Snail– Do not exist on the lake
- Zebra Mussel-(Dreissens polymorpha)– Do not exist on the lake
- Landlocked Salmon (Salmo salar) – (past and current NHFGD stocking; also note some limited natural reproduction in Great Brook.)
- Smallmouth Bass (Micropterus dolomieu) – (past NHFGD introduction/stocking – currently self sustaining.)
- Rock Bass (Ambloplites rupestris) - (recent unsanctioned introduction– currently self sustaining.)
- Banded Killifish – (recent unsanctioned introduction– currently self sustaining.)
- Rainbow Smelt – (Past NHFGD introduction/stocking of eggs into tributaries-currently self sustaining.)

Evaluation Criteria:	**Score:**
1) Waterbody does not currently have an exotic animal, is beyond 10 miles of a waterbody with an exotic animal, and has low recreational use	1
2) Waterbody does not currently have an exotic animal, is beyond 10 miles of a waterbody with an exotic animal, and has moderate to high recreational use	2
3) Waterbody does not currently have an exotic animal, is within 10 miles of a waterbody with an exotic animal, and has low recreational use	3
4) Waterbody does not currently have an exotic animal, is within 10 miles of a waterbody with an exotic animal, and has moderate to high recreational use	4
5) Waterbody has an established exotic animal, regardless of the size of the infestation	5

Sources:

Wilson, John. Weed Watcher Captain for PLPA. "Exotic Plant Species" 17 October, 2005.

Viar, John. (jviar@nhfgd.org) "Fish Species" E-mail to Steve Hash to Matt Urban. (shash@colby-sawyer.edu) (murban@colby-sawyer.edu) October 11, 2005.

Assessment of Question: This question was difficult to evaluate because the fish species that were introduced are exotic species. However because of their long lasting history and self sustainability in the lake they have been accepted as naturalized species. Thus, at one point these species would have been considered truly exotic. However they are no longer considered nuisance exotics. The question should consider this.

Date Completed: October 2005

Investigator: Matt Urban

Attribute 4: Biological / Ecological Characteristics

Category: Unique or Outstanding Value

Question K: Threatened and endangered plant and animal species and exemplary natural communities.

Directions: Consult New Hampshire Natural Heritage Bureau (NH NHB) of the NH Department of Resources and Economic Development (DRED) and the NH Fish and Game Department to identify the status of any plants or animals listed either by the state or federal government as threatened or endangered. Endangered species are defined as those in danger of being extirpated from their natural range. Threatened species are defined as those plants or animals facing the possibility of becoming endangered. Include only those species or communities that occur within the immediate watershed (i.e. land or water that drains directly into the waterbody).

Rationale: Plants or animals listed as endangered or threatened, either by the state or nationally, will require additional efforts to ensure their continued existence. The lake or pond and the land within its watershed may contain one or more of these species. Their occurrence within your watershed* indicates that there are special characteristics about that area that permit its survival. In addition, there may be a specific area that promotes the existence of a unique or highly diverse natural community of plants and animals. Known as "exemplary natural communities", these areas should be recognized with the same significance as threatened or endangered species. A management plan should identify these species or areas and recognize that their protection is critical.

* Only take note of those species within the immediate lake **watershed.**

Process Followed: Contacted the New Hampshire Natural Heritage Bureau. Inquired about threatened or endangered plant or animal species in the Pleasant Lake Watershed. The New Hampshire Natural Heritage Bureau supplied a list that consisted of threatened species within the Upper Black-water River Watershed, of which New London's Pleasant Lake is a part of. With that in mind the list generated could be accounting for some species that are not directly associated within Pleasant Lake's watershed, but the larger Upper Black-water River Watershed as represented in the map. Created a map to distinguish the watershed boundaries for Pleasant Lake, and the Upper Black-water River Watershed.

Findings and Analysis:
(* Date first identified)

Invertebrate Species

- Columbine Duskywing (Erynnis lucilius) *1896
- Graceful Clearwing (Hemaris gracilis) *1948

Plant Species

- Slender Blue Flag (iris prismatica) *1982 [State- threatened]

Vertebrate Species

- Common Loon (Gavia immer) *2003 [State- threatened]
- Least Bittern (Ixobrychus exilis) *1986
- Northern Harrier (Circus cyaneus) *1986 [State- endangered]
- Pied-billed Grebe (Podilymbus podiceps) *1997 [State- endangered]

Evaluation Criteria:	**Score:**
1) None	1
2) 1 or more species listed by the state as threatened	2
3) 1 or more federally listed threatened species	3
4) 1 or more species listed by the state as endangered OR 1 - 2 exemplary natural communities	4
5) 1 or more federally listed endangered species OR >2 exemplary natural communities	5

Sources:

Carins, Sara. "Threatened or endangered plant or animal Species." NH Natural Heritage Bureau Division of Forests & Lands. (scarins@dred.state.nh.us) Nov. 7, 2005

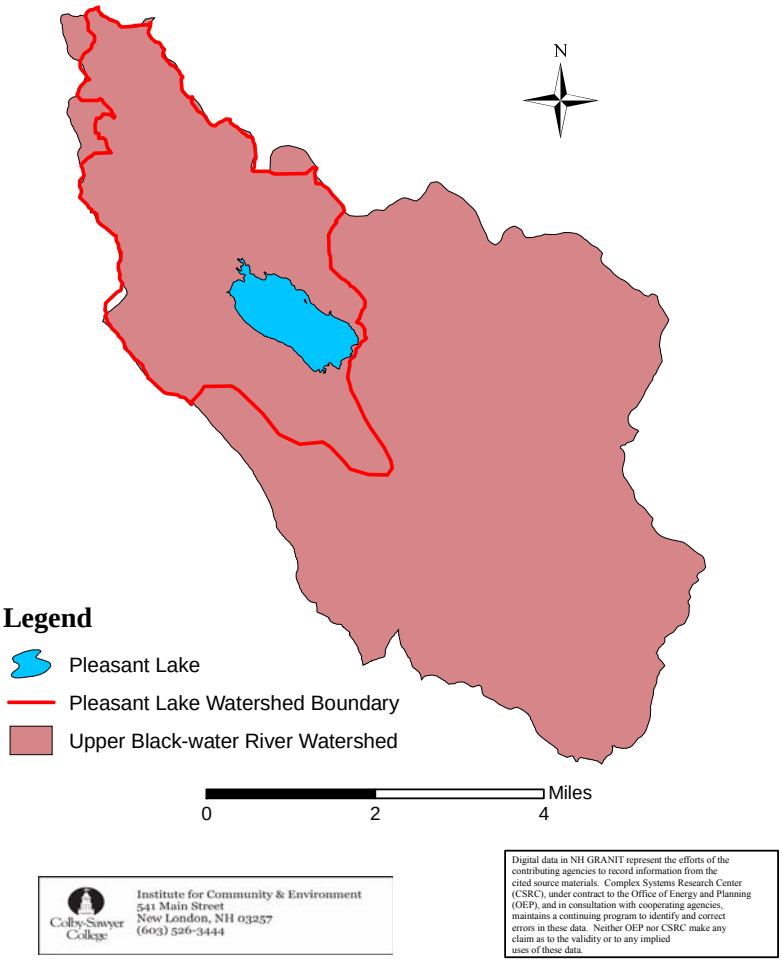
Assessment of Question: It should be noted that information may not be available for specific watersheds as the NH Natural Heritage Bureau Division of Forests & Lands provides information based on river watersheds not lake watersheds.

Investigator: Matt Urban

Date Completed: November 2005

Pleasant Lake Watershed within the Upper Black-Water River Watershed

Attribute 4: Question K



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Attribute 4: Biological / Ecological Characteristics

Category:

Question L: New Hampshire Natural Heritage Inventory Program (NHI) rank.

Directions: Consult NH NHI Program of the NH Department of Resources and Economic Development to identify the plant or animal of greatest concern that resides within the watershed of interest. Then determine its "flag" ranking by the NH NHI. The species chosen can be any plant or animal of local or global interest. Depending on the species selected, its "flag" ranking will determine the appropriate point value.

Rationale: The "flag" rank by the NH NHI of the species selected indicates its population status and the uniqueness of the watershed. If the chosen species is endangered worldwide and occurs in or around your watershed ensuring its survival, through protective measures, is critically important. Even if the chosen species is not rare statewide or globally, but is important locally to the public, similar effort should be put forth to ensure its continued existence, but with the realization that its presence does not make that watershed particularly unique biologically.

Process Followed: Consulted the New Hampshire Natural Heritage Bureau website and cross referenced the species list with (NHI) ranking on the webpage.

Findings and Analysis:
* Date first identified

Species	Global Rank	State Rank
Columbine Duskywing (*1896)	(G4)- Widespread and apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.	(S1)- Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.
Graceful Clearwing (*1948)	(G3)- Either very rare and local throughout its range (generally 21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction because of other factors.	(S2)- Imperiled because rarity (generally 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.

Slender Blue Flag (*1982)	(G4)- Widespread and apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.	(S2)- Imperiled because rarity (generally 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.
Common Loon (*2003)	(G5)- Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.	(S3)- Either very rare and local throughout its range (generally 21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction because of other factors.
Least Bittern (*1986)	(G5)- Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.	(S1) - Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.
Northern Harrier (*1986)	(G5)- Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.	(S2)- Imperiled because rarity (generally 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.
Pied-billed Grebe (*1997)	(G5)- Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.	(S1) - Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.

Species selected for assessment: Common Loon (2003) G5S3

Reason for selection: This is the most recently documented species on the Natural Heritage Bureau's list. It is also a species that is known to actually have been in the Pleasant Lake Watershed. With a global rank of G5 this bird is doing well and is widespread and secure. However, with its state rank of S3 the bird is very rare within its local range. The Common Loon is a good flagship species that people are drawn towards because of its unique appearance, and its distinct call. While species such as the Columbine Duskywing are of a higher ranked impairment, the loon was chosen because

it's the only species know for sure to be within the Pleasant Lake Watershed. This eliminates the chance of false scoring that could occur by choosing a species just out of the Pleasant Lake Watershed in the Upper Black-water Watershed.

Evaluation Criteria:

1) Species not considered to be rare, endemic, disjunctive, threatened, or endangered; No flag ranking by NH NHI
2) Species secure globally, but may be rare in parts of its statewide range; single "flag" ranking by NH NHI
3) Species moderately rare globally; good evidence of statewide rarity; double "flag" ranking by NH NHI.
4) Species globally rare (<20 occurrences worldwide); extremely rare statewide vulnerable statewide; triple "flag" ranking by NH NHI
5) Species imperiled because of global rarity globally and extremely rare statewide; quadruple "flag" ranking by NH NHI.

Sources:

"Rarity and Ranking." 2005. NH Natural Heritage Bureau. 28 Nov. 2005 <http://nh.gov/dred/divisions/forestandlands/bureaus/naturalheritage/Rarity_Ranking.htm>.

Carins, Sara. "Threatened or endangered plant or animal Species." NH Natural Heritage Bureau Division of Forests & Lands. (scarins@dred.state.nh.us) Nov. 7, 2005

Assessment of Question: This question is adequate as stated.

Investigator: Matt Urban

Date Completed: November 2005

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question A: Average watercraft density on lake or pond

Directions: Refer to the NH DES Watercraft Survey in Appendix B for instructions on determining the average watercraft density on a lake or pond.

Rationale: An estimate of watercraft use provides one component for estimating the waterbody's popularity. Ultimately, estimating watercraft use will be helpful in establishing a carrying capacity or maximum number of watercraft that is desirable on the individual waterbody and/or the need to provide specialized facilities such as boat launches and public restrooms.

Process Followed: Information collected over the summer of 2005 by Kittie Wilson, member of the Pleasant Lake Protective Association, was received September 29, 2005 and later used in the calculations provided in Appendix B to determine the average watercraft activity per day.

Findings and Analysis: Refer to the following page for quantitative data, results, and map of viewing area. While the lake is approximately 602 acres, the entire lake is viewable from the middle. The 4th of July was a Monday; however, the surveyor noted that it was a holiday and received weekend type traffic. The surveyor also noted that the 4th of July was often their busiest boating day of the year. After completing the appropriate calculations, the lake has an average watercraft density of 0.02 watercraft/acre.

Evaluation Criteria:	**Score:**
1) 1 watercraft / <5 acres	1
2) 1 watercraft / 5-15 acres	2
3) 1 watercraft / 16-30 acres	3
4) 1 watercraft / 31-50 acres	4
5) 1 watercraft / >50 acres	5

Sources:
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This particular question is quite important when determining the amount of use a lake receives on an average day, as the number of watercraft corresponds quite closely to the quality of water and thus the amount of pleasure people receive from the lake. It should be noted that it was slightly confusing how the equations given in Appendix B correlated to the evaluation criteria. Dividing the total acreage of the lake by the number of watercraft per day will actually give you the proper value for determining where the lake falls into the evaluation criteria.

Date Completed: October 2005

Investigator: Steven Hash

Watercraft Survey of Pleasant Lake
Summer 2005-Pleasant Lake Protective Association

Date	Non-Motor	Motor	Total	Day of Week
3-Jul	16	19	35	Sunday
4-Jul	20	17	37	Monday
3-Aug	6	5	11	Wednesday
4-Aug	2	3	5	Thursday

- To estimate the number of watercraft per day:
  1. Average the two weekday counts ((week day one + weekday two)/2).
  2. Multiply number from A by 5.
  3. Add the two weekend counts (weekend day one + weekend day two).
  4. Add totals from B and C.
  5. Divide number from D by 7.

- To determine the average watercraft density of the waterbody, divide the total number of watercraft per day (E) by the water surface area of the waterbody.

A. Aug. 3 – 11
   Aug. 4 – 5
   11+5=16/2=8
B. 8*5=40
C. July 3 – 35
   July 4 – 37
   35+37=72
D. 40+72=112
E. 112/7=16

Watercraft Density: 16/602.3= 0.02 watercraft/acre.
Watercraft per acre: 602.3/16= 1 watercraft per 37.64 acres.

Attribute 5: Recreational Characteristics

Category: Susceptibility to Impairment

Question A: Average watercraft density on lake or pond

Directions: Refer to the NH DES Watercraft Survey in Appendix B for instructions on determining the average watercraft density on a lake or pond.

Rationale: An estimate of watercraft use provides one component for estimating the waterbody's popularity. Ultimately, estimating watercraft use will be helpful in establishing a carrying capacity or maximum number of watercraft that is desirable on the individual waterbody and/or the need to provide specialized facilities such as boat launches and public restrooms.

Process Followed: Information collected over the summer of 2005 by Kittie Wilson, member of the Pleasant Lake Protective Association, was received September 29, 2005 and later used in the calculations provided in Appendix B to determine the average watercraft activity per day.

Findings and Analysis: Refer to the following page for quantitative data, results, and map of viewing area. While the lake is approximately 602 acres, the entire lake is viewable from the middle. The 4th of July was a Monday; however, the surveyor noted that it was a holiday and received weekend type traffic. The surveyor also noted that the 4th of July was often their busiest boating day of the year. After completing the appropriate calculations, the lake has an average watercraft density of 0.02 watercraft/acre.

Evaluation Criteria:	**Score:**
1) 1 watercraft / <5 acres	5
2) 1 watercraft / 5-15 acres	4
3) 1 watercraft / 16-30 acres	3
4) 1 watercraft / 31-50 acres	2
5) 1 watercraft / >50 acres	1

Sources:
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This particular question is quite important when determining the amount of use a lake receives on an average day, as the number of watercraft corresponds quite closely to the quality of water and thus the amount of pleasure people receive from the lake. It should be noted that it was slightly confusing how the equations given in Appendix B correlated to the evaluation criteria. Dividing the total acreage of the lake by the number of watercraft per day will actually give you the proper value for determining where the lake falls into the evaluation criteria.

Date Completed: October 2005

Investigator: Steven Hash

Watercraft Survey of Pleasant Lake
Summer 2005-Pleasant Lake Protective Association

Date	Non-Motor	Motor	Total	Day of Week
3-Jul	16	19	35	Sunday
4-Jul	20	17	37	Monday
3-Aug	6	5	11	Wednesday
4-Aug	2	3	5	Thursday

- To estimate the number of watercraft per day:
  6. Average the two weekday counts ((week day one + weekday two)/2).
  7. Multiply number from A by 5.
  8. Add the two weekend counts (weekend day one + weekend day two).
  9. Add totals from B and C.
  10. Divide number from D by 7.

- To determine the average watercraft density of the waterbody, divide the total number of watercraft per day (E) by the water surface area of the waterbody.

F. Aug. 3 – 11
   Aug. 4 – 5
   11+5=16/2=8
G. 8*5=40
H. July 3 – 35
   July 4 – 37
   35+37=72
I. 40+72=112
J. 112/7=16

Watercraft Density: 16/602.3= 0.02 watercraft/acre.
Watercraft per acre: 602.3/16= 1 watercraft per 37.64 acres.

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question B: Type of watercraft use

Directions: Refer to the NH DES Watercraft Survey in Appendix B for instructions on determining the average watercraft density on a lake or pond.

Rationale: An estimate of watercraft use provides one component for estimating the waterbody's popularity. Ultimately, estimating watercraft use will be helpful in establishing a carrying capacity or maximum number of watercraft that is desirable on the individual waterbody and/or the need to provide specialized facilities such as boat launches and public restrooms.

Process Followed: Information collected over the summer of 2005 by Kittie Wilson, member of the Pleasant Lake Protective Association, was received September 29, 2005 and later used in the calculations provided in Appendix B to determine the average percentage of petroleum versus non-petroleum watercraft.

Findings and Analysis: Refer to the following page for quantitative data, results, and map of viewing area. While the lake is approximately 602 acres, the entire lake is viewable from the middle. Totaled the number of petroleum and non-petroleum watercraft viewed during the watercraft survey. The numbers of petroleum, as well as non-petroleum, watercraft were both forty-four. Divide each number by eighty-eight, which was the total number of boats viewed, to find the percentages. These percentages represent the abundance of both petroleum and non-petroleum watercraft on an average day.

Date	**Non-Petroleum**	**Petroleum**
3-Jul	16	19
4-Jul	20	17
3-Aug	6	5
4-Aug	2	3
Total	44	44
Formula	x/88=percent of total	x/88=percent of total
% of Total	50%	50%

Evaluation Criteria:	**Score:**
1) 76-100% power : 0-24% non-power	1
2) 51-75% power : 25-49% non-power	2
3) 26-50% power: 50-74% non-power	3
4) 1-25% power: 75-99% non-power	4

5) 0% power : 100% non-power 5

Sources:
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This particular question is extremely helpful when determining the type and amount of certain pollutants that are released by petroleum powered watercraft. The amount of recreation in the form of petroleum powered watercraft directly correlates to the quality of water and amount of pleasure an individual can receive from that particular waterbody.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Susceptibility to Impairment

Question B: Type of watercraft use

Directions: Refer to the NH DES Watercraft Survey in Appendix B for instructions on determining the average watercraft density on a lake or pond.

Rationale: An estimate of watercraft use provides one component for estimating the waterbody's popularity. Ultimately, estimating watercraft use will be helpful in establishing a carrying capacity or maximum number of watercraft that is desirable on the individual waterbody and/or the need to provide specialized facilities such as boat launches and public restrooms.

Process Followed: Information collected over the summer of 2005 by Kittie Wilson, member of the Pleasant Lake Protective Association, was received September 29, 2005 and later used in the calculations provided in Appendix B to determine the average percentage of petroleum versus non-petroleum watercraft.

Findings and Analysis: Refer to the following page for quantitative data, results, and map of viewing area. While the lake is approximately 602 acres, the entire lake is viewable from the middle. Totaled the number of petroleum and non-petroleum watercraft viewed during the watercraft survey. The numbers of petroleum, as well as non-petroleum, watercraft were both forty-four. Divide each number by eighty-eight, which was the total number of boats viewed, to find the percentages. These percentages represent the abundance of both petroleum and non-petroleum watercraft on an average day.

Date	**Non-Petroleum**	**Petroleum**
3-Jul	16	19
4-Jul	20	17
3-Aug	6	5
4-Aug	2	3
Total	44	44
Formula	x/88=percent of total	x/88=percent of total
% of Total	50%	50%

Evaluation Criteria:	**Score:**
1) 76-100% power : 0-24% non-power	1
2) 51-75% power : 25-49% non-power	2
3) 26-50% power: 50-74% non-power	3
4) 1-25% power: 75-99% non-power	4
5) 0% power : 100% non-power	5

Sources:
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This particular question is extremely helpful when determining the type and amount of certain pollutants that are released by petroleum powered watercraft.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question C: Private marine service/docking facilities

Directions: Utilize local tax maps to determine the name(s) and location(s) of all the privately owned marine service or docking facilities that surround the waterbody's perimeter.

Rationale: Knowing the locations of all the service and docking facilities will assist in estimating the number of boats that use the waterbody of interest. Cataloging the names and locations of these facilities will be useful in creating a shoreline use map. Finally, when obtaining this information, identify those areas that provide refueling areas or waste disposal centers.

Process Followed: Contacted Terry Lee, one of the lake-hosts for Pleasant Lake via telephone regarding any privately owned marine services/docking.

Findings and Analysis: Not having private, or public for that matter, marine services could potentially decrease the amount of boaters on the water. Furthermore, tourists could possibly take this into consideration when researching possible vacation spots.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 – 3 marinas	2
3) 4 – 6 marinas	3
4) 7 – 10 marinas	4
5) >10 marinas	5

Sources:
Lee, Terry. Lake-host. Personal Conversation (Telephone). (603) 526-4818.

Assessment of Question: Private marine services on the waterbody have the potential to pollute the water quality drastically. If Pleasant Lake had a fueling station somewhere on the waterbody, it would most likely increase the amount of gasoline that could potentially make its way into the water, thus reducing water quality. Furthermore, it would provide the potential for petroleum-powered watercraft to stay out on the water for extended periods of time, also increasing the risk of polluting the waterbody, and possible increasing the total number of watercraft on the waterbody at a given time. For these reasons, it is my recommendation that this question also be scored under the susceptibility to impairment category, as lakes with a high number of marine service/docking facilities have the potential to drastically impair a given waterbody.

Date Completed: October 2005
Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category:

Question D: Other water dependant activities

Directions: Identify all other types of recreational activities that require open water and that occur on the lake or pond.

Rationale: In addition to power boating, there are a great variety of other recreational activities that might occur on a waterbody. Some of these activities could potentially provide unique opportunities and attract a large number of people. Whether or not the activities are unique to a waterbody, they should be considered in the development of a management plan

Process Followed: Contacted various residents of the town of New London, as well as Kittie Wilson of the Pleasant Lake Protective Association.

Findings and Analysis: In addition to power boating, other recreational activities occurring on Pleasant Lake include:

Swimming	Wakeboarding
Fishing	Water cycling
Sailing	Paddleboats
Kayaking	Rowing shells
Canoeing	Electric boating
Water skiing	Birding

According to Kittie Wilson of the Pleasant Lake Protective Association and a resident of the town of New London, there are at least four water bikes, four single shell rowing boats, and one restored 1906 ELCO electric boat on Pleasant Lake.

Evaluation Criteria:

1) 1 – 3 different activities
2) 4 – 6 different activities
3) >6 different activities

Sources:

Alexander, Laura. Professor of Natural Sciences, Colby-Sawyer College. New London, NH. lalexander@colby-sawyer.edu. (603) 526-3006.

Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005
Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question E: Recreational Fishing

Directions: Find the waterbody in the *Fishing Waters of New Hampshire* booklet published by the NH Fish and Game Department. Record the number and type of game fish species that occur in the lake or pond. You may wish to denote whether the species is regularly stocked by the NH Fish and Game Department.

Rationale: Fishing is an important recreational use of many lakes and ponds. In New Hampshire, waterbodies with warmwater game fish species are most common. Lakes or ponds with coldwater game fish species also occur, but are not as common. Identifying the game fish species present is the first step in evaluating the value of the waterbody's recreational fishery.

Process Followed: Contacted Kris Harmon, Executive Secretary for the New Hampshire Fish and Game Department, Region 2 in New Hampton, NH. K. Harmon sent via email a list of fish species found in Pleasant Lake. Furthermore, K. Harmon sent via postal mail the *Freshwater Fishing Guide* of New Hampshire booklet, which also lists the fish species found in the lake. Emailed K. Harmon to find documentation information on the list sent in the email. John Viar, fisheries biologist for NH Fish & Game Department Region 2, replied to the email with an updated list including documentation.

Findings and Analysis: The New Hampshire Fish & Game Department, including Mr. Viar himself, has surveyed Pleasant Lake with trap nets in 2000, and electrofishing in 2004. Of the species listed, the Landlocked salmon, Smallmouth bass, Rock bass, Banded killifish, and Rainbow smelt are all exotic species to Pleasant Lake. However, it should be noted that salmon, Smallmouth bass, and Rainbow Smelt were all introduced by the New Hampshire Fish & Game Department. Of the exotics, only salmon is still stocked regularly. However, Smallmouth bass and Rainbow smelt are now self-sustaining. Of the native species, the Eastern brook trout is the only species to be stocked regularly, while the Brown bullhead was stocked in the past.

Warmwater Species	Coldwater Species
Yellow Perch	Eastern Brook Trout
Chain Pickerel	Brown Bullhead
Horned Pout	Landlocked Salmon
Smallmouth Bass	Common Shiner
Rock Bass	American Eel
Red Breasted Sunfish	Rainbow Smelt
Pumpkinseed	
Common Shiner	
Golden Shiner	
Common White Sucker	
Banded Killifish	

Evaluation Criteria:	**Score:**
1) Single warmwater species	1
2) Multiple warm water species	2
3) Single coldwater species	3
4) Multiple coldwater species	4
5) Warm water and coldwater species	5

Sources:

Harmon, Kris. Executive Secretary. New Hampshire Fish & Game Department. (603) 744-5470. reg2@nhfgd.org.

New Hampshire Fish and Game Department. *Freshwater Fishing Guide*. Concord: NH Fish & Game Department, 2005.

"New Hampshire Fish Stocking Report for 2004." Fishing. New Hampshire Fish & Game Department.09 Oct. 2005 <http://www.wildlife.state.nh.us/Fishing/fish_stocking_report_2004.htm>.

Viar, John. Fisheries Biologist. New Hampshire Fish & Game Department. (603)744-5470. jviar@nhfgd.org.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question F: Occurrence of fishing tournaments/derbies

Directions: Consult the NH Department of Fish and Game website to identify any fishing tournaments / derbies that have occurred on the lake or pond within the last few years. Also research tournament/derby lists from the past five years to note the year with the maximum number of events.

Rationale: Exceptional populations of game fish (along with lake accessibility, accommodations, and desire for local promotion) attract additional recreational fishing pressure through organized tournaments or derbies. These events usually last 1 – 2 days and can significantly increase boat traffic and angling efforts. An awareness of the frequencies and timing of these events will assist with the development of organized plans that accommodate the anglers and their boats in a wise and practical manner.

Process Followed: Referred to the New Hampshire Fish & Game website to obtain information about fishing tournaments on Pleasant Lake. Also, referred to the newsletter for the Pleasant Lake Protective Association (Reflections) obtained from Kittie Wilson.

Findings and Analysis: The Rock Bass Marathon put on by the Pleasant Lake Protective Association is used by the Association to help control the Rock Bass population, a non-native species, in Pleasant Lake.

Tournament	Date	Species	# of Boats
Rock Bass Marathon	7/3/2005 - 8/28/2005	Rock Bass	N/A
White Mountain Bass Club	8/20/2005	Bass	7

Evaluation Criteria:	Score:
1) None	1
2) 1 / year	2
3) 2-3 / year	3
4) 3-5 / year	4
5) >5 / year	5

Sources:

"Announcing the 2005 Pleasant Lake Rock Bass Marathon." Reflections 36.1 (2005): 8.

"Fishing Tournaments in New Hampshire." Fishing. 22 Jul. 2005. New Hampshire Fish & Game Department. 09 Oct. 2005 <http://www.wildlife.state.nh.us/Fishing/fish_tournament_table.htm>.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question G: Angler Usage

Directions: Using the method outlined in the angler survey instructions included in Appendix C, estimate the approximate number of anglers per acre for an average day during the summer.

Rationale: Completing this question will provide an estimate of the popularity of the waterbody in regards to its recreational fishing opportunities. An estimate of angler use should be considered in conjunction with lake or pond surface area, as this will ultimately determine the density of recreational anglers. The amount of angler usage that a waterbody receives will help in assessing the need to provide specialized facilities such as boat launching or public shoreline fishing areas.

Process Followed: Information collected over the summer of 2005 by Kittie Wilson, member of the Pleasant Lake Protective Association, was received September 29, 2005 and later used in the calculations provided in Appendix B to determine number of anglers per day on an average day.

Findings and Analysis: Refer to the following page for quantitative data and results.

Evaluation Criteria:	**Score:**
1) 1 angler / >10 acres	1
2) 1 angler / 8.1 – 10 acres	2
3) 1 angler / 6.1 – 8 acres	3
4) 1 angler / 4 – 6 acres	4
5) 1 angler / <4 acres	5

Sources:
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Angler Survey

Date	Time	Conditions	Anglers	Day of Week
18-Jul	8:00-9:00 am	Overcast/humid	4	Monday
19-Jul	6:00-7:00 pm	Overcast/humid	1	Tuesday
20-Aug	8:00-9:00 am	Blue Sky	5	Saturday
21-Aug	6:00-7:00 pm	Partly Cloudy	2	Sunday

- To estimate the number of anglers fishing per day:
    A. Average the two weekday counts ((week day on + week day two/2)
    B. Multiply number from step A by 5
    C. Add the two weekend counts (weekend day one + weekend day two)
    D. Add totals from B and C
    E. Divide the number from D by 7

    A. Jul 18 – 4
       Jul 19 – 1
       4+1=5/2=2.5
    B. 2.5*5=12.5
    C. Aug 20 – 5
       Aug 21 – 2
       5+2=7
    D. 12.5+7=19.5
    E. 19.5/7=2.8

    =2.8 anglers per day

    Anglers per acre: 602.3/2.8=215.1

Attribute 5: Recreational Characteristics

Category:

Question H: Ice dependant activities

Directions: Identify all types of recreational activities that occur on the lake or pond while it is ice covered

Rationale: Many of New Hampshire's lakes and ponds host a number of winter activities that occur while they are frozen. Identifying these activities will assist in evaluating the overall recreational value of a waterbody.

Process Followed: Contacted various residents of the town of New London, as well as Kittie Wilson of the Pleasant Lake Protective Association.

Findings and Analysis: Included is a list of activities that occur on Pleasant Lake when it is ice-covered.

Ice boating	Snowshoeing
Ice skating	Snowmobiling
Cross country skiing	

According to Kittie Wilson of the Pleasant Lake Protective Association, and a resident of the town of New London, there are at least three ice boats on the lake. Kittie also noted that the reason there is no ice fishing on the lake is because it is prohibited by law. While she did not include snowmobiling in her list, Laura Alexander, professor of Natural Sciences at Colby-Sawyer College and resident of New London, mentioned that she has occasionally seen evidence of snowmobile tracks scattered on the lake.

Evaluation Criteria:

1) 1 – 3 activities
2) 4 – 6 activities
3) >6 activities

Sources:

Alexander, Laura. Professor of Natural Sciences, Colby-Sawyer College. New London, NH. lalexander@colby-sawyer.edu. (603) 526-3006.
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category:

Question I: Non-water dependant activities

Directions: Identify all types of recreational activities that occur around the shoreline of the lake or pond that do not require water.

Rationale: Non-water dependent activities, such as hiking or camping, are also an important component in determining the lake or pond's recreational value. Identifying these activities and their relative popularity should be considered when planning public shoreline recreational facilities.

Process Followed: Contacted various residents of the town of New London, as well as Kittie Wilson of the Pleasant Lake Protective Association.

Findings and Analysis: Activities that occur around the lake, but are non-water dependant, include:

Tennis	Hiking
Horseshoes	Biking
Gardening	Walking/Jogging
Barbequing	Picnicking

According to Kittie Wilson of the Pleasant Lake Protective Association and resident of the town of New London, there are several private tennis courts around the lake as well as many public hiking trails on some of the conserved land parcels. She also noted that walking/jogging were two of the most popular non-water dependant activities that occur around the lake. Barbequing and picnicking occur frequently at the Elkins Town Beach. Laura Alexander, professor of Natural Sciences at Colby-Sawyer College and resident of the town of New London also noted the popularity of jogging as she herself jogs around the lake frequently.

Evaluation Criteria:

1) 1 – 3 different activities
2) 4 – 6 different activities
3) >6 different activities

Sources:

Alexander, Laura. Professor of Natural Sciences, Colby-Sawyer College. New London, NH. lalexander@colby-sawyer.edu. (603) 526-3006.
Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005
Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category:

Question J: Commercial seasonal camps

Directions: Identify the name(s) and location(s) of any extended-stay (>1 week) summer camps (i.e. youth camps).

Rationale: These facilities are important recreational centers that make the lake or pond unique. Their attendees often gain a deep appreciation of the waterbody and the inherent values that it provides. Depending on its size and location, the camp(s) may require special consideration when developing a management plan.

Process Followed: Referred to a phonebook for the town of New London under "Camps" for any listings of extended stay summer camps. Also, Kittie Wilson of the Pleasant Lake Protective Association was contacted.

Findings and Analysis: After referring to the phonebook, it appeared that there were no extended stay summer camps found along the shoreline of the waterbody. An email received from Kittie Wilson also reinforced this finding, as she noted there are no extended stay commercial summer camps.

Evaluation Criteria:

1) None
2) 1 camp
3) 2 – 4 camps
4) 4 – 6 camps
5) >6 camps

Sources:

Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005
Telephone Directory for Andover, Boscawen, Meriden, New London and Salisbury, NH.. Residential & Business. TDS Telecom, 2005.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question K: Boat launches and access sites

Directions: Identify the name(s), location(s), and owner(s) of all public and private boat launching site(s) for the waterbody. Consult the maps from the NH Department of Fish and Game to obtain the most complete information.

Rationale: The ability to gain access to any lake or pond is likely to be directly related to its water-dependent recreational popularity. These sites can also serve as information stations to educate the public about the condition and concerns that pertain to the waterbody of interest. Since they can also concentrate on- and off-water recreational activities they must also be designed and maintained in a manner that protects and matches the natural characteristics of the waterbody.

Process Followed: Contacted Terry Lee, one of the lake-hosts for Pleasant Lake via telephone for information regarding any public and privately owned boat launches that give access to Pleasant Lake.

Findings and Analysis: Pleasant Lake is accessible through two main launch sites; the boat launches at the Elkins Town Beach and Slope N' Shore. It is important to note that the launch at the town beach is owned by the town of New London, and not the state of New Hampshire, like many launches. Therefore, the launch is not governed by state rules and regulations, rather by the town of New London. The launch at Slope N' Shore is not open to the public, but rather to visitors and residents of their facilities.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 – 3 launches/access sites	2
3) 4 – 6 launches/access sites	3
4) 7 – 10 launches/access sites	4
5) >10 launches/access sites	5

Sources:
Lee, Terry. Lake-host. Personal Conversation (Telephone). (603) 526-4818.

Assessment of Question: It should be noted that this question has the potential to also be scored under the susceptibility to impairment category. Having numerous boat launches increases the opportunities for aquatic invasive species, such as milfoil, to infiltrate a waterbody that was previously uncontaminated.

Date Completed: October 2005
Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category: Recreational Value

Question L: Other recreation and support facilities

Directions: Note the name(s), location(s), and owner(s) of any parks, camping, or bathing facilities that occur on a waterbody's shoreline and the activities that are allowed.

Rationale: For the non-boating public, the number of alternative shoreline recreational facilities that are provided will, in part, determine its popularity. Similar to public boat launching sites, these areas can also serve as information stations to educate the public about the condition and concerns that pertain to the waterbody of interest. Since they can also concentrate shoreline and nearshore recreational activities they must also be designed and maintained in a manner that protects and matches the natural characteristics of the waterbody.

Process Followed: Conducted a windshield survey to find any potential facilities that may offer recreational opportunities for the general public. Once these potential sites were found, further research was done to determine the name(s), location(s), parking capacity, owner(s), and activities permitted. Contacted Kittie Wilson of the Pleasant Lake Protective Association with questions regarding the activities permitted at the Elkins Beach. Kittie advised to contact the Recreation Department of the Town of New London. Bob Andrews, the New London Recreation Director, was contacted and answered questions regarding the Elkins Beach recreational facilities. Barry Bradford, President of the Slope 'N Shore Club, was contacted for question regarding the recreational facilities found on their property.

Findings and Analysis: There is only one publicly accessible recreational facility in the shoreline of Pleasant Lake. This recreational facility is known as the Elkins Beach, and is owned by the Town of New London. It is located next to the Elkins Post Office, which is located at 349 Elkins Road. The Elkins Beach has restroom facilities, a public playground, tables for various picnicking activities, individual barbeques, and the lake enables individuals to swim. One of the major problems with the Elkins Beach is the lack of available parking. The beach is only open to residents of New London, and parking stickers are issued to said residents. However, on many days in the summer, there is just not enough parking. Therefore, people often park illegally, and without proper enforcement, these illegal parkers often get away scot-free.

There is also the private community of seventy homes on the northwest section of Pleasant Lake known as Slope 'N Shore Club. This community has five acres of land bordering the lake. However, the facilities located here are strictly for residents and guests of Slope 'N Shore and the Inn at Pleasant Lake, another part of Slope 'N Shore. The land bordering the lake has a barn-like building used to host social events and has two restrooms. On the same land are a large beach area and three tennis courts. Slope 'N Shore also offers twenty-one mooring sites and a large swimming area that is patrolled by

lifeguards in the summer months. There are two changing rooms and a boathouse that is used as storage for recreational equipment; there is parking for fifty or more vehicles alone their driveway.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 facility	2
3) 2 – 3 facilities	3
4) 4 – 5 facilities	4
5) >5 facilities	5

Sources:

Andrews, Bob. New London Recreation Director. "Re: Elkins Town Beach." E-mail to Steven Hash. 30 Nov 2005.

Bradford, Barry. President of the Slope 'N Shore Club. "Re: Recreational Activities at Slope 'N Shore." E-mail to Steven Hash. 28 Nov 2005.

Wilson, Kittie. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Attribute 5: Recreational Characteristics

Category:

Question M: Time of recreational use/activities.

Directions: Record the time of year (season), time of week, and time of day that each of the three most popular recreational activities take place on or around the waterbody.

Rationale: Documenting the times that a variety of recreational activities occur on the lake or pond will assist in identifying any potential conflicts that may arise among user groups. Also, if completed over a number of years, this information will track the recreational trends on the lake or pond and assist in developing plans to provide adequate facilities.

Process Followed: Contacted Terry Lee, one of the lake-hosts for Pleasant Lake via telephone for information regarding any public and privately owned boat launches that give access to Pleasant Lake.

Findings and Analysis: It is important to note that the days/times of day these activities take place depends heavily on the weather and other recreational opportunities around the region to compete with**.** This question proves important in making aware the general times in which the lake is most populated. Higher populations on or in the lake can greatly increase the amount of pollution that occurs. A higher density of boaters can increase the amount of gasoline and other substances that are associated with power boats into the lake. An increase in swimming and sailing means the obvious increase in humans, resulting in possible increases in garbage and other pollutants.

Activity	Time of Year	Time of Week	Time of Day
Boating	End of June-July/August	Saturday	Peak 11am-2pm
Swimming	End of June-July/August	Saturday	Peak 11am-2pm
Sailing	End of June-July/August	Saturday	Peak 11am-2pm

Sources:
Lee, Terry. Lake-host. Personal Conversation (Telephone). (603) 526-4818.

Assessment of Question: This question is adequate as stated.
Date Completed: October 2005

Investigator: Steven Hash

Attribute 6: Restrictions for Prohibited Uses

Category:

Question A: Public swimming facility postings* imposed because of threats to human health.

Directions: Consult the New Hampshire *Surface Water Quality Assessment 305(b)* report, or the Environmental Protection Agency's *National Health Protection Survey of Beaches*.

Rationale: Postings of public swimming facilities are a nuisance and concern to visiting recreational users and lakeside as well as community property owners. Awareness of the frequencies and locations of such closures is useful in prioritizing water quality protection efforts.

**A posting occurs when high numbers of toxic cyanobacteria occur or when E. coli or Enterococci bacteria exceed NH state standards (See NH DES Environmental Fact Sheet WD-BB-41). In the case of E. coli or Enterococci, high bacteria levels persist only for a short time period (i.e. <2 days) and swimmers are advised to swim at their own risk during this time. While the posting is in effect additional water samples are collected to determine if the problem is acute or chronic.*

Process Followed: The US EPA's *National Health Protection Survey of Beaches* has been replaced by a new tool for viewing beach advisory and closing data named BEACON. This is EPA's new Beach Advisory and Closing Online Notification (BEACON) system. It contains a list of state beaches, beach advisory and closing data, and beach contact information from 2000 to present. As a second reference, the 2004 NH *Surface Water Quality Assessment 305(b)* report was reviewed from the NH DES website.

Findings and Analysis: According to BEACON, the following data is available for Elkins Beach since 2000.

Year	Number of Advisories and Closings
2005	0
2004	0
2003	0
2002	0
2001	0
2000	0

The 2004 NH *Surface Water Quality Assessment 305(b)* report confirmed that beach in Elkins fully supports primary contact recreation.

Evaluation Criteria:

1) > 6 within past 3 years
2) 4 – 6 within past 3 years
3) 2 – 4 within past 3 years
4) 1 within past 3 years
5) None within past 3 years

Sources:

New Hampshire Department of Environmental Services, Watershed Management Bureau. New Hampshire Final 2004 305(b) and 303(d) Surface Water Quality Assessment Report. 2004. http://www.des.state.nh.us/wmb/swqa/2004/pdf/Vol2/Lakes.pdf

United States Environmental Protection Agency, Beach Advisory and Closing Online Notification (BEACON) system. 28 November 2005. http://www.epa.gov/waterscience/beaches/data.html. Elkins Beach information can be found directly at: http://oaspub.epa.gov/beacon/beacon_beach_page.main?p_beach_id=26276&p_county_fips=013&p_state_fips=33&p_tab=1

Assessment of Question: The results of this inquiry are important to know, in order to provide for a safe and healthy recreational spot. Positive tests may show patterns at particular beaches, signaling a need for evaluation of the problems and solution. Facility postings due to increased bacterial levels that are repetitive every season may deter the public from continual use of the area. The BEACON system has replaced the *National Protection Survey of Beaches* and the Inventory should be corrected to reflect this change. The BEACON site provided the most useful information. The other recommended source, New Hampshire's *Surface Water Quality Assessment* 305(b) report, while containing valuable information, did not include information directly related to this question.

Date Completed: November 2005

Investigator: John Callewaert

Attribute 6: Restrictions for Prohibited Uses

Category:

Question B: Fish Consumption limits due to threats to human health.

Directions: Consult the NH Department of Health and Human Services website for any fish consumption limits due to threats to human health.

Rationale: If any such restrictions apply to the lake or pond (other than the statewide recommendation in regards to mercury in fish tissue) public awareness is important to ensure compliance with the restrictions. In addition it may be desirable to obtain and keep records of any fish tissue analysis that is completed.

Process Followed: Consulted the New Hampshire Department of Health and Human Services website and followed the links to The New Hampshire fresh water fishing digest, where the fish consumptions limits are published every year.

Findings and Analysis: In consulting the New Hampshire Department of Health and Human Services website there are no other regulations other than the state wide mercury warnings. The state recommends that people only eat four, eight ounce meals of fresh water fish once a month, unless they are a child under seven. Children under seven are only to eat one three ounce meal a month. Pregnant or nursing women should only eat one eight ounce meal a month. The size regulations for bass and pickerel are nothing over 12 inches.

Evaluation Criteria:

1) Advisory to limit or avoid fish consumption because of suspected pollutant other than mercury
2) Avoid consumption of fish recommendation issued for specific waterbody because of suspected mercury contamination
3) General statewide advisory on fish consumption because of potential exposure to mercury

Sources:

New Hampshire Fish and Game Department. 2005. *New Hampshire Freshwater Fishing Digest,* http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/FW_Fishing_Digest_05.pdf), 28 November 2005.

New Hampshire Department of Health and Human Services. 2005. http://www.dhhs.state.nh.us/DHHS/DHHS_SITE/default.htm, 28 November 2005.

New Hampshire Department of Health and Human Services. 2005. *Is it Safe to Eat the Fish We Catch? Mercury & Other Pollutants in Fish.*

Assessment of Question:
The importance of this question can be seen as a health factor. There are restrictions for fish consumption in the entire state of New Hampshire. Pleasant lake is no different. These restrictions should be taken into consideration when thinking about tourism. The lake is a popular trout fishing pond and may people come to fish Pleasant Lake each year. The directions should suggest consulting the New Hampshire First and Game *Freshwater Fishing Digest*.

Date Completed: November 2005

Investigator: Brian Valle

Attribute 6: Restrictions for Prohibited Uses

Category:

Question C: Recreational Fishing Restrictions.

Directions: Consult the most current edition of the *New Hampshire Freshwater Fishing Digest*, published by the New Hampshire Fish and Game Department for a list of statewide and waterbody-specific fishing regulations and restrictions

Rationale: Special fishing restrictions apply to many waterbodies in New Hampshire and can provide unique opportunities for anglers. Often these restrictions are designed specifically to manage populations of naturally reproducing species or are an attempt to equally satisfy anglers fishing for stocked species. In the planning phases of a management plan you may want to consider the public's awareness of any fishing restrictions and their satisfaction with the current fishing opportunities.

Process Followed: Consulted the most current edition on of the New Hampshire Freshwater Fishing Digest.

Findings and Analysis: Pleasant Lake is a trout fishing lake, and there are state wide regulations anglers need to follow. Below are tables from the *New Hampshire Freshwater Fishing Digest* that outline rules for trout ponds as well as statewide fishing rules. A specific rule for Pleasant Lake is that the use or possession of rainbow smelt for bait is permitted.

RULES FOR FISHING IN TROUT PONDS

This waterbody is managed for trout, and is open to fishing for all species the fourth Saturday in April through October 15. Fishing for any species is prohibited from October 16 until the fourth Saturday in April the following year. For information on bag and length limits for species other than trout, see General Fishing Rules for Lakes and Ponds on pages 16-19.

1) The taking of brook trout, rainbow trout, brown trout, lake trout, trout hybrids and salmon between two hours after sunset and one hour before sunrise is prohibited.
2) Trout ponds open this year on April 23. Closed to salmon October 1 and to all species October 16.
3) The daily combined limit for trout is 5 fish or 5 pounds, whichever limit is reached first.
4) The use or possession of live fish, or their eggs, for bait is prohibited. The use of salmon eggs, however, is permitted.

GENERAL FISHING RULES

SPECIES	SEASONS AND DAILY LIMITS
Black Bass (Smallmouth Bass and Largemouth Bass)	Ice-in to May 14 and June 16 to June 30 – 2 fish; May 15 to June 15 – all fish must be immediately released unharmed at site of catch; July 1 to ice-in – 5 fish.
Brook Trout, Brown Trout, Rainbow Trout, Tiger Trout, Splake	Combined daily limit : Open water – 5 fish or 5 pounds, whichever is reached first. Through the ice – 2 fish. No length limit.
Lake Trout	Open water season – April 1 to September 30; Ice-fishing season – January 1 to March 31. 2 fish daily limit. Minimum length 18 inches. Daily bag limit for lake trout and salmon is 2 fish– (2 lake trout, 2 salmon, or 1 of each).
Landlocked Salmon	Season: April 1 to September 30. 2 fish daily limit. Minimum length 15 inches. Daily bag limit for lake trout and salmon is 2 fish– (2 lake trout, 2 salmon, or 1 of each.)
Pickerel	No closed season. 10 fish daily limit; no length or weight limits.
Northern Pike	No closed season. 1 fish daily limit; minimum length 28 inches.
Walleye	No closed season. 2 fish daily limit; minimum length 18 inches; no limits on weight.
Yellow Perch, Horned Pout, Sunfish, Rock Bass	No closed season. No daily limits; no length or weight limits.
White perch, black crappie	No closed season. 25 fish daily limit; no length or weight limits.

IMPORTANT LAWS AND RULES

When in doubt about whether a fish you have caught is legal, play it safe and RELEASE THE FISH UNHARMED.

- **NEW RULE: Possession and Use of Live Fish for Bait: Only the following species shall be possessed and used as live fish for bait when fishing any freshwaters of the state:** rainbow smelt *(Osmerus mordax)*, longnose dace *(Rhinichthys cataractae)*, blacknose dace *(Rhinichthys atratulus)*, northern redbelly dace *(Phoxinus eos)*, lake chub *(Couesius plumbeus)*, creek chub *(Semotilius atromaculatus)*, fallfish *(Semotilius corporalis)*, golden shiner *(Notemigonus crysoleucas)*, common shiner *(Luxilus cornutus)*, emerald shiner *(Notropis atherinoides)*, bridle shiner *(Notropis bifrenatus)*, spottail shiner *(Notropis hudsonius)*, silvery minnow *(Hybognathus nuchalis)*, creek chubsucker *(Erimyzon oblongus)*, longnose sucker *(Catostomus catostomus)*, and white sucker *(Catostomus commersoni)*.
- Fishing tournaments on New Hampshire waters require a permit. Applications are taken on a first-come, first-served basis and are available from the New Hampshire Fish and Game Department.
- Shiners may be taken for personal use by licensed anglers with up to six traps not over 18 inches long each, with an opening not over one inch in diameter, or a circular drop net not over 48 inches in diameter; or a square net of equal area. Each trap must have the angler's name and address on it.
- Commercial harvesting of bait is permitted with a bait dealer's license and under specific rules. The license is available from the New Hampshire Fish and Game Department.
- Traps, nets, fish houses, holding boxes or other receptacles used to take, hold or to keep live bait in public waters must be marked with the name and address of the owner and user.
- Hooks used for bait from ice-in to March 31 must have only a single hook point. From April 1 to ice-in, 2 hooks for bait may be used. One must be a single hook point and the other must not exceed three hook points.
- Bob houses must be removed from public waters, public property or private property prior to April 1. Owner's name and address shall be plainly marked on the bob house.
- No more than 6 ice fishing devices per person shall be used to take fish while ice fishing, unless otherwise specified for a particular waterbody.

Violation of any fishing rule or regulation will result in the loss of the violator's license or privilege to fish in New Hampshire.

UNLAWFUL ACTIONS

- The sale of freshwater fish is prohibited.
- Snagging fish in freshwaters is prohibited. Any fish accidentally snagged must be immediately released to the water.
- No fish may be taken by use of a set line (as defined on page 11) in freshwater.
- Exceeding daily bag limits of fish is prohibited, whether taken from one or several water bodies.
- **No person shall have live fish in their possession when leaving the freshwaters of the state, except those species allowed to be possessed and used as live fish for bait or the person is participating in a permitted fishing tournament.**
- Release of fish in waters other than where caught is prohibited. Fish must be returned to the water where taken.
- Culling of fish, except during permitted bass tournaments, is prohibited.
- The water surrounding any dam containing a fishway is closed to fishing. (See Rivers and Streams with Special Rules on pages 42-53).
- The use of alewives, carp or goldfish as live bait while fishing is prohibited. The use of shad or whitefish as bait for cusk is prohibited.
- Importation of fish or their eggs, including bait fish, is prohibited without a special permit.
- Except as otherwise specifically permitted, it is unlawful to use or have in possession a set line, net, fishing otter, trawl, grapple, spear, jack, jack light, poisons, explosives or electrical device or any other device for killing or stunning fish.
- To counsel or aid another in violating a fishing rule is prohibited.
- **NEW RULE: The use of lead sinkers (1 ounce or less) and jigs (less than 1 inch along its longest axis) is prohibited in all freshwater, effective Jan. 1, 2005.**

Evaluation Criteria:

1) All fishing prohibited
2) Combination of restrictions
3) Gear restrictions (e.g. fly-fishing only)
4) Fishing prohibited in selected areas or certain usage of bait prohibited or restricted
5) No special restrictions; regulations follow general rules outlined by NH Fish and Game Department

Sources:

New Hampshire Fish and Game Department. 2005. *New Hampshire Freshwater Fishing Digest,* http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/FW_Fishing_Digest_05.pdf), 28 November 2005, pp 12-14, 30 and 38.

Assessment of Question: The question is adequate as stated

Date Completed: October, 2005

Investigator: Brian Valle

Attribute 6: Restrictions or Prohibited Uses

Category:

Question D: Waterbody is designated as a drinking water supply.

Directions: Consult *Administrative Rules Env – Ws 386, Protection of the Purity of Surface Water Supplies*, or with the assistance of NH DES staff, consult the NH DES One Stop web site Public Water Systems List.

Rationale: Lakes or ponds that serve as a current, emergency, for future drinking water supply have specific watershed restrictions. Enforcement and awareness of these restrictions can vary depending on the size of the waterbody and its proximity to population centers. As part of a management plan, identify the specific restrictions and the perceived level of compliance by the public. Once this is completed, it is important to prioritize protection methods and efforts.

Process Followed: In consulting the Administrative Rules Env-Ws 386, Protection of the Purity of Surface Water Supplies, Pleasant Lake was not listed. An e-mail was sent to the contact listed on the web site, Mr. Paul Susca. Also, the DES one stop web site was consulted and Ms. Laurie Cullerot from Water Supply Engineering Bureau replied to the e-mail request saying that Pleasant Lake has never been and currently is not a water body designated as a drinking water supply.

Findings and Analysis:
Pleasant Lake is not a designated drinking water source and it has not been one in the past.

Evaluation Criteria:

1) Waterbody does not serve as current, emergency, or future drinking water supply.
2) Waterbody currently serves as a drinking water supply or is designated as an emergency or future drinking water supply and has watershed rules in place.

Sources:

Susca, Paul. 2005. Personal Communication. Source Water Protection Coordinator: Drinking Water Source Assessment Program, New Hampshire Department of Environmental Services. [psusca@des.state.nh.us], November 2005.

Cullerot, Laurie. 2005. Personal Communication. Water Supply Engineering Bureau, New Hampshire Department of Environmental Services. 603 271-2954 [lcullerot@des.state.nh], November 2005.

Assessment of Question: The directions to the question advise referencing the NH DES One Stop web site Public Water Systems List, but this is a confusing website because it

gives no direct answers and it is difficult to navigate. Using a browser such as Google to search directly for the Env-Ws 386 Protection of the Purity of Surface Water Supplies rule is less complicated and more efficient. Also, it was necessary to contact DES staff to verify that the lake was not a drinking water source. This is because the list only shows the water bodies which are designated as drinking water sources and the ones that are being considered in the future for drinking water supplies.

Date Completed: November 2005

Investigator: Brian Valle

Attribute 6: Restrictions or Prohibited Uses

Category: Recreation

Question E: Power boat restrictions.

Directions: Consult the list of waterbodies with watercraft-specific restrictions in the *State of NH Restricted Bodies of Water* published by the NH Department of Safety – Division of Safety Services.

Rationale: The enactment of power boat restrictions or prohibitions can be effective in protecting surface water quality or sensitive aquatic and nearshore ecological communities. Power boats may also be prohibited or horsepower limited on specific waterbodies to retain its remote or wilderness characteristics and maintain public safety. However, it must be recognized that all types of watercrafts must be considered equally when developing recreational use policies.

Process Followed: Consulted the New Hampshire Department of Safety – Division of Safety Services web site to review the State of New Hampshire's *Restricted Bodies of Water* list.

Findings and Analysis: According to the list, there are no watercraft-specific restrictions for Pleasant Lake.

Evaluation Criteria:	**Score:**
1) No watercraft permitted	1
2) No motorized watercraft allowed (i.e.: petroleum or electric); sail or oar / paddle powered only	2
3) No petroleum powered watercraft permitted	3
4) Power watercraft permitted but with horsepower restrictions	4
5) No restrictions	5

Sources:

New Hampshire Department of Safety. 2005. *Restricted Bodies of Water, 2005 List, Updated June 14, 2005*. Division of Safety Services, Marine Patrol Bureau. http://www.nh.gov/safety/ss/bodies.html. November 30, 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005

Investigator: Brian Valle

Attribute 6: Restrictions or Prohibited Uses

Category: Recreation

Question F: Ski craft restrictions.

Directions: Consult the list of waterbodies with ski craft-specific restrictions in the *State of NH Restricted Bodies of Water* published by the NH Department of Safety – Division of Safety Services.

Rationale: Personal ski craft have dramatically increased in popularity within the past decade. As fast, mobile recreational vehicles, personal ski craft can potentially present a safety hazard if operated irresponsibly or in high densities. These concerns must, however, be balanced with the general public's recreational desires in addition to protecting water quality and the ecological community. Any restrictions to recreational surface water uses must reflect reasonable solutions capable of gaining wide public support. Per the State of NH, ski craft are defined as "any motorized watercraft or private boat which is less than thirteen feet in length as manufactured, is capable of exceeding a speed of twenty miles per hour, and has the capacity to carry not more than the operator and one other person while in operation". As defined, this does not pertain to similar ski craft that can carry 3 or more passengers. Finally, under RSA 270:74, the use of ski craft is prohibited on all public bodies in New Hampshire which are less than 75 acres in size.

Process Followed: Consulted the New Hampshire Department of Safety – Division of Safety Services web site to review the State of New Hampshire's *Restricted Bodies of Water* list.

Findings and Analysis: Ski crafts have been banned on Pleasant Lake since October 1, 1989.

Evaluation Criteria:	**Score:**
1) Personal ski craft prohibited on waterbody	1
2) Personal ski craft restricted to specific areas of the waterbody	3
3) No restrictions	5

Sources:

New Hampshire Department of Safety. 2005. *Restricted Bodies of Water, 2005 List, Updated June 14, 2005*. Division of Safety Services, Marine Patrol Bureau. http://www.nh.gov/safety/ss/bodies.html. November 30, 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: October, 2005

Investigator: Brian Valle

Attribute 6: Restrictions or Prohibited Uses

Category:

Question G: Lake surface areas with restrictions/limitations.

Directions: With assistance from DES Lakes Program staff, list any areas on the lake or pond where specific activities are restricted. In particular, identify any areas where non-native aquatic plants have become established. Developing a reference map showing the locations and restriction would be beneficial. You should also consider the size of the waterbody when assessing the number of restrictions.

Rationale: These areas are designed to protect against the spread of non-native aquatic plants, promote wildlife inhabitation, and limit specific boating activities.

Process Followed: Contacted Laura Alexander, member of the New London Conservation Commission and Kittie Wilson, member of the Pleasant Lake Protective Association.

Findings and Analysis: There are no specialized restrictions for Pleasant Lake. There are also no areas of non-native aquatic plants.

Evaluation Criteria:

1) No specialized restrictions (other than statewide regulations outlined in the New Hampshire Boater's Guide)
2) 1 – 2 restricted areas or activities
3) 3 – 4 restricted areas or activities
4) 5 – 6 restricted areas or activities
5) > 6 restricted areas or activities

Sources:

Alexander, Laura. 2005. Personal communication. New London Conservation Commission. November 30, 2005.
Wilson, Kittie. 2005. Personal communication. Pleasant Lake Protective Association. November 30, 2005.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: John Callewaert

Attribute 6: Restrictions or Prohibited Uses

Category:

Question H: Restricted activity times.

Directions: Consult the list of waterbodies with watercraft restrictions in the *State of NH Restricted Bodies of Water* as published by the NH Department of Safety and list any activities on the lake or pond that are restricted to certain times of the day.

Rationale: "Time zoning" represents one solution that might minimize conflict between user groups and increase the value of their experience. Further, in cases where wildlife disturbance may be of concern, reducing some surface water activities in specific areas may be beneficial to promoting their continued residence.

Process Followed: Consulted the New Hampshire Department of Safety – Division of Safety Services web site to review the State of New Hampshire's *Restricted Bodies of Water* list.

Findings and Analysis: There are no time related restricted activated for Pleasant Lake.

Evaluation Criteria:

1) No time restrictions
2) 1 time restriction
3) 2 or more restrictions

Sources:

New Hampshire Department of Safety. 2005. *Restricted Bodies of Water, 2005 List, Updated June 14, 2005*. Division of Safety Services, Marine Patrol Bureau. http://www.nh.gov/safety/ss/bodies.html. November 30, 2005.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: John Callewaert

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question A: Public drinking water supply.

Directions: Identify whether the lake serves as a "designated" public water supply, and if so, the approximate population that is served. Consult the NHDES One Stop Database Public Drinking Water Systems list for the towns surrounding the waterbody. Record the location of the intake on a map of the waterbody. Not that this does not include any waterbodies from which lakeside residents draw water directly from the lake into their home or cottage.

Rationale: Lakes or ponds that serve as a public water supply may need additional protection measures to ensure that it is not contaminated by unnatural activities. In many cases this amounts to a reduction in on-water recreation and close monitoring of shoreline activities. A management plan should identify areas that are deficient in their protection measure or where the current protection measures are loosely enforced.

Process Followed: Visited the New Hampshire Department of Environmental Service webpage to check the One Stop Database Public Drinking Water Systems List. Then confirmed that the lake does not serve as a public supply by talking to Kittie Wilson, member of the Pleasant Lake Protective Agency and New London resident.

Findings and Analysis: Pleasant Lake does not serve as a public water supply.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 – 1000 people served	2
3) 1001 – 5000 served	3
4) 5001 – 10,000 served	4
5) >10,000 served	5

Sources:

"NHDES One Stop Database Public Drinking Water Systems List." New Hampshire Department of Environmental Services. October 2005. http://www.des.state.nh.us/OneStop/Public_Water_Systems_Query.aspx

Wilson, Kittie. "Lake Inventory." E-mail to Carly Rademaker. 25 November 2005.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005
Investigator: Carly Rademaker

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question B: Historic features in or around the waterbody.

Directions: Consult the NH Division of Historic Preservation and/or local historic committee to identify any features that are recognized by a local/state/national historical commission which occur in or around the lake or pond.

Rationale: Registered landmarks or other similar types of attractions that have historical significance along the waterbody's shoreline, or even submerged structures, can attract interest from regular and occasional visitors. Further, they often serve as important gathering places for permanent residents. A management plan should consider their value and protection.

Process Followed:
Contacted Kittie Wilson of the Pleasant Lake Protective Agency. Kittie referred me to Debra Lamson Perkins whose family has a long history with Pleasant Lake.

Findings and Analysis: The only official historical sites around the lake are a set of three historical markers at spots around the shoreline. The markers were written by the New London's second town historian, J. Duane Squires. The first is located by the bandstand in Elkins and is titled "Early Industry". The second is on Bunker Road and titled "Primal Peoples," and the last is "Pleasant Street Pioneers" and can be found by the bridge near the strawberry fields near Great Brook. These markers were installed in the years leading up to New London's 200th birthday in 1979. Because these markers are considered to be a set they are considered one historical feature for the purpose of this inventory.

Evaluation Criteria:	**Score:**
1) None	1
2) 1 – 2 features	2
3) 3 – 4 features	3
4) 5 – 6 features	4
5) > 6 features	5

Sources:
Foot walk around Pleasant Lake. October 2005.
Perkins, Debra Lamson. "Lake Inventory." E-mail to Carly Rademaker. 30 Nov 2005.

Assessment of Question: This question is adequate as stated.
Date Completed: November 2005
Investigator: Carly Rademaker

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question C: Education facilities or sites.

Directions: Record the name(s) and location(s) of any educational facilities or sites that are specifically designed to educate the public about the lake or pond's characteristics.

Rationale: Educational facilities or sites will increase the public's awareness of the natural characteristics for the waterbody of interest. Public education is arguably the most important long-term component in facilitating wise land use and reducing the potential for negative impacts to water supply.

Process Followed: Contacted Kittie Wilson, Secretary of the Pleasant Lake Protective Association by e-mail.

Findings and Analysis: Ms. Wilson informed me that Pleasant Lake has no formal educational facilities or sites. The Pleasant Lake Protective Agency puts out a yearly newsletter to try and inform the community about things that happen around the lake but it is not include as specific area to educate the public.

Evaluation Criteria:	**Score:**
1) No formal educational facilities or sites	1
2) At least one outside trail or waterside area specifically designed to educate the public about the waterbody's natural characteristics	2
3) At least one facility with both outside and inside facilities designed to educate the public about the waterbody's natural characteristics	3

Sources:

Rademaker, Carly. "Education Facilities on Pleasant Lake." E-mail to Kittie Wilson. 29 Sep 2005.

Assessment of Question: Although specific educational sites are important to increase public awareness such things as newsletters and other forms of publication by organizations involved in the waterbody can serve the same educational purpose. It may be just as important to know about these types of education or information available to the public.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 7: Unique Characteristics

Category:

Question D: Research or scientific study.

Directions: Record the name(s) and affiliation(s) or any institution or organized groups such as universities, conservation groups or government organizations that conduct periodic or regular scientific investigations in or around the lake or pond. For example, specific types of studies commonly undertaken on lakes or ponds include long-term ecological research (i.e. >5 years of continuous study) or diagnostic feasibility studies (intensive studies of the lake ecosystem that usually last 1 or 2 years), periodic monitoring as part of a basin-wide research program. Consider past and ongoing studies. Do not include volunteer monitoring efforts (See Question E).

Rationale: Identifying if any periodic or regular scientific information is collected in or around the lake or pond could help establish a valuable partnership for information and protection efforts.

Process Followed: Contacted members of the Pleasant Lake Protective Agency.

- Kittie Wilson, Secretary
- Richard Clayton, President

Findings and Analysis: In 2004 the New Hampshire Fish and Game Department carried out an "electro-fishing" experiment on Pleasant Lake to see if such practices could be effective in controlling the rock bass population in New Hampshire's Lakes and Ponds. The only current study being conducted on the Lake is the Comprehensive Lake Inventory being undertaken by Colby-Sawyer College.

Sources:

Wilson, Kittie. "Lake Inventory." E-mail to Carly Rademaker. 12 Oct 2005.

Clayton, Richard. "Lake Inventory." E-mail to Carly Rademaker. 13 Oct 2005.

Assessment of Question: Although periodic or regular scientific studies or information is collected one-time studies may also provide valuable and unique information about the waterbody. Therefore such studies should be included in this question.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question E: Participant in VLAP, LLMP, or an alternative volunteer monitoring program.

Directions: Identify if the lake is a part of either DES's VLAP (Volunteer Lake Assessment Program) or UNH's LLMP (Lap Lake Management Program) by contacting the NH Department of Environmental Services Watershed Management Bureau or the University of New Hampshire Cooperative Extension. Include any type of regular volunteer monitoring efforts.

Rationale: Identifying in the lake undergoes regular volunteer assessment could help establish an information sharing partnership and potential participants for the management plan group. Volunteer monitoring assessment groups have become a valuable took to simultaneously gather basic information about various lake wide characteristics and raising the awareness of a waterbody as a community resource.

Process Followed:
Contacted members of the Pleasant Lake Protective Agency.

- Kittie Wilson, Secretary
- Richard Clayton, President

Also contacted the VLAP Coordinator Andrea M. LaMoreaux.

Findings and Analysis: Pleasant Lake is involved in several volunteer monitoring programs. The most significant is that is a part of the New Hampshire Volunteer Lake Assessment Program (VLAP) run by the DES. Pleasant Lake has been a member of this program since 1996. Previous to that year the lake was monitored my members of the Pleasant Lake Protective Association, established in 1969.

The New Hampshire Lakes Association (NHLA) also manages the Lake Host Program which Pleasant Lake participates in. The NH DES provides funding to hire lake hosts; Pleasant Lake has two hosts. The PLPA applies for this money and manages the week-to-week management of the lake hosts.

The PLPA also partakes in the Weed Watch Program sponsored by the DES. This program takes place yearly; volunteers swim or kayak the perimeter of Pleasant Lake and look for unusual week growth including invasive or exotic species.

PLPA members are involved in a yearly loon-census organized by the Loon Preservation Committee.

It is obvious that the PLPA is responsible for most of Pleasant Lake's volunteer efforts and is involved in many different programs. All of which are valuable tools for raising awareness about the waterbody and tools for future management planning.

Evaluation Criteria:	**Score:**
1) Not a participant in a volunteer monitoring program	1
2) Volunteer monitoring program participant for <1 year	2
3) Volunteer monitoring program participant for at least 1 year	3
4) Volunteer monitoring program participant for at least 5 years	4
5) Volunteer monitoring program participant for at least 10 years	5

Sources:

Clayton, Richard. "Lake Inventory." E-mail to Carly Rademaker. 13 Oct 2005.

LaMoreaux, Andrea. "Lake Inventory." E-mail to Carly Rademaker. 18 Oct 2005.

Wilson, Kittie. "Lake Inventory." E-mail to Carly Rademaker. 12 Oct 2005.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question A: Shoreland development and land use.

Directions: Construct a map indicating the location and approximate amount of forested, wetland, active agricultural, clear / open, and urban land use types, within 250 feet of the high water mark around the entire waterbody. Town planning or assessing departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: Identifying the percentage of each of these land use types within the shoreland area will help in the development of general and targeted nonpoint source pollution prevention strategies. In cases where nonpoint source pollution is of a lesser concern, knowing the types of each of these land uses will assist in efforts to create public awareness of potential pollutant sources.

Process Followed: Created a land use map using data obtained from New Hampshire GRANIT. The shoreline was buffered by 250 feet to represent the shoreline zone boundary. The type of land use within this boundary was then calculated into percentages based on the total area of the shoreland zone.

Findings and Analysis: The shoreland of Pleasant Lake has remained fairly undeveloped. A small percentage of the undeveloped land is conserved land so the ratio of developed to undeveloped shoreland may change in the future.

Forested: 59.3%
Wetlands: 4.3%

Active Agricultural: 3.3%
Clear/Open: 5.1%
Urban Land Use: 28.0%
Total Percent Developed: 36.4%

*Total Percent Developed is a total of Active Agriculture, Clear/Open, and Urban Land Use percent.

Evaluation Criteria:		**Score:**
	Developed : Undeveloped	
1)	< 10% : > 90%	1
2)	10 – 25% : 75 – 90%	2
3)	26 – 50% : 50 – 74%	3
4)	51 – 75% : 25 – 49 %	4
5)	> 75% : < 25%	5

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

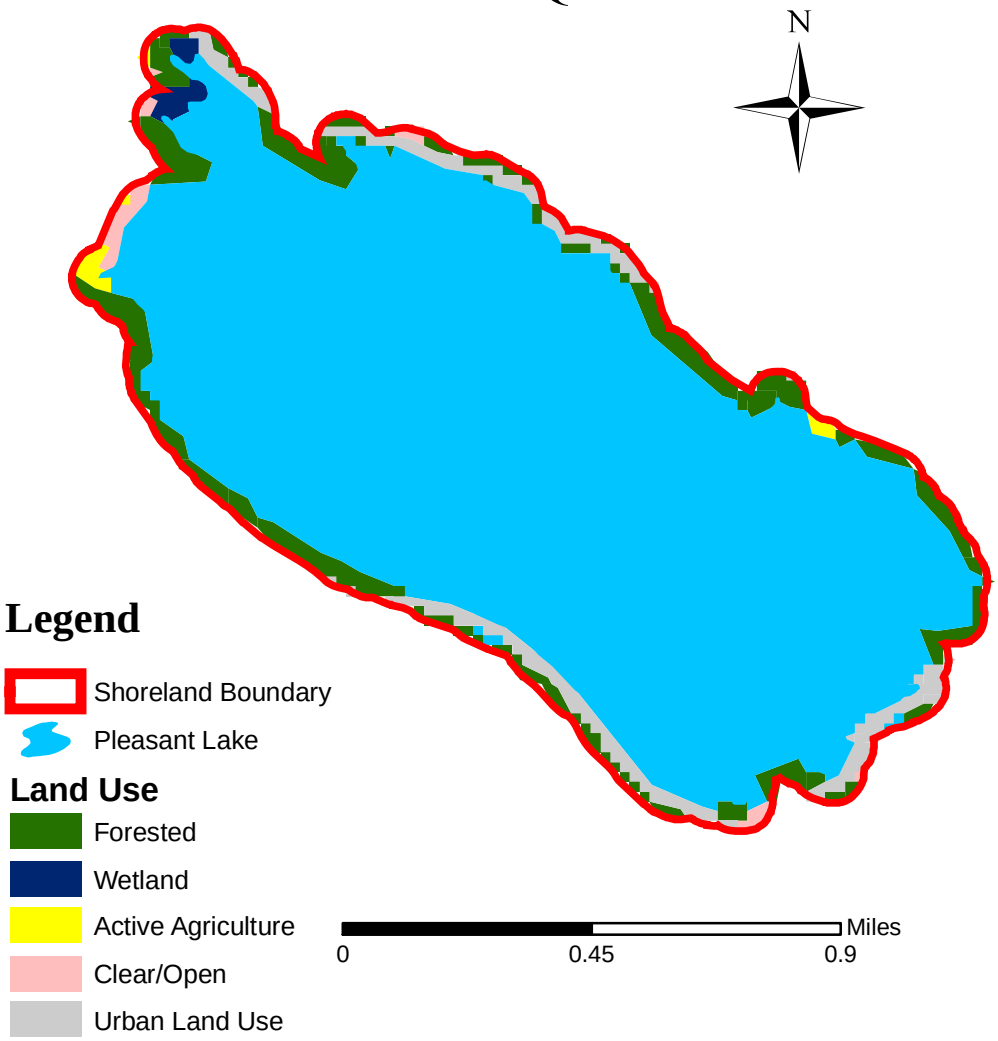
Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Shoreland Development and Land Use

Attribute 8: Question A



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Attribute 8: Shoreland Characteristics

Category:

Question B: Shoreland ownership

Directions: Develop a map showing land ownership (public or private) within 250 feet of the high water mark. Calculate the percentage of each ownership type. Town planning or assessing departments, as well as regional planning commission may be able to offer assistance in generating a land use map of the lake shoreland.

Rationale: Shoreland held in private ownership provides some indication of where residential and commercial development is located. Defining these areas is useful for planning pollution prevention outreach strategies and programs. Identifying publicly held shoreland assists in assessing current and potential future public access points. Shoreland owned by the public can present nonpoint source pollution concerns, particularly in the case of community swimming facilities. In such cases, the pollution prevention strategies will differ from those employed for private landowners.

Process Followed: Map representing the results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. Specifically, hydrology data was used to pinpoint Pleasant Lake and construct a 250 ft. buffer around the lake to isolate the shoreland. Digital tax parcel data layer was clipped to the shoreland buffer. Tax maps located in the Town Offices of New London were used to find parcel number and total acreage. Jessie Levine, Town Administrator for the Town of New London was contacted in regards to one parcel of land to ensure the information represented was correct.

Findings and Analysis: The majority of the shoreland on Pleasant Lake is privately owned. The Town of New London owns five parcels of land in the shoreland area, including the Elkins Beach (077-012-000), Blueberry Island (050-020-000), a dam structure (077-016-000), a right of way to Pleasant Lake (077-014-000), and a piece of land near the dam structure (077-030-000). The Webb Forest (036-010-000) is a parcel of conserved land with open access to the public.

Public (acres)	4.49
Private (acres)	160.51
Shoreland (acres)	165
Formula	x/shoreland=Y*100
Public	2.72
Private	97.28

Public Land: 2.72%
Private Land: 97.28%

Evaluation Criteria:

1) All private; no public land
2) All public; no private land
3) Mix of public and private land

Sources:

Levine, Jessie W. Town Administrator. Town of New London. jessielevine@verizon.net.
Tax Maps. New London Town Offices. 375 Main Street. New London, NH 03257. Town Clerk/Tax Collector Office Phone 603-526-4821.
"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

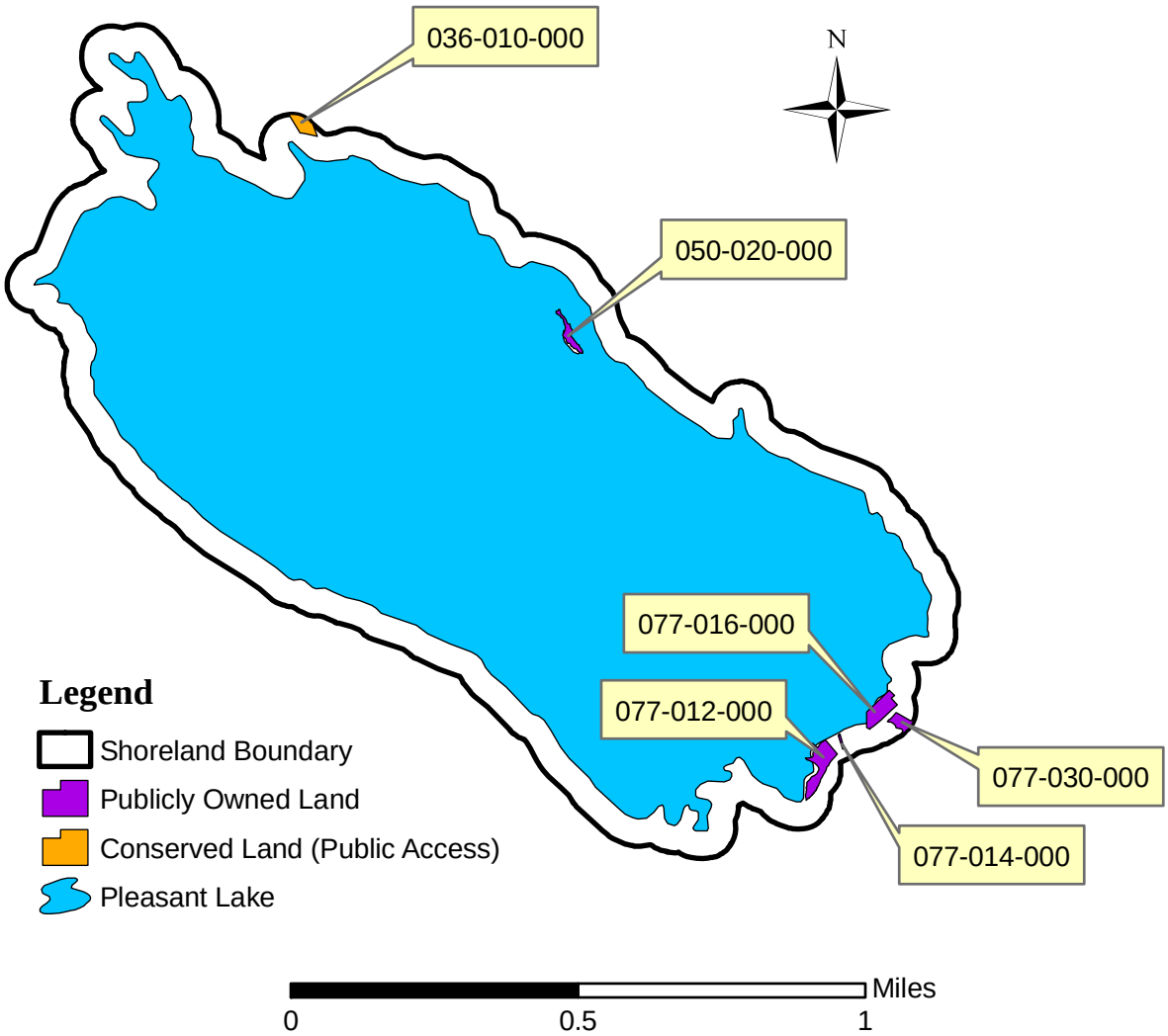
Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Shoreland Ownership

Attribute 8: Question B



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Attribute 8: Shoreland Characteristics

Category: Unique or Outstanding Value

Question C: Protected land or land not available for development within the shoreland area.

Directions: Using a land use map or the GRANIT *Conservation Lands Viewer*, identify all land that is protected from future development within the shoreland area including state owned conservation properties, town owned conservation properties, private conservation organization properties, and conservation easements. An estimate should identify the amount of lake frontage (feet) and shoreland area (acres). The *New Hampshire Lakes and Ponds Inventory* may help to identify shoreline length. Note who owns the land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland use and the associated levels of nonpoint source pollution that a lake or pond receives. By identifying who owns the lands you recognize potential partnerships for future lake management.

Process Followed: Obtained the Conserved Lands data layer from NH GRANIT website to look at conserved lands in the shoreland. Then created a map of conserved lands in the shoreland using ArcGIS.

Findings and Analysis:

Conservation Name	**Ownership**	**Lake Frontage (feet)**	**Shoreland Acreage (acres)**
Webb		0	0.7
Sargent	Ausbon Sargent Land Trust	0	0.9
Judith M. Oates Easement		1,204	4.5
	Total Protected Lake Frontage	**1,204**	**6.1**
	Total Percentage	**5.1%**	**3.7%**

Total lake frontage: 23622.1 feet
Total shoreland: 164.8 acres

Evaluation Criteria:	**Score:**
As percent of total shoreland frontage:	
1) 0%	1
2) 1 – 10%	2
3) 11 – 25%	3
4) 26 – 50%	4
5) > 50%	5

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

Colby-Sawyer College
Institute for Community & Environment
541 Main Street
New London, NH 03257
(603) 526-3444

Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question C: Protected land or land not available for development within the shoreland area.

Directions: Using a land use map or the GRANIT *Conservation Lands Viewer*, identify all land that is protected from future development within the shoreland area including state owned conservation properties, town owned conservation properties, private conservation organization properties, and conservation easements. An estimate should identify the amount of lake frontage (feet) and shoreland area (acres). The *New Hampshire Lakes and Ponds Inventory* may help to identify shoreline length. Note who owns the land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland use and the associated levels of nonpoint source pollution that a lake or pond receives. By identifying who owns the lands you recognize potential partnerships for future lake management.

Process Followed: Obtained the Conserved Lands data layer from NH GRANIT website to look at conserved lands in the shoreland. Then created a map of conserved lands in the shoreland using ArcGIS.

Findings and Analysis:

Conservation Name	**Ownership**	**Lake Frontage (feet)**	**Shoreland Acreage (acres)**
Webb		0	0.7
Sargent	Ausbon Sargent Land Trust	0	0.9
Judith M. Oates Easement		1,204	4.5
	Total Protected Lake Frontage	**1,204**	**6.1**
	Total Percentage	**5.1%**	**3.7%**

Total lake frontage: 23622.1 feet
Total shoreland: 164.8 acres

Evaluation Criteria:	**Score:**
As percent of total shoreland frontage:	
1) 0%	5
2) 1 – 10%	4
3) 11 – 25%	3
4) 26 – 50%	2
5) > 50%	1

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Carly Rademaker

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Attribute 8: Shoreland Characteristics

Category:

Question D: Percent of impervious surface in the shoreland

Directions: Contact the DES Lakes Program staff for assistance with constructing a map that indicates the amount of impervious surface (i.e. roadways, rooftops, driveways, parking lots) within the shoreland area.

Rationale: The amount of impervious area is important in determining stormwater runoff quantity and quality. Shoreland areas that provide little area for stormwater infiltration (i.e. high percentage of impervious surfaces) into the soil will convey high quantities of stormwater runoff into surface waters. Impervious surfaces can also compromise water quality by transferring oils, greases, heavy metals, and excess nutrients from pavement and rooftops to nearby tributaries and drainage ditches. Stormwater retention facilities and vegetated buffer strips can be effective mitigation measures for controlling stormwater quantity and quality. A management plan should identify the percentage of impervious surfaces in need of stormwater control mechanisms within the shoreland boundaries.

Process Followed: Impervious surface calculations were completed using Geographic Information Systems (GIS) data and field work. GIS data layers constructed by Cartographic Associates, including building footprint, driveway, and roadway layers were used. Windshield surveys were employed primarily to ground-truth the data layers created by Cartographic Associates. While conducting the windshield surveys, width measurements were taken of numerous driveways and roadways to create average widths.

Any building structure, roadway, driveway, or parking lot that was missing from Cartographic Associate data, due to new features constructed after Cartographic Associates completed their data, were digitized into their respective layers. Driveway and roadway layers consist of spatially referenced linear data, and do not take into consideration width; therefore, the area they take up in the real world cannot be accounted for. The average widths calculated from the windshield survey measurements was then used in GIS to create buffers that represent the width of the roads and driveways in real life. Driveways were assigned a ten foot width, while roadways received a twenty-two foot width. Once buffers were applied to driveways and roadways, the acreage of driveways, roadways, and building footprints could be calculated.

Findings and Analysis: Refer to the following page for a table and map of results.

	Acres
Building Footprints	5.39
Roadways	15.98
Driveways	7.7
Parking Lots	0.1
Shoreland	164.8
Percent Impervious	17.70%

Evaluation Criteria:

1) >25%
2) 16 – 25%
3) 5 – 15%
4) 1 – 5%
5) No impervious shoreland within 250' of the highwater mark

Sources:

Cartographic Associates, Inc. Littleton, New Hampshire. www.cai-info.com. Data updated to April 1, 2005.

"Welcome to NH Granit." 14 Oct. 2005 <http://www.granit.sr.unh.edu>

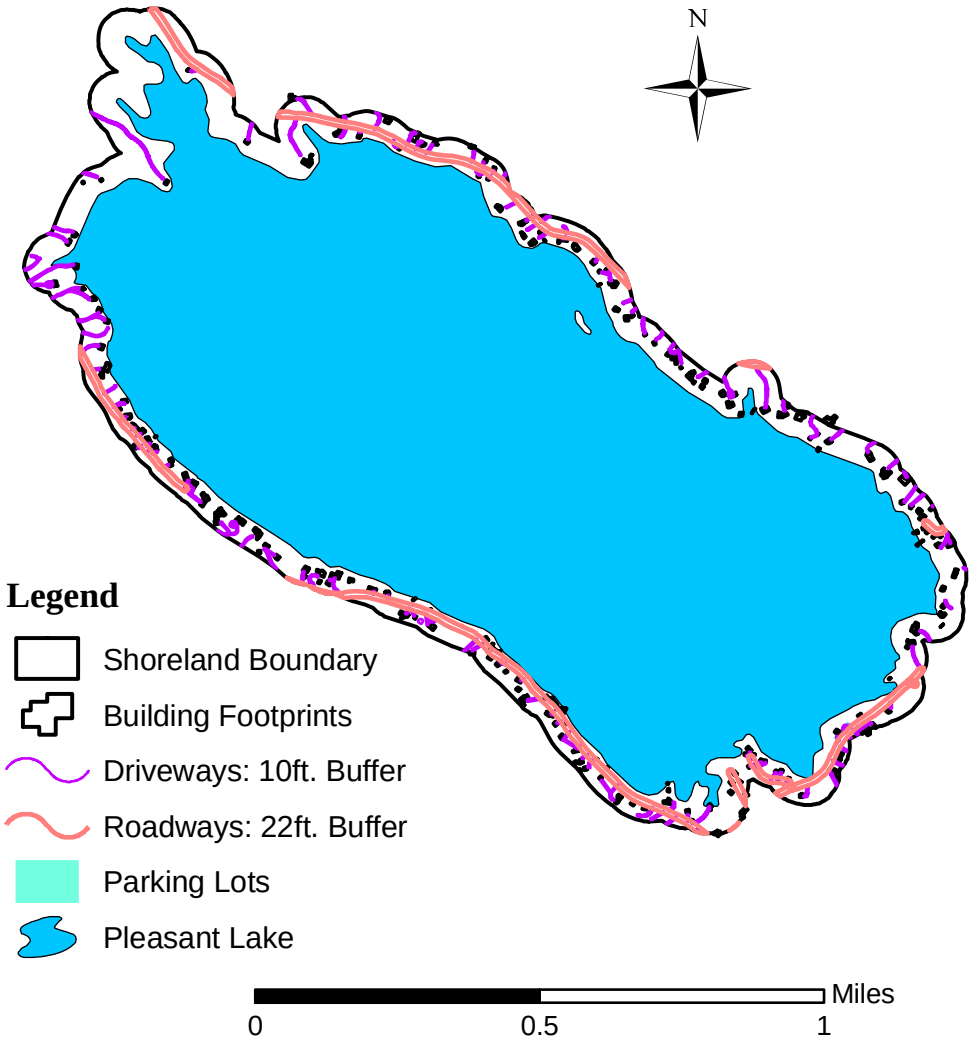
Assessment of Question: I believe that it is critical for the NH DES Watershed Management Program to adopt standardized methodologies for completing the impervious surface question presented in the Comprehensive Lake Inventory. Impervious Surfaces can be defined quite broadly, which could create problems for some inexperienced groups attempting to answer this question for their particular waterbody. Furthermore, even groups with some knowledge of impervious surfaces and the way they react can approach this question from many different angles. Furthermore, groups that do not possess geographic information systems need a standardized way of completing this program in an effective and efficient way.

Date Completed: March 2006

Investigator: Steven Hash

Impervious Surfaces: Shoreland

Attribute 8: Question D



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Attribute 8: Shoreland Characteristics

Category:

Question E: Permanent or seasonal water dependant structures

Directions: Using the shoreline structure survey instructions located in Appendix B, estimate the density (number / 1,000 feet) of water dependent structures (e.g. docks, boathouses, breakwaters) on the lake or pond. Be sure to exclude marinas and other similar types of commercial docking facilities from the count.

Rationale: The density of water dependent structures is useful for assessing the waterbody's popularity. It may also assist in future use assessments to determine if their prevalence has increased or decreased. Encroachment on or alteration of the natural shoreline may negatively impact the littoral zone biological community. For example, a fully developed shoreline may modify the natural sediment characteristics of the littoral zone in turn interfering with fish spawning habitat.

Process Followed: Information collected over the summer of 2005 by Kittie and John Wilson, members of the Pleasant Lake Protective Association, was received October 28, 2005 and later used in the calculations provided in Appendix B to determine the density of water dependant structures.

Findings and Analysis: Refer to the following page for quantitative data and results. In order to determine the density of water dependant structures along the shoreline, the length of the shoreline in feet was needed. To calculate this value, data from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. Specifically, hydrology data was used to pinpoint Pleasant Lake polygon. This polygon was then converted into a polyline; using the XTools extension in ArcGIS, length of the shoreline in feet was calculated.

Evaluation Criteria:

1) >10 structures / 1,000 feet of shoreline
2) 7 – 9 structures / 1,000 feet of shoreline
3) 4 – 6 structures / 1,000 feet of shoreline
4) 1 – 3 structures / 1,000 feet of shoreline
5) No boathouses, docks, or breakwaters; continuous natural shoreline

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

Wilson, John and Kittie Wilson. Pleasant Lake Protective Association. (603) 526-4069. 9-29-2005.

Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Shoreline Structure Survey
September 2005-Plesant Lake Protective Association

Shoreline Structures	**Total**
Seasonal Docks	72
Permanent Docks	25
Boathouses	2
Breakwaters	19
Retaining Walls/Rip Rap	72
Other	0

- To find the number of shoreline structures per 1,000 feet of shoreline:
  A. Add the total number of shoreline structures (docks, boathouses, breakwaters, and retaining walls).
  B. Divide the number of structures by the shoreline length (in feet).
  C. After determining the number of structures per foot, multiply this number by 1,000.

A. 72+25+2+19+72=190
B. 190/29,868 ft.=0.0064
C. 0.0064*1,000=6.4 structures/1000 feet

Attribute 8: Shoreland Characteristics

Category:

Question F: Shoreland topography

Directions: Contact the DES Lakes Program staff for assistance with identifying all shoreland areas with a slope >15%.

Rationale: The topography, or slope, of the shoreland draining into the lake or pond is an important natural characteristic controlling the rate and amount of direct stormwater that it receives. A waterbody that has a steeply sloped shoreland will convey stormwater more quickly than a waterbody with relatively level shoreland. As a result, stormwater runoff for lakes and ponds that have a steep shoreland grade will have a lower chance of infiltrating the soil, limiting the potential for natural pollutant retention.

Process Followed: Map representing the results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. Specifically, hydrology data was used to pinpoint Pleasant Lake and construct a 250 ft. buffer around the lake to isolate the shoreland. Digital Elevation Models were then manipulated in the program to calculate the slope. The Digital Elevation Models were then clipped to the 250 ft. buffer to isolate the slope of the shoreland area.

Findings and Analysis: After completing the necessary data manipulation in ArcGIS 9.1, it was determined that the shoreland area was relatively flat, with over 91% of the slope falling between 1 and 8%. Only 6.75% of the shoreland area can be said to have a slope of 15 or greater. While this result seems insignificant, the presence of even this miniscule amount should be noted. So while this result really does not correspond to any of the Evaluation Criteria, it was categorized under 1-25% of the shoreland area having slope in excess of 15%.

Evaluation Criteria:

1) >75% of the shoreland area has a slope in excess of 15%
2) 51-75% of the shoreland area has a slope in excess of 15%
3) 26-50% of the shoreland area has a slope in excess of 15%
4) 1-25% of the shoreland area has a slope in excess of 15%
5) None of the shoreland area has a slope in excess of 15%

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

Assessment of Question: This question could use a little clarification and reinforcement as to why steep slopes are so important. Furthermore, some mention of ArcGIS should be

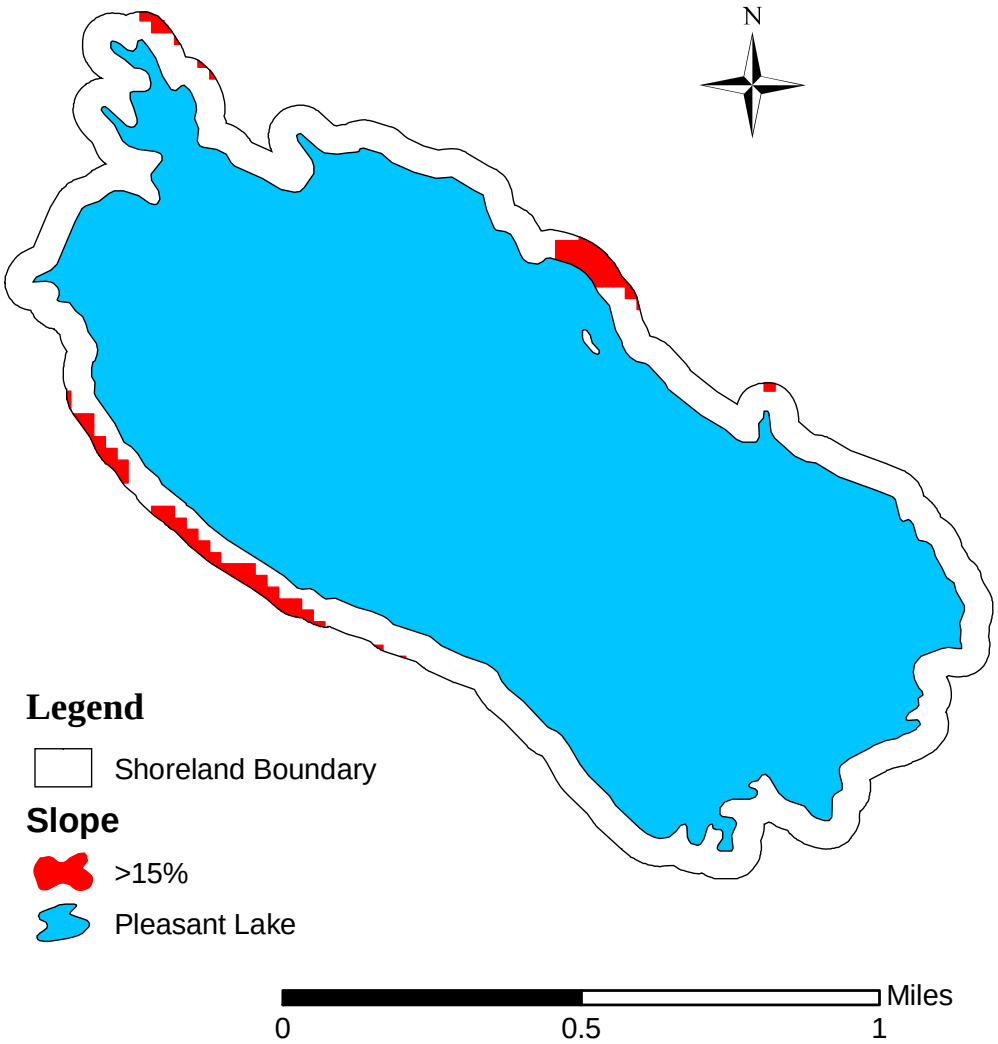
made for individuals who may not be familiar with the program, but would maybe like to explore that avenue to complete this question.

Date Completed: October 2005

Investigator: Steven Hash

Shoreland Topography

Attribute 8: Question F



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Attribute 8: Shoreland Characteristics

Category:

Question G: Shoreland geology and soils

Directions: Consult the DES Lakes Program staff for assistance with identifying the percentages of bedrock and hydric soils in the shoreland area.

Rationale: The geology and soils of the shoreland area are important characteristics to inventory because they dictate what type and where development can and should occur. For example, if bedrock were present it would be difficult or cost prohibitive to excavate a foundation for a home. Along the same lines, if wetland soils are present, then septic system placement should be prohibited.

Process Followed: Map representing results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. Specifically, hydrology data was used to pinpoint Pleasant Lake and construct a 250 ft. buffer around the lake to isolate the shoreland. Soil data was brought into the program and clipped to the 250 ft. shoreland buffer, and later manipulated to specifically show hydric soils and bedrock.

Findings and Analysis:

Hydric Soil Types
Lyme and Moosilauke soils; 3-8 % slopes
Chocorua mucky peat
Pillsbury fine sandy loam; 3-8% slope, very stony

Hydric Soils (acres)	22.9
Bedrock (acres)	22.8
Shoreland (acres)	165

Formula	X/165=Y*100
Hydric	22.9/165*100=13.8%
Bedrock	22.8/165*100=13.8%

Evaluation Criteria:

1) 0%; all shoreland soils are suitable for development
2) <10%
3) 11-25%
4) 26-50%
5) >50%

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

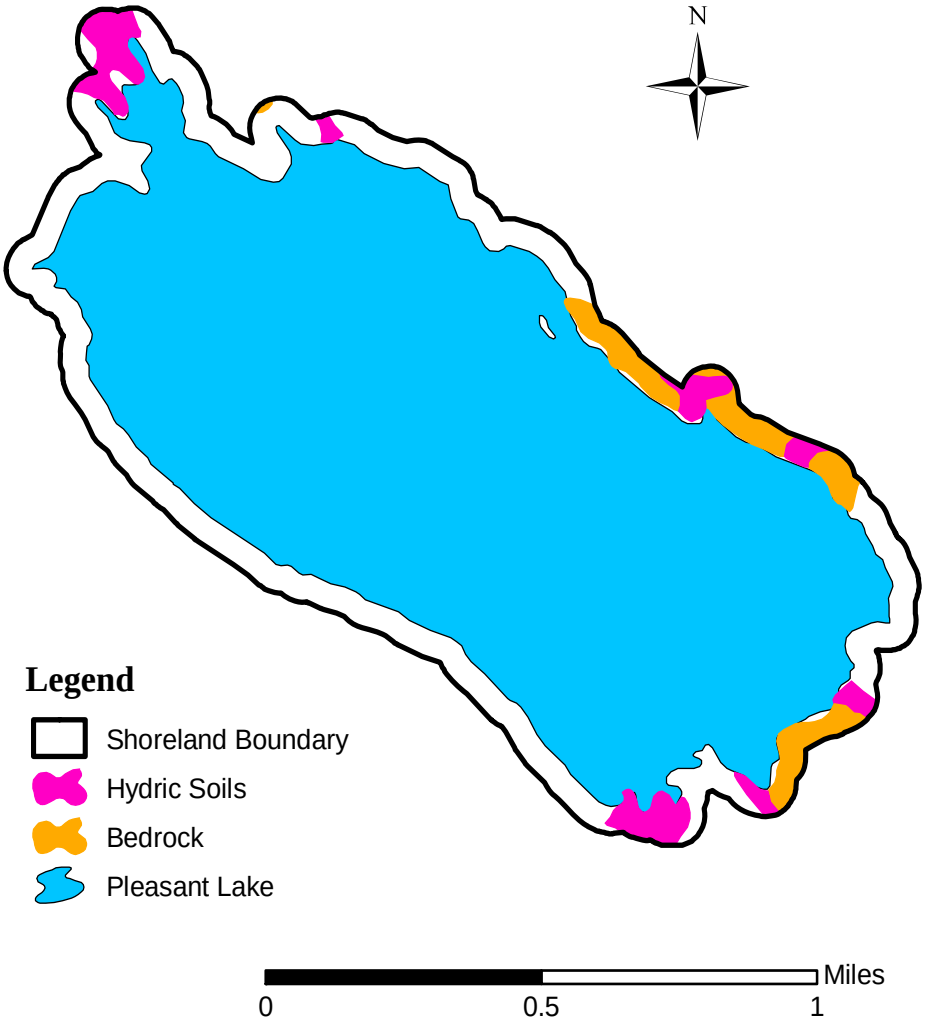
Assessment of Question: It is important to note that this data cannot be used for site specific analysis as the data is at too large of a scale for this type of manipulation. It is important to emphasize the ecological/biological importance of the soils that can be found around the shoreland, and not solely emphasize the developmental implications. Furthermore, current technologies can work around wetlands and bedrock to develop on both. Most states only require the creation of a wetland in as alternative location if one is destroyed for a development. Also, blasting through bedrock with explosives is a common practice among contractors, making development on bedrock possible.

Date Completed: October 2005

Investigator: Steven Hash

Shoreland Geology and Soils

Attribute 8: Question G



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Attribute 8: Shoreland Characteristics

Category: Outstanding or Unique Value

Question H: Local land use regulatory measures

Directions: Review the regulatory measures for land use and development for each of the municipalities within the shoreland area to determine if there are any ordinances designed to protect the natural waterbody characteristics.

Rationale: Reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures already in place to protect surface water quality. This process will identify certain land use practices or activities that are of particular concern so that the surrounding communities can address them in the future.

Process Followed: Retrieved the zoning ordinance publication from the Town of New London website. The Town of New London's ordinances were reviewed and compared against statewide regulatory measures.

Findings and Analysis: New London's ordinances pertaining to shoreland development are as follows, which are as stated in the Town of New London's Zoning Ordinances, Article XVI: Shoreland Overlay District, Section C: Permitted Uses:

1. Docks and Boathouses constructed entirely over a body of water are permitted subject to required state permits and standards.
2. Single Family Residence and accessory Structures and Uses provided that all Buildings and Structures shall be set back a minimum of 50 feet from the Normal High Water level and constructed in accordance with the erosion control requirements of Section F.
No construction or land disturbance whatsoever will be permitted within the vegetative buffer 50 feet from Normal High Water, except as provided in Section C.4., D.2. and F.2. e. below. Unless special construction practices ensure that no land disturbance will occur in the 50 foot vegetative buffer as a result construction activities, all Structures must be set back a minimum of 10 feet from the 50 foot vegetative buffer to accommodate land disturbance resulting from such activities.
3. Sub-surface sewage disposal facilities provided that they shall be set back in accordance with state requirements.
4. Stairways and walkways with a maximum width of 4 feet are permitted within the first 50 feet from Normal High Water provided adequate soil erosion control measures are implemented as outlined in Section F.
5. Replenishment of existing Beaches as provided in D.2. below.
Construction of a new Beach or expansion of an existing Beach is not permitted.
Replenishment of an existing Beach is permitted only under the following conditions:

a. no more than 6 cubic yards of replenishment material is permitted to be added in any 6 year period; and

b. approval is obtained from the NH Department of Environmental Services for a Minimum Impact Expedited Wetlands Permit Application after review and comment by the New London Conservation Commission.

Evaluation Criteria:	**Score:**
1) No municipality has an ordinance	
a. specifically to protect the lake or pond;	1
b. only state and federal standards apply	
2) At least 1 municipality has 1	
a. ordinance to protect the lake or pond	2
3) Two municipalities have at least 1	
a. ordinance to protect the waterbody OR 1	
b. municipality has 2 ordinances to protect	3
c. the lake or pond	
4) Three or more municipalities have at	
a. least 1 ordinance OR 1 municipality has 3	4
b. or more ordinances	
5) Each of the municipalities has numerous	
a. (2 or more) ordinances to protect the lake	5
b. or pond	

Sources:

Town of New London. Zoning Ordinance. New London: Town of New London, 2001. (http://www.nl-nh.com/05zoningord.pdf)

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Steven Hash

Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question H: Local land use regulatory measures

Directions: Review the regulatory measures for land use and development for each of the municipalities within the shoreland area to determine if there are any ordinances designed to protect the natural waterbody characteristics.

Rationale: Reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures already in place to protect surface water quality. This process will identify certain land use practices or activities that are of particular concern so that the surrounding communities can address them in the future.

Process Followed: Retrieved the zoning ordinance publication from the Town of New London website. The Town of New London's ordinances were reviewed and compared against statewide regulatory measures.

Findings and Analysis: New London's ordinances pertaining to shoreland development are as follows, which are as stated in the Town of New London's Zoning Ordinances, Article XVI: Shoreland Overlay District, Section C: Permitted Uses:

1. Docks and Boathouses constructed entirely over a body of water are permitted subject to required state permits and standards.
2. Single Family Residence and accessory Structures and Uses provided that all Buildings and Structures shall be set back a minimum of 50 feet from the Normal High Water level and constructed in accordance with the erosion control requirements of Section F.
No construction or land disturbance whatsoever will be permitted within the vegetative buffer 50 feet from Normal High Water, except as provided in Section C.4., D.2. and F.2. e. below. Unless special construction practices ensure that no land disturbance will occur in the 50 foot vegetative buffer as a result construction activities, all Structures must be set back a minimum of 10 feet from the 50 foot vegetative buffer to accommodate land disturbance resulting from such activities.
3. Sub-surface sewage disposal facilities provided that they shall be set back in accordance with state requirements.
4. Stairways and walkways with a maximum width of 4 feet are permitted within the first 50 feet from Normal High Water provided adequate soil erosion control measures are implemented as outlined in Section F.
5. Replenishment of existing Beaches as provided in D.2. below.
Construction of a new Beach or expansion of an existing Beach is not permitted.
Replenishment of an existing Beach is permitted only under the following conditions:

a. no more than 6 cubic yards of replenishment material is permitted to be added in any 6 year period; and

b. approval is obtained from the NH Department of Environmental Services for a Minimum Impact Expedited Wetlands Permit Application after review and comment by the New London Conservation Commission.

Evaluation Criteria:	**Score:**
1) No municipality has an ordinance	
a. specifically to protect the lake or pond;	5
b. only state and federal standards apply	
2) At least 1 municipality has 1	
a. ordinance to protect the lake or pond	4
3) Two municipalities have at least 1	
a. ordinance to protect the waterbody OR 1	
b. municipality has 2 ordinances to protect	3
c. the lake or pond	
4) Three or more municipalities have at	
a. least 1 ordinance OR 1 municipality has 3	2
b. or more ordinances	
5) Each of the municipalities has numerous	
a. (2 or more) ordinances to protect the lake	1
b. or pond	

Sources:

Town of New London. Zoning Ordinance. New London: Town of New London, 2001. (http://www.nl-nh.com/05zoningord.pdf)

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Steven Hash

Attribute 8: Shoreland Characteristics

Category:

Question I: Rate of shoreland development

Directions: Consult town planning boards, town Master Plans, regional planning commissions, or the NH Office of State Planning to obtain an estimate of the rate of development within the most recent 10 year period and within the shoreland area. Note whether the estimate is based upon acre or building permits/year.

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

Process Followed: Due to restrictions in the necessary data for calculating the rate of development for the Pleasant Lake watershed/shoreland, the calculation needed to be applied at the town, county, and state level. Working with the best available information, the rate of development for the Town of New London, Merrimack County, and New Hampshire were calculated using population data from the New Hampshire Office of Energy & Planning (OEP), which was manipulated to show the percent increase in population from 1990 to 2004. Data pertaining to 1990 and 2000 were from the United States Census Bureau, while the 2004 data were estimates calculated by the OEP. Furthermore, percent increase of new housing structures was also used in determining the rate of development for the Town of New London, Merrimack County, and New Hampshire. Information from the United States Census Bureau concerning total housing units was manipulated to complete these calculations. On the town level, the Census Bureau only had information regarding total housing units for the year of 2000. Information on the county level was found for 1990 and 2000. On the state level, information was found for 1990, 2000, and 2004. Therefore, a 10 year comparison was completed for Merrimack County, and a 14 year comparison was completed for the state of New Hampshire. In order to complete any sort of comparison on the town level, Peter Stanley, the Town of New London Zoning Administrator, was contacted to retrieve any information regarding the number of housing permits issued for as many years as his facilities held records. Mr. Stanley had information on housing permits issued for new housing developments from 2000 to 2005. This information was used in completing a 5 year comparison for the Town of New London.

While there was no information concerning number of housing units on the watershed level, the calculation was completed using a variety of sources other than the OEP and Census Bureau. Geographic Information Systems (GIS) were used to find how many housing structures were in the watershed, based off data layers constructed by Cartographic Associates, Inc. Peter Stanley, the Zoning Administrator for the Town of New London was then contacted to determine how many permits were issues for new housing structures in the past four years. These numbers were then used along with the

data derived from GIS to calculate the percent increase in housing structures from 2001 to 2005 in the immediate Pleasant Lake Watershed.

Findings and Analysis:

	1990			2004	
	Population	**Housing Units**		**Population**	**Housing Units**
New Hampshire	1,109,117	503,904		1,306,000	575,671
Merrimack County	120,005	50,870		145,085	56,224 (2000)
New London	3,180	2,085 (2000)		4,435	2,225

On the state level, calculating the 14 year percent increase in population for the state of New Hampshire was completed as follows:

[(population 2004 - population 1990) / population 1990] x 100
-Or-
[(1,306,000 - 1,109,117) / 1,109,117] x 100 = 17.75% Increase in Population

One the state level, calculating the 14 year percent increase in total housing structures was completed as follows:

[(housing 2004 - housing 1990) / housing 1990] x 100
-Or-
[(575,671 - 503,904) / 503,904] x 100 = 14.24% Increase in Housing

The remaining percent increases were calculated using the same logic as the previous examples. The results can be found in the following table:

	% Change: Population	% Change: Housing Structures
New London	39.47% (1990-2004)	6.71% (2001-2005)
Merrimack County	20.90% (1990-2004)	10.56% (1990-2000)
Pleasant Lake Watershed	N/A	2.99% (2001-2005)

Evaluation Criteria:

1) >25% / year
2) 15 – 25% / year
3) 7 – 15% / year
4) 0 – 7% / year
5) None within the past 5 years

Disclaimer: The group "0 – 7%" was chosen based off the rate of development for the Town of New London alone. The rate of development for the Town of New London was based solely on the percent change of housing structures from the years 2001 through 2005, and primary houses were the only structures used in the calculation. While this information is accurate and reliable, it would benefit interested parties to look at the percent change of population over the fourteen year period indicated in the preceding table. As the reader can see, the percent change of population for New London in the fourteen year period was quite high, and was significantly higher than the whole of New Hampshire and Merrimack County. Furthermore, instead of using the rate of development for the immediate watershed as the number to base the evaluation off of, the entire town was used as incoming residents outside of the watershed have the potential to recreate at Pleasant Lake.

Sources:

American Factfinder. United States Census Bureau. http://factfinder.census.gov/home/saff/main.html

Stanley, Peter. Zoning Administrator. Town of New London. (603) 526-4821 Ext.16.

"State Data Center Library." New Hampshire Office of Energy & Planning. 27 Mar. 2006. http://www.nh.gov/oep/programs/DataCenter/library.htm

Assessment of Question: This question is adequate as stated.

Date Completed: March 2006

Investigator: Steven Hash

Attribute 9: Watershed Characteristics

Category: Recreational Value

Question A: Watershed development and land use.

Directions: Construct a map indication the location and approximate amount of forested, wetland, active agriculture, clear/open, and urban land use types in the immediate watershed area. Town planning or assessing departments, as well as regional planning commission may be able to offer assistance in generating a map.

Rationale: Identifying the percent of each of these land use types within the immediate watershed will help in the development of general and targeted nonpoint source pollution prevention strategies. In addition, knowing the location and distribution of various land use types will assist in identifying those land available for future development or and use conversion.

Process Followed:
Used the NH GRANIT Land Cover Assessment (2001) layer and clipped it to the immediate watershed boundary. Then calculated the acreage of each land use type found in the watershed to find each land use as a percentage of the total watershed land.

Findings and Analysis:

Open Water:	.31%
Forested:	83.91%
Wetlands:	1.48%
Active Agricultural:	5.10%
Clear/Open:	5.01%
Urban Land Use:	4.19%
Total Percent Developed:	**14.3%**

* Total Percent Developed is the sum of Active Agriculture, Clear/Open, and Urban Land Use percentages.

Evaluation Criteria:	**Score:**
% Developed: % Undeveloped	
1) > 75% : < 25%	1
2) 51 – 75% : 25 – 49%	2
3) 26 – 50% : 50 – 74%	3
4) 10 – 25% : 75 – 90%	4
5) < 10% : > 90%	5

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

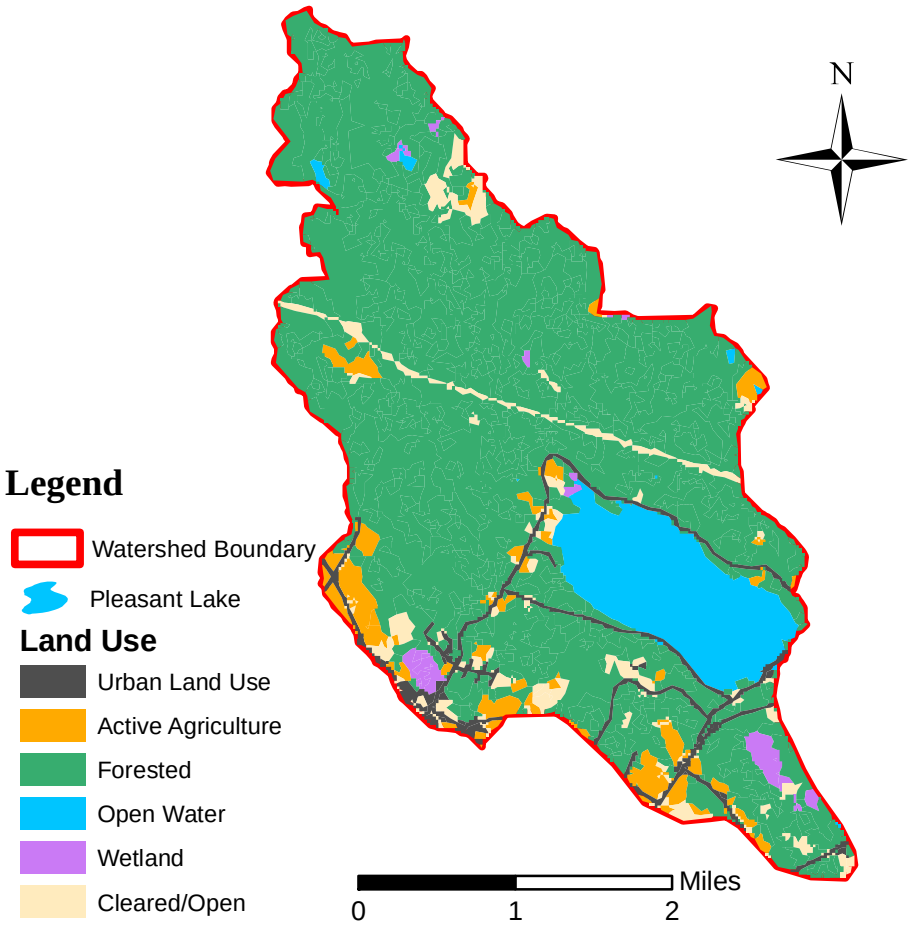
Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Watershed Development and Land Use

Attribute 9: Question A



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Attribute 9: Watershed Characteristics

Catergory: Susceptibility to Impairment

Question A: Watershed development and land use.

Directions: Construct a map indication the location and approximate amount of forested, wetland, active agriculture, clear/open, and urban land use types in the immediate watershed area. Town planning or assessing departments, as well as regional planning commission may be able to offer assistance in generating a map.

Rationale: Identifying the percent of each of these land use types within the immediate watershed will help in the development of general and targeted nonpoint source pollution prevention strategies. In addition, knowing the location and distribution of various land use types will assist in identifying those land available for future development or and use conversion.

Process Followed:
Used the NH GRANIT Land Cover Assessment (2001) layer and clipped it to the immediate watershed boundary. Then calculated the acreage of each land use type found in the watershed to find each land use as a percentage of the total watershed land.

Findings and Analysis:

Open Water:	.31%
Forested:	83.91%
Wetlands:	1.48%
Active Agricultural:	5.10%
Clear/Open:	5.01%
Urban Land Use:	4.19%
Total Percent Developed:	**14.3%**

* Total Percent Developed is the sum of Active Agriculture, Clear/Open, and Urban Land Use percentages.

Evaluation Criteria:	**Score:**
% Developed: % Undeveloped	
1) > 75% : < 25%	5
2) 51 – 75% : 25 – 49%	4
3) 26 – 50% : 50 – 74%	3
4) 10 – 25% : 75 – 90%	2
5) < 10% : > 90%	1

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

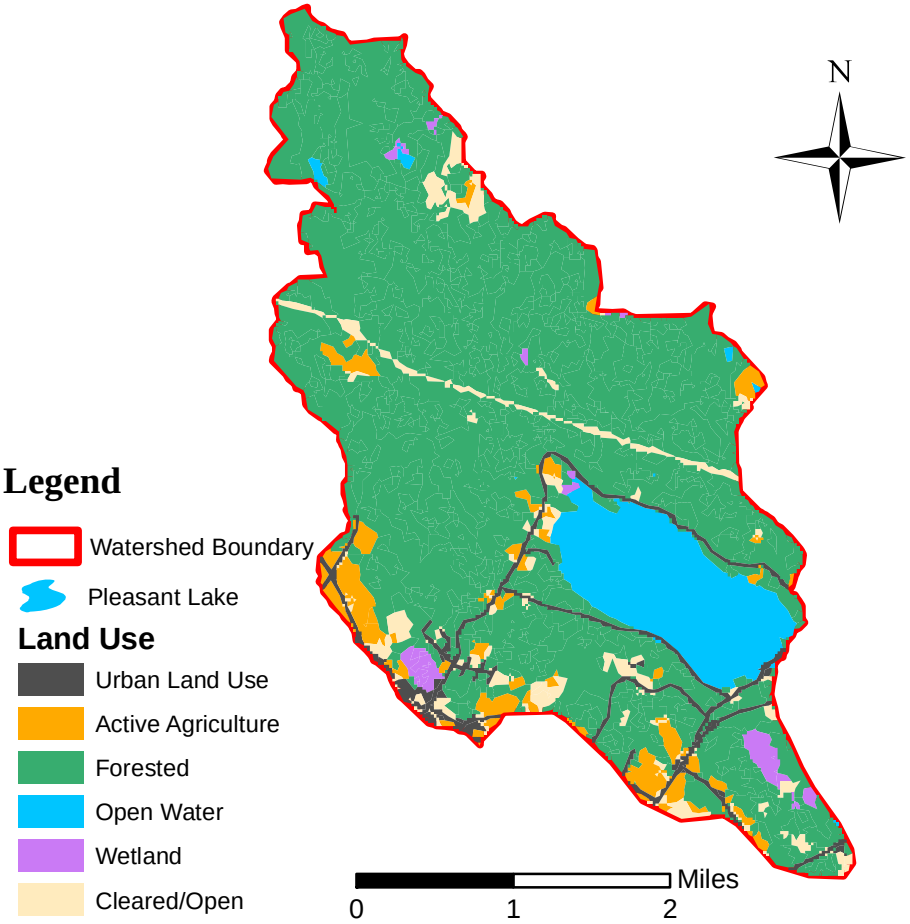
Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Watershed Development and Land Use

Attribute 9: Question A



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Attribute 9: Watershed Characteristics

Category:

Question B: Watershed land ownership

Directions: Develop a map of the immediate watershed showing the amount and location of lands held in private and public ownership. Calculate the percentage of each ownership type. Town planning or assessing departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: Strategies for nonpoint source pollution prevention may differ among public and private lands depending on their use. Private lands will consist of residential, commercial, and agricultural uses, while public land may serve primarily as recreational or silvicultural uses. In addition, tracking the distribution and location of public and private lands over time will help in documenting changes in land use.

Process Followed: Map and table representing the results can be found on the following pages. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. ArcGIS was used to delineate the watershed boundary. Data concerning conserved land was used along with tax parcel information to construct a map showing publicly owned land and conserved land accessible by the general public. XTools, an extension of ArcGIS, was used to calculate the acreage of each parcel of land. Parcels of conserved land are labeled with numbers that correspond to the included table, containing information about each particular parcel.

Findings and Analysis: More then half of the watershed is privately owned. The corresponding table provides information pertaining to each individual parcel of land. The map on the following page represents conserved lands that are accessible by the public. This means that the parcels of land are not owned by the Town of New London; however, in the easement rights for each specific parcel of conserved land are laws permitting public usage at various levels, depending on each specific easement.

Public (acres)	2067.54
Private (acres)	4538.68
Watershed (acres)	6606.22

Formula	x/watershed=Y*100
Public	31.29%
Private	68.71%

Evaluation Criteria:

1) All private; no public land
2) All public; no private land
3) Mix of public and private land

Sources:

Carbone, Michael, Peter Craven, Adam Finkelman, Kerrie Garvey, Kristofor Kebler, Chris Mckee, Biz Stamm. Identifying Conservation Priorities in the Kearsarge/Sunapee Region Portfolio. Institute for Community and Environment. Fall 2004/Spring 2005.

Levine, Jessie W. Town Administrator. Town of New London. jessielevine@verizon.net.

Tax Maps. New London Town Offices. 375 Main Street. New London, NH 03257. Town Clerk/Tax Collector Office Phone 603-526-4821.

"Welcome to NH Granit." 14 Oct. 2005 <http://www.granit.sr.unh.edu>

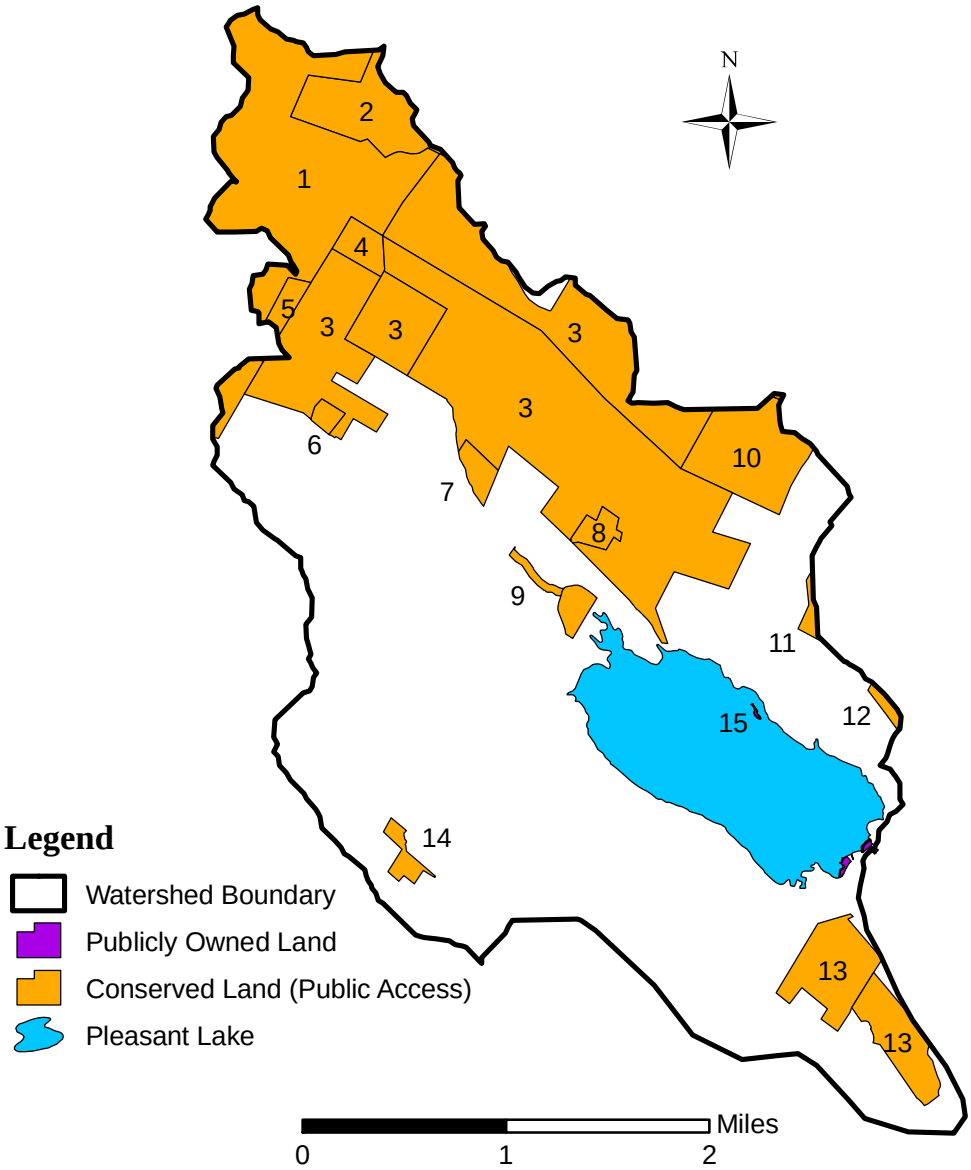
Assessment of Question: This question is adequate as stated.

Date Completed: October 2005

Investigator: Steven Hash

Watershed Land Ownership

Attribute 9: Question B



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Conserved Lands with Public Access

# on Map	Name of Area	Description
1	Gile State Forest	High recreational value; fishing, snowmobiling, cross country skiing, etc… (495.53 acres)
2	French #1	(113.61 acres)
3	Webb Forest	Contains the Webb Forest Interpretive Trail (987.52 acres)
4	Unnamed Easement	(27.93 acres)
5	Springfield Town Forest	Provides publicly accessible land for various recreation (17.47 acres)
6	Yerkes	Views of Mt. Kearsarge and Pleasant Lake; trailhead access (10.32 acres)
7	Colby Sanctuary	Abuts the Webb Forest (19.85 acres)
8	Spofford Easement	Historical significance, old foundations; link four trails for regional hiking (19.71 acres)
9	Sargent	Active farmland; footpath access; access for Sunapee/Ragged/Kearsarge Greenway (27.43 acres)
10	Langenau Forest	Large forest protected by the Society for the Protection of New Hampshire Forests (136.21 acres)
11	Deming	Views of Mt. Kearsarge and Pleasant Lake; trail access (9.57 acres)
12	Cook Easement	Parcel of conserved land containing several extremely old and large trees (8.09 acres)
13	Low Plain Natural Area	Large wetland area; prime bird watching; footpaths (171.44 acres)
14	Cleveland & Kidder	Preserves open space; provides recreational value via hiking trails (17.49 acres)
15	Blueberry Island	Small island located in Pleasant Lake (0.5 acres)

Attribute 9: Watershed Characteristics

Category: Unique or Outstanding Value

Question C: Protected land or land not available for development within the watershed.

Directions: Using a land use map, identifying all land that is protected from future development within this watershed including state owned properties, town owned properties, private conservation organization properties, and conservation easements. Note ownership of land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland usage and the associated levels on non-point source pollution that a lake or pond receives. By identifying who owns the lands you recognize potential partnerships for future lake management.

Process Followed:
Used the NH GRANIT conserved lands layer and clipped it to the immediate watershed. Calculated the acreage of each parcel of conserved lands and identified ownership based on the attribute table associated with the layer.

Findings and Analysis: See attached Spreadsheet

Evaluation Criteria:	**Score:**
As percentage of immediate watershed area	
1) 0%	1
2) 1 – 10%	2
3) 11 – 25%	3
4) 26 – 50 %	4
5) > 50%	5

Sources:
"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

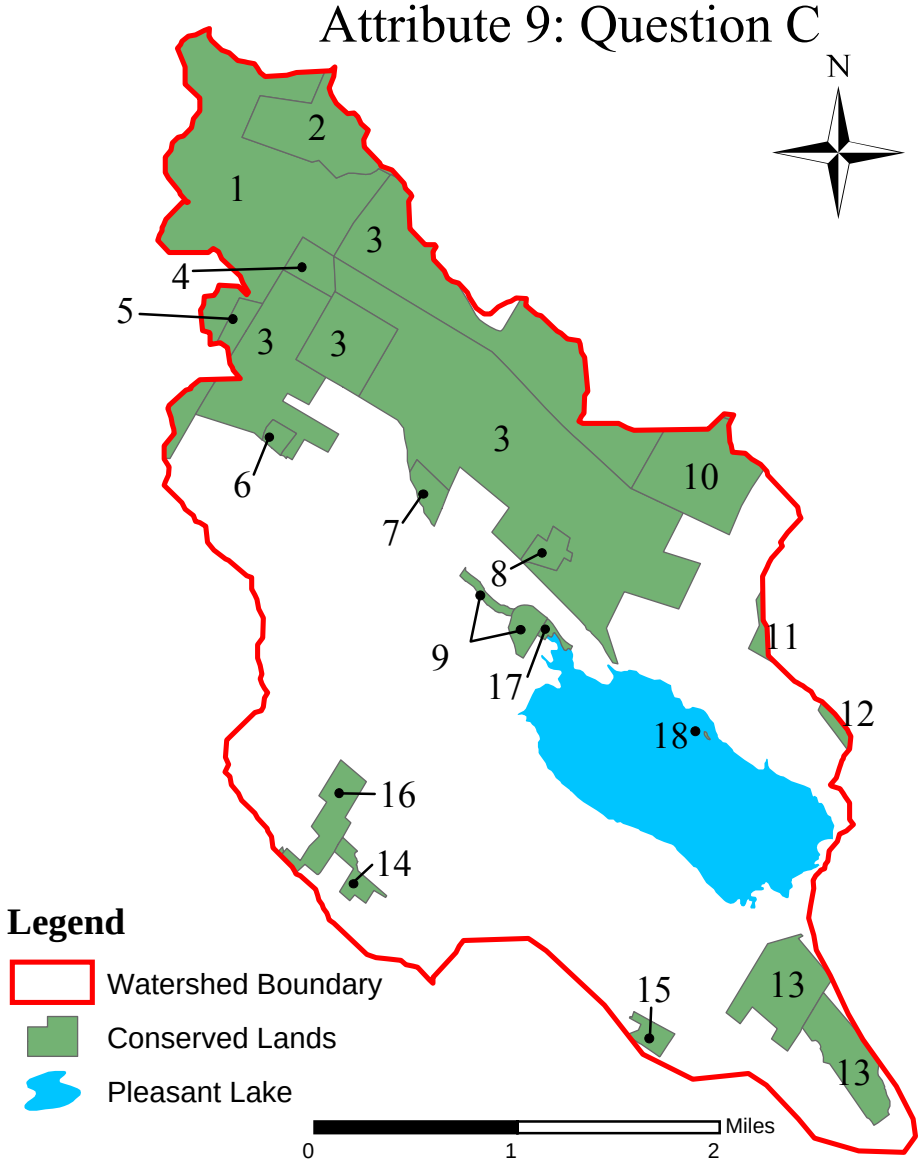
Investigator: Carly Rademaker

Public and private conserved lands in the Pleasant Lake Watershed

	Conservation Parcel Name	Ownership	Acreage
1	Gile State Forest	NH Department of Resources and Economic Development	495.5
2	French #1	Ausbon Sargent Land Preservation Trust	113.6
3	Webb Forest	Town of New London	1293.4
4	Unnamed Parcel		27.9
5	Springfield Town Forest	Town of Springfield	17.5
6	Yerkes	Ausbon Sargent Land Preservation Trust	10.3
7	Colby Sanctuary	Town of New London	19.9
8	Spofford Easement	Ausbon Sargent Land Preservation Trust	19.7
9	Sargent	Town of New London	27.5
10	Langenau Forest	Society for the Protection of NH Forests	136.2
11	Deming	Ausbon Sargent Land Preservation Trust	9.6
12	Cook Easement	Ausbon Sargent Land Preservation Trust	8.1
13	Low Plain Natural Area	Town of New London	171.5
14	Cleveland and Kidder	Town of New London	17.5
15	Baldwin Easement	Ausbon Sargent Land Preservation Trust	15.4
16	Clough	Town of New London	0.4
17	Judith M. Oates Easement	Ausbon Sargent Land Preservation Trust	4.9
18	Pleasant Lake Island	Town of New London	0.3
		Total Conserved Acreage	2389.2
		Total Watershed Acreage	6606.22

Protected Lands in the Pleasant Lake Watershed

Attribute 9: Question C



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Attribute 9: Watershed Characteristics

Category: Susceptibility to Impairment

Question C: Protected land or land not available for development within the watershed.

Directions: Using a land use map, identifying all land that is protected from future development within this watershed including state owned properties, town owned properties, private conservation organization properties, and conservation easements. Note ownership of land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland usage and the associated levels on non-point source pollution that a lake or pond receives. By identifying who owns the lands you recognize potential partnerships for future lake management.

Process Followed:
Used the NH GRANIT conserved lands layer and clipped it to the immediate watershed. Calculated the acreage of each parcel of conserved lands and identified ownership based on the attribute table associated with the layer.

Findings and Analysis: See attached Spreadsheet

Evaluation Criteria:	**Score:**
As percentage of immediate watershed area	
1) 0%	5
2) 1 – 10%	4
3) 11 – 25%	3
4) 26 – 50 %	2
5) > 50%	1

Sources:
"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

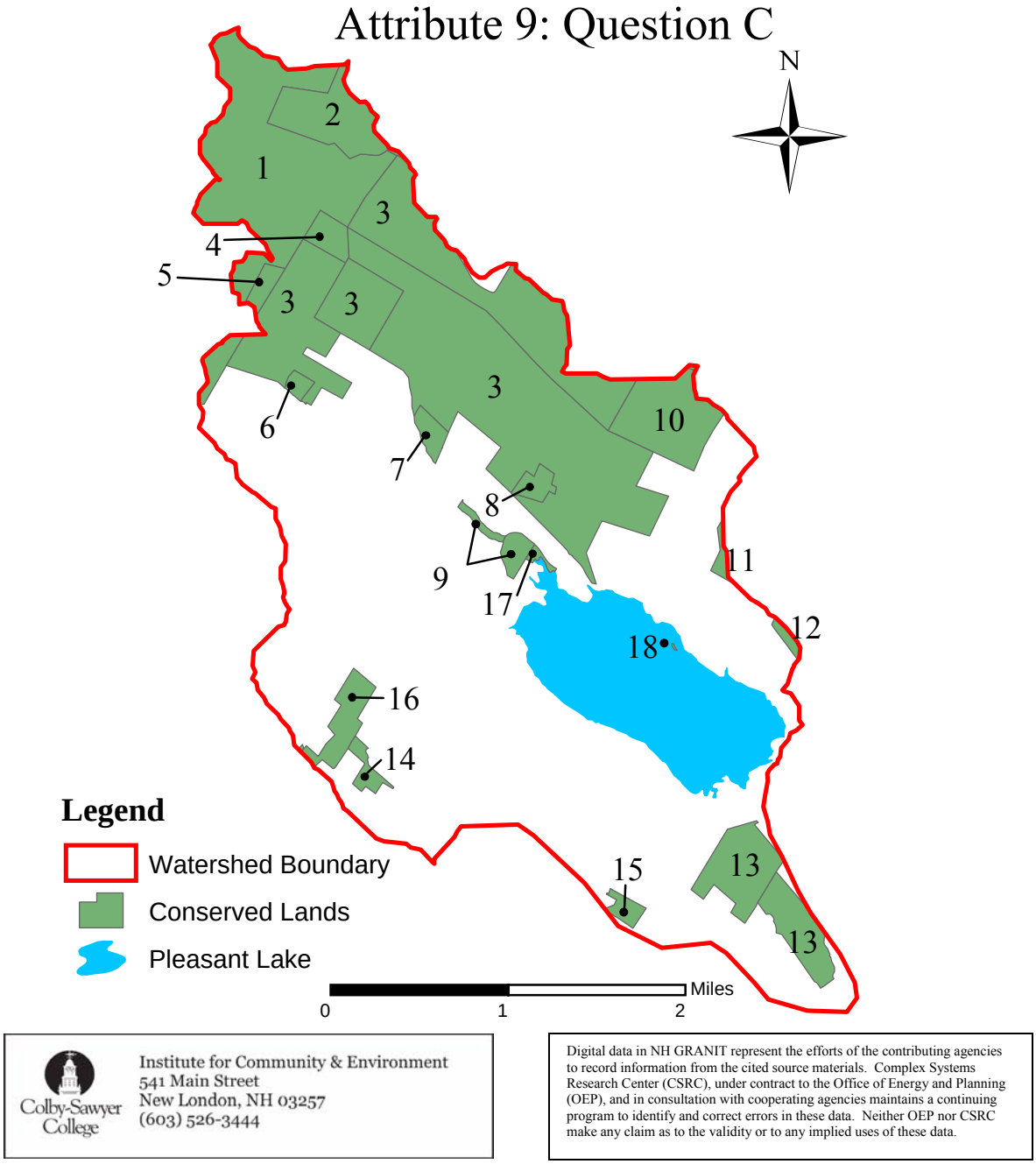
Investigator: Carly Rademaker

Public and private conserved lands in the Pleasant Lake Watershed

	Conservation Parcel Name	Ownership	Acreage
1	Gile State Forest	NH Department of Resources and Economic Development	495.5
2	French #1	Ausbon Sargent Land Preservation Trust	113.6
3	Webb Forest	Town of New London	1293.4
4	Unnamed Parcel		27.9
5	Springfield Town Forest	Town of Springfield	17.5
6	Yerkes	Ausbon Sargent Land Preservation Trust	10.3
7	Colby Sanctuary	Town of New London	19.9
8	Spofford Easement	Ausbon Sargent Land Preservation Trust	19.7
9	Sargent	Town of New London	27.5
10	Langenau Forest	Society for the Protection of NH Forests	136.2
11	Deming	Ausbon Sargent Land Preservation Trust	9.6
12	Cook Easement	Ausbon Sargent Land Preservation Trust	8.1
13	Low Plain Natural Area	Town of New London	171.5
14	Cleveland and Kidder	Town of New London	17.5
15	Baldwin Easement	Ausbon Sargent Land Preservation Trust	15.4
16	Clough	Town of New London	0.4
17	Judith M. Oates Easement	Ausbon Sargent Land Preservation Trust	4.9
18	Pleasant Lake Island	Town of New London	0.3
		Total Conserved Acreage	2389.2
		Total Watershed Acreage	6606.22
		% Watershed Acreage Conserved	36.17

Protected Lands in the Pleasant Lake Watershed

Attribute 9: Question C



Attribute 9: Watershed Characteristics

Category:

Question D: Percent of impervious surface in the watershed

Directions: Contact the DES Lakes Program staff for assistance with constructing a map that indicates the amount of impervious surface within the watershed.

Rationale: The amount of impervious surface is important in determining stormwater runoff quantity and quality. Watersheds that are highly developed tend to have a higher percentage of impervious surfaces. Impervious surfaces reduce natural stormwater soil infiltration and convey high quantities of runoff directly to the nearest tributary. Impervious surfaces can also compromise water quality by transferring oils, greases, heavy metals, pathogens, and excess nutrients to tributaries and drainage ditches. The installation of stormwater retention facilities can assist in mitigating some of the negative impacts. A management plan should identify the percentage of impervious surfaces and areas in need of stormwater control mechanisms with the shoreland boundaries.

Process Followed: Impervious surface calculations were completed using Geographic Information Systems (GIS) data and field work. GIS data layers constructed by Cartographic Associates, including building footprint, driveway, and roadway layers were used. Windshield surveys were employed primarily to ground-truth the data layers created by Cartographic Associates. While conducting the windshield surveys, width measurements were taken of numerous driveways and roadways to create average widths.

Any building structure, roadway, driveway, or parking lot that was missing from Cartographic Associate data, due to new features constructed after Cartographic Associates completed their data, were digitized into their respective layers. Driveway and roadway layers consist of spatially referenced linear data, and do not take into consideration width; therefore, the area they take up in the real world cannot be accounted for. The average widths calculated from the windshield survey measurements was then used in GIS to create buffers that represent the width of the roads and driveways in real life. Driveways were assigned a ten foot width, while roadways received a twenty-two foot width. Once buffers were applied to driveways and roadways, the acreage of driveways, roadways, and building footprints could be calculated.

Findings and Analysis: Refer to the following page for a table and map of results.

	Acres
Building Footprints	36.44
Roadways	141.83
Driveways	48.22
Parking Lots	3.49
Watershed	6606.22
Percent Impervious	3.48%

Evaluation Criteria:

1) >50%
2) 26 – 50%
3) 10 – 25%
4) 1 – 10%
5) 0%

Sources:

Cartographic Associates, Inc. Littleton, New Hampshire. www.cai-info.com. Data updated to April 1, 2005.
"Welcome to NH Granit." 14 Oct. 2005 <http://www.granit.sr.unh.edu>

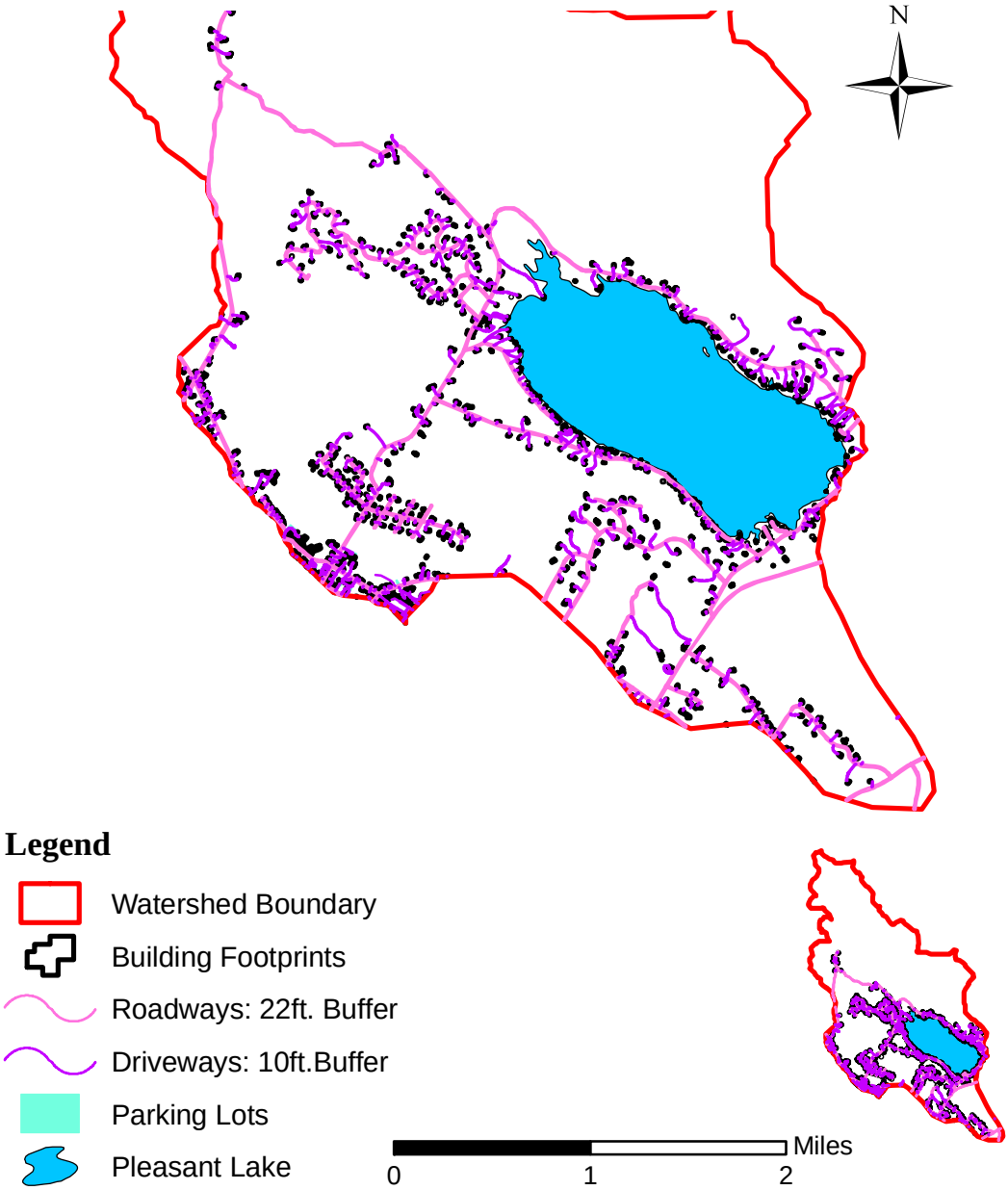
Assessment of Question: I believe that it is critical for the NH DES Watershed Management Program to adopt standardized methodologies for completing the impervious surface question presented in the Comprehensive Lake Inventory. Impervious Surfaces can be defined quite broadly, which could create problems for some inexperienced groups attempting to answer this question for their particular waterbody. Furthermore, even groups with some knowledge of impervious surfaces and the way they react can approach this question from many different angles. Furthermore, groups that do not possess geographic information systems need a standardized way of completing this program in an effective and efficient way.

Date Completed: March 2006

Investigator: Steven Hash

Impervious Surfaces: Watershed

Attribute 9: Question D



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Attribute 9: Watershed Characteristics

Category:

Question E: Land use adjacent to perennial streams.

Directions: Construct a map that identifies the locations and amounts of forested, wetland, active agricultural, clear / open, and urban land use types within 250 feet on each side of the most significant tributaries that ***drain into*** the lake or pond. Town planning or assessing departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: The inlets that drain into a waterbody act as conduits for pollutant transport from the land that surrounds them. Different land use types are associated with different pollutant types and quantities and must be considered when developing a non-point source pollution investigation or prevention program. In addition, when assessing land use in the areas surrounding the largest tributaries, estimate the pollutant load delivered to the lake or pond of interest.

Process Followed: Using the streams network downloaded from GRANIT, and ArcGIS all perennial streams that drain directly into Pleasant Lake were identified and buffered by 250ft. Then the Landcover Assessment layer, also from GRANIT, was used to identify the percentages of land use within the buffers.

Findings and Analysis:

Urban Land Use:	3.4 %
Active Agriculture:	2.5 %
Forested:	84.2 %
Wetlands:	4.4 %
Clear/Open:	3.6 %
Total % Developed:	**5.9 %**

*Total percent developed is the sum of Urban Land Use and Active Agriculture percentages.

Evaluation Criteria:	**Score:**
% Developed : % Undeveloped	
1) 75 – 100% : < 25 %	1
2) 50 – 75% : 25 – 50%	2
3) 25 – 50% : 50 – 75%	3
4) 10 – 25% : 75 – 90%	4
5) < 10% : > 90%	5

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. <http://granit.sr.unh.edu>

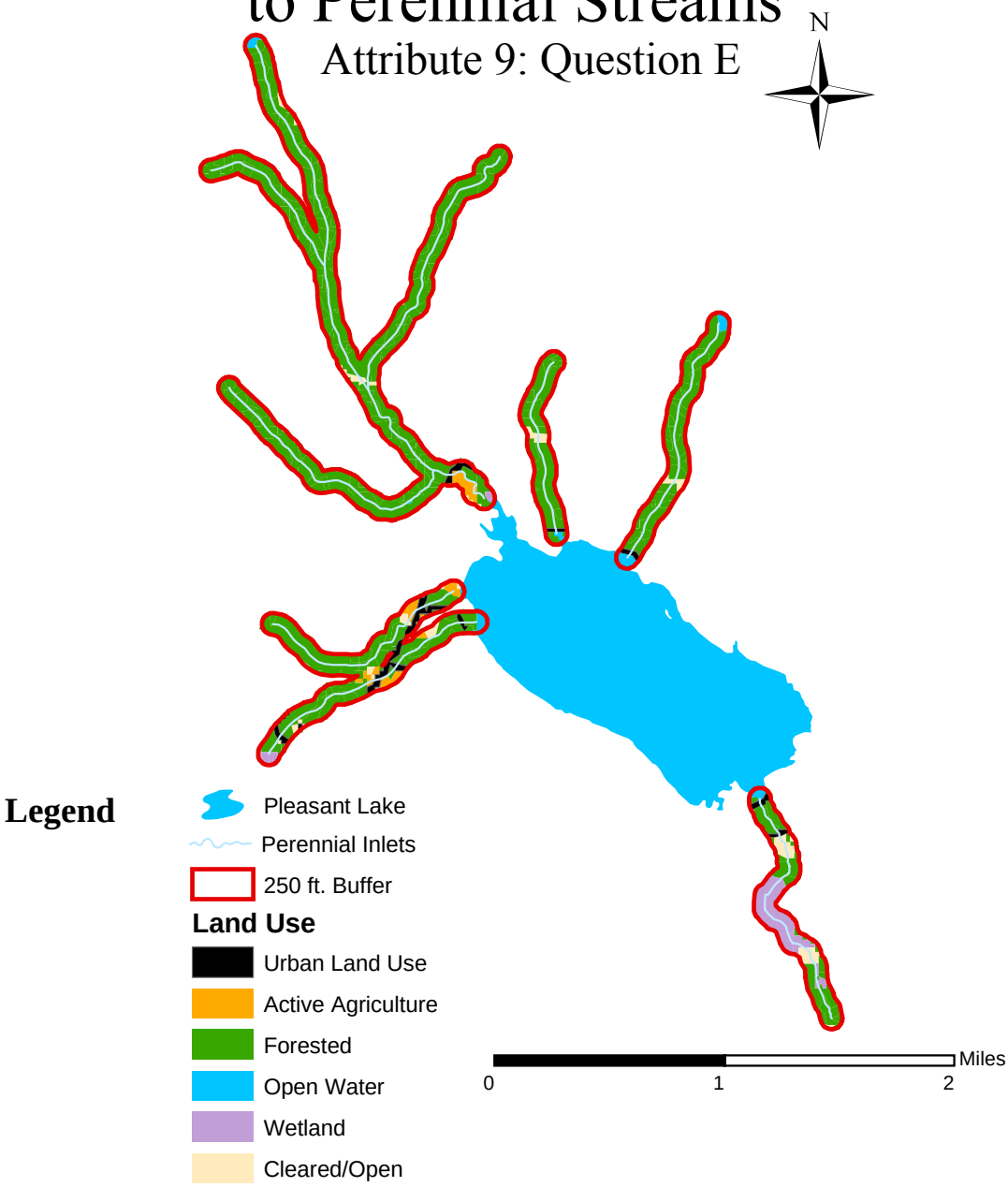
Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Carly Rademaker

Land Use Adjacent to Perennial Streams

Attribute 9: Question E



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Attribute 9: Watershed Characteristics

Category:

Question F: Watershed topography

Directions: Contact the DES Lakes Program staff for assistance with identifying those areas that have a slope greater than 15%.

Rationale: The topography, or slope, of a watershed draining into the lake or pond is an important natural characteristic controlling the rate and amount of direct stormwater a waterbody receives. A steeply sloped watershed will convey stormwater more quickly to nearby tributaries than a watershed with a relatively flat landscape.

Process Followed: Map representing the results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. ArcMap was used to delineate the watershed boundary. Digital Elevation Models were then manipulated in the program to calculate the slope. The Digital Elevation Models were then clipped to the 250 ft. buffer to isolate the slope of the shoreland area.

Findings and Analysis: After completing the necessary data manipulation in ArcMap 9.1, it was determined that 21.53% of the entire watershed has a slope greater than 15%. The majority of the watershed has slopes less than 8%, with 42.25% falling in this category.

Evaluation Criteria:

1) >75% of the watershed area has a slope in excess of 15%
2) 51-75% of the watershed area has a slope in excess of 15%
3) 26-50% of the watershed area has a slope in excess of 15%
4) 1-25% of the watershed area has a slope in excess of 15%
5) None of the watershed area has a slope in excess of 15%

Sources:

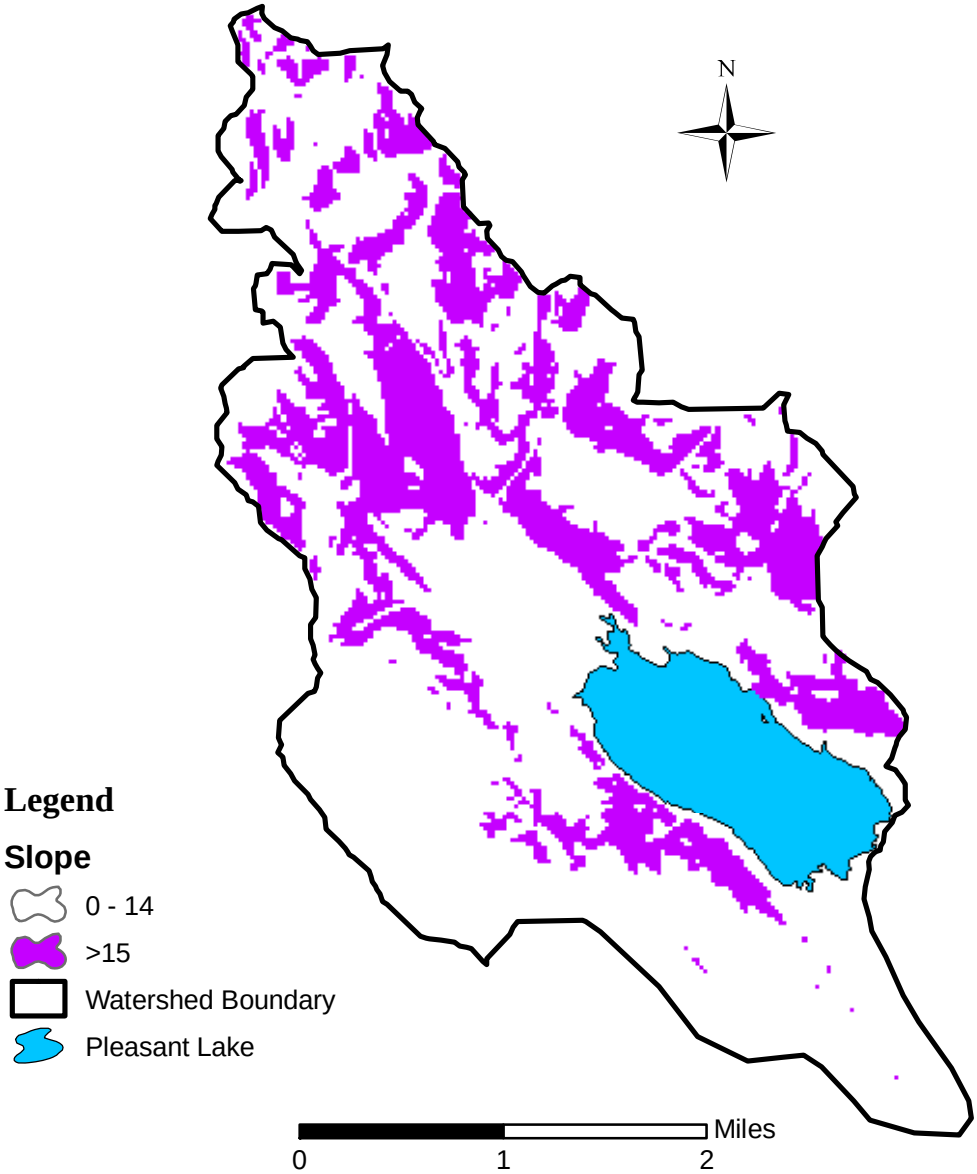
"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

Assessment of Question: This question could use a little clarification and reinforcement as to why steep slopes are so important. Furthermore, some mention of ArcMap should be made for individuals who may not be familiar with the program, but would maybe like to explore that avenue to complete this question. The Pleasant Lake Watershed contains a wide spectrum of slope percentages, meaning it is able to support many different species of wildlife that may be bound by certain topographical characteristics.

Date Completed: October 2005
Investigator: Steven Hash

Watershed Topography

Attribute 9: Question F



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Attribute 9: Watershed Characteristics

Category:

Question G: Watershed geology and soils

Directions: Contact the DES Lakes Program staff for assistance with identifying the percentages of bedrock and hydric soils in the shoreland area.

Rationale: The geology and soils within the watershed area are important characteristics to inventory because they dictate what type and where development can and should occur. For example, if bedrock were present it would be difficult or cost prohibitive to excavate a foundation for a home. Along the same lines, if wetland soils are present, then septic system placement should be prohibited.

Process Followed: Map representing the results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 geographic information systems program. ArcGIS was used to delineate the watershed boundary. Soil data was brought into the program and clipped to the watershed boundary, and later manipulated to specifically show hydric soils and bedrock.

Findings and Analysis:

Hydric Soil Types: Merrimack County	**Hydric Soils: Sullivan County**
Greenwood Mucky Peat	Pillsbury Stony Loam; 0-3% slopes
Lyme-Moosilauke Stony Loam; 3-8 % slopes	Lyme-Moosilauke Stony Loam; 0-3% slopes
Chocorua Mucky Peat	Lyme-Moosilauke Stony Loam; 3-8% slopes
Ossipee Mucky Peat	Borohemists; ponded
Peacham Muck, very stony	Pillsbury Stony Loam; 3-8% slopes
Pillsbury Fine, Sandy Loam; 3-8 % slopes	

Hydric Soils (acres)	542.67
Bedrock (acres)	2186.82
Watershed(acres)	6606.22

Formula	X/6606.22=Y*100
Hydric	542.67/6606.22*100=8.21
Bedrock	2186.82/6606.22*100=33.1

The separation by county for the soil information is due to different GIS data sets. The data was collected by two different agencies, thus the attribute information varies. When merged together, certain values from one data set that did not match the other data sets would take precedence, making the analytical steps of this question difficult. Therefore, the soil data was kept separate by county.

Evaluation Criteria:

1) 0%; based on soils only, entire watershed is suitable for development.
2) <10%
3) 11-25%
4) 26-50%
5) >50%

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

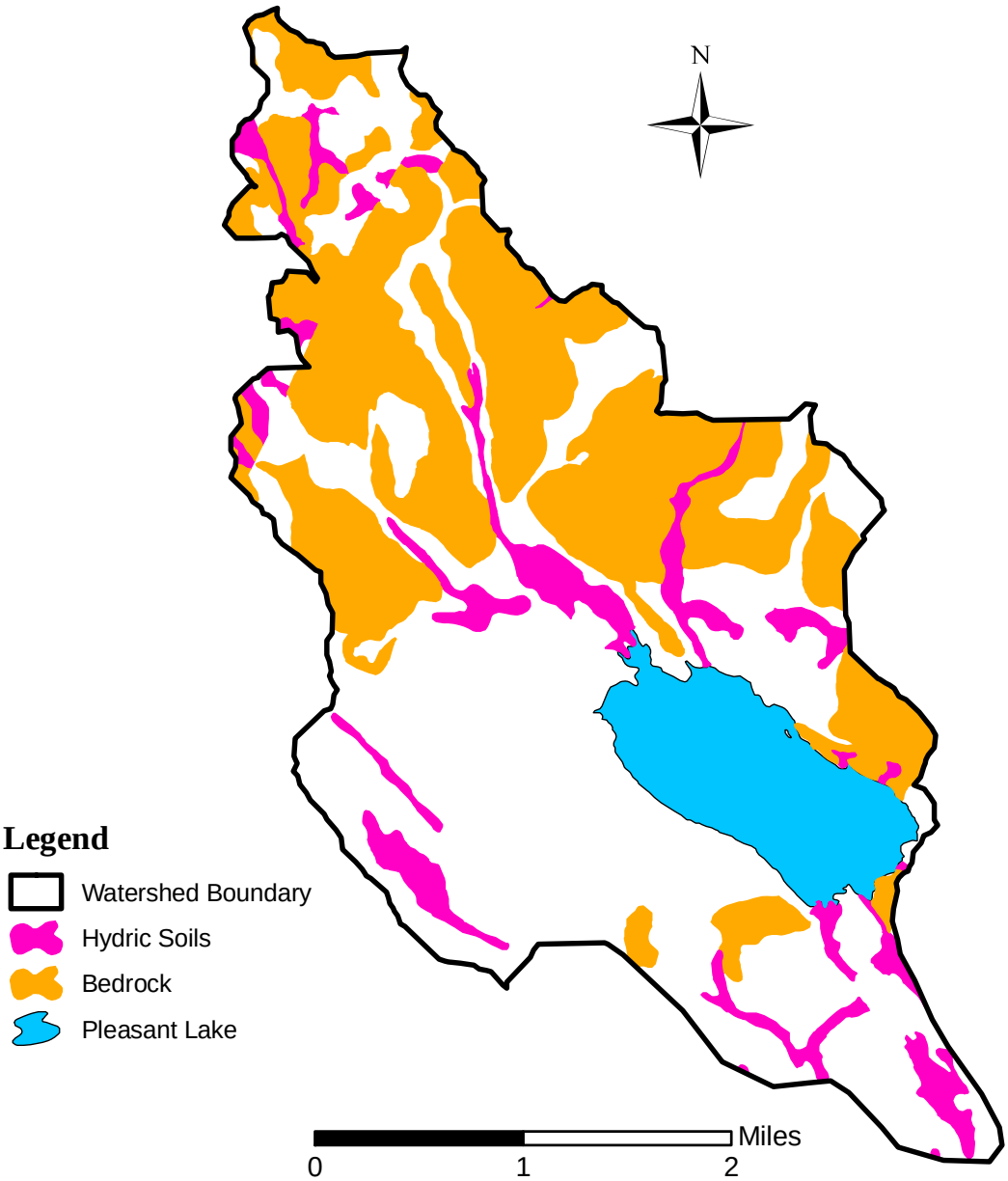
Assessment of Question: It is important to note that this data cannot be used for site specific analysis as the data is at too large of a scale for this type of manipulation. It is important to emphasize the ecological/biological importance of the soils that can be found in the watershed, and not solely emphasize the developmental implications. Furthermore, current technologies can work around wetlands and bedrock to develop on both. Most states only require the creation of a wetland in as alternative location if one is destroyed for a development. Also, blasting through bedrock with explosives is a common practice among contractors, making development on bedrock possible.

Date Completed: October 2005

Investigator: Steven Hash

Watershed Geology and Soils

Attribute 9: Question G



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Attribute 9: Watershed Characteristics

Category: Unique or Outstanding Value

Question H: Local land use regulatory measures

Directions: Contact each of the municipalities immediately surrounding the watershed or consult the Office of State Planning to determine if the local floodplain, aquifer, wetland, and shoreland ordinances meet or exceed state standards. Listed below are potential protection measures that may be in place for some of the municipalities within the watershed. Complete the list for each of the municipalities within the watershed in order to assess the adequacy of the surface water protection measures.

Rationale: A comparison of local and state protection measures that apply to the lake or pond will provide an indication of the regulatory measures currently in place to ensure wise shoreland development and use. Also, reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures already in place to protect surface water quality. It may be important to identify certain land use practices or activities that are of particular concern so that the surrounding communities can address them in the future.

Process Followed: Retrieved the zoning ordinance publication from the Town of New London website. The Town of New London's ordinances were reviewed and compared against statewide regulatory measures.

Findings and Analysis: Refer to the accompanying chart to review the zoning ordinances for the Town of New London and the State of New Hampshire. New London has inadequate zoning ordinances because there is no mention of a stream setback, just a shoreland setback. Tributary streams are extremely important to the overall water quality of any watershed, and certain protection measures should be taken. Cases where New London did not have a regulatory measure in place were recorded as not applicable (N/A). Being that New London has portions of Lake Sunapee, and all of Pleasant Lake, it should not be of a surprise that local zoning ordinances are in place for setbacks from waterbodies, as developments close to lake, ponds, streams, etc… can potentially degrade said water source.

Evaluation Criteria:	**Score:**
1) One or more municipalities within the	
a. watershed has inadequate local land use	1
b. regulations (i.e. only state and federal	
c. regulations apply)	
2) All municipalities within the watershed	
a. have adequate local land use regulations	3
b. (i.e. town ordinances comply with minimum	
c. state standards)	
3) One or more municipalities within the	

a. watershed has exceptional land use regulations that exceeds state standards 5

Sources:

Peter Stanley. Zoning Administrator: Town of New London, NH. (603) 526-4821 ext. 16. consplg@adelphia.net.

Town of New London. Zoning Ordinance. New London: Town of New London, 2001. (http://www.nl-nh.com/05zoningord.pdf).

Assessment of Question: The categories listed in the chart seemed the most appropriate when assessing the adequacy of zoning ordinances in terms of their affects on a watershed. While regulations may look adequate on paper, the degree to which they are enforced would be a better way to approach this question. Without proper enforcement, zoning ordinances may be quite ineffective.

Date Completed: November 2005

Investigator: Steven Hash

Zoning Ordinances

	Lake/Stream Setback	Shoreland Setback	Wetland Setback	Building Setback	Septic Setback	Erosion Control	Minimum Lot Size	Slope Development
New London	N/A	300 ft.	Min. of 100-200 ft, depending on wetland status	50 ft.	75 ft. with soil provisions	All disturbances within 50 ft. Of shoreline	2, 4, 10, and 25 for each zoning district	Not to exceed 25%
State	50 ft.	250 ft.	N/A	50 ft.	125 ft. (75 ft. with soil provisions)	All projects must be "designed and constructed to percent release of surface runoff across exposed mineral soil"	N/A	Not to exceed 25%

Attribute 9: Watershed Characteristics

Category: Susceptibility to Impairment

Question H: Local land use regulatory measures

Directions: Contact each of the municipalities immediately surrounding the watershed or consult the Office of State Planning to determine if the local floodplain, aquifer, wetland, and shoreland ordinances meet or exceed state standards. Listed below are potential protection measures that may be in place for some of the municipalities within the watershed. Complete the list for each of the municipalities within the watershed in order to assess the adequacy of the surface water protection measures.

Rationale: A comparison of local and state protection measures that apply to the lake or pond will provide an indication of the regulatory measures currently in place to ensure wise shoreland development and use. Also, reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures already in place to protect surface water quality. It may be important to identify certain land use practices or activities that are of particular concern so that the surrounding communities can address them in the future.

Process Followed: Retrieved the zoning ordinance publication from the Town of New London website. The Town of New London's ordinances were reviewed and compared against statewide regulatory measures.

Findings and Analysis: Refer to the accompanying chart to review the zoning ordinances for the Town of New London and the State of New Hampshire. New London has inadequate zoning ordinances because there is no mention of a stream setback, just a shoreland setback. Tributary streams are extremely important to the overall water quality of any watershed, and certain protection measures should be taken. Cases where New London did not have a regulatory measure in place were recorded as not applicable (N/A). Being that New London has portions of Lake Sunapee, and all of Pleasant Lake, it should not be of a surprise that local zoning ordinances are in place for setbacks from waterbodies, as developments close to lake, ponds, streams, etc… can potentially degrade said water source.

Evaluation Criteria:	**Score:**
1) One or more municipalities within the watershed has inadequate local land use regulations (i.e. only state and federal regulations apply)	5
2) All municipalities within the watershed have adequate local land use regulations (i.e. town ordinances comply with minimum state standards)	3
3) One or more municipalities within the	

a. watershed has exceptional land use regulations 1
b. that exceeds state standards

Sources:

Peter Stanley. Zoning Administrator: Town of New London, NH. (603) 526-4821 ext. 16. consplg@adelphia.net.

Town of New London. Zoning Ordinance. New London: Town of New London, 2001. (http://www.nl-nh.com/05zoningord.pdf).

Assessment of Question: The categories listed in the chart seemed the most appropriate when assessing the adequacy of zoning ordinances in terms of their affects on a watershed. While regulations may look adequate on paper, the degree to which they are enforced would be a better way to approach this question. Without proper enforcement, zoning ordinances may be quite ineffective.

Date Completed: November 2005

Investigator: Steven Hash

Zoning Ordinances

	Lake/Stream Setback	Shoreland Setback	Wetland Setback	Building Setback	Septic Setback	Erosion Control	Minimum Lot Size	Slope Development
New London	N/A	300 ft.	Min. of 100-200 ft, depending on wetland status	50 ft.	75 ft. with soil provisions	All disturbances within 50ft. Of shoreline	2, 4, 10, and 25 for each zoning district	Not to exceed 25%
State	50 ft.	250 ft.	N/A	50 ft.	125 ft. (75 ft. with soil provisions)	All projects must be "designed and constructed to percent release of surface runoff across exposed mineral soil"	N/A	Not to exceed 25%

Attribute 9: Watershed Characteristics

Category:

Question I: Drainage network

Directions: Contact the DES Lakes Program staff for assistance with determining the stream or river draining into the waterbody with the highest "order" ranking.

Rationale: In completing this question it is hoped that you will gain a better understanding of the lake or pond's relative position (order) in transferring water to its ultimate destination. Answering this question will increase awareness of the waterways that supply and receive the water to and from the waterbody, respectively.

Process Followed: Map representing the results can be found on the following page. Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 Geographic Information Systems program. ArcGIS was used to delineate the watershed boundary. Stream network data was brought into ArcGIS and clipped to the watershed boundary, as to only see those streams included in said boundary. The streams were then classified as 1st, 2nd, or 3rd order streams as defined by…… Intermittent streams are shown on the map, but do not play a role in the delineation of rank for any stream.

Findings and Analysis: The Strahler Method from the "Good Forestry in the Granite State" publication was used to analyze the drainage network of the Pleasant Lake Watershed. The highest ranking stream in the Pleasant Lake Watershed is Great Brook, which is categorized as 2nd order. The two 1st order streams that create the 2nd order Great Brook both originate in conserved parcels of land, making their susceptibility to degradation low. Furthermore, the majority of the 2nd order sections of Great Brook also flow through conserved parcels, further decreasing the possible pollutant discharge into Pleasant Lake.

Evaluation Criteria:

Highest order rank of stream or river:

1) 1st
2) 2nd
3) 3rd
4) 4th
5) 5th

Sources:

"GRANIT." Complex Systems Research Center. University of New Hampshire. 20 Oct 2005. http://granit.sr.unh.edu

The Society for the Protection of New Hampshire Forests. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire.

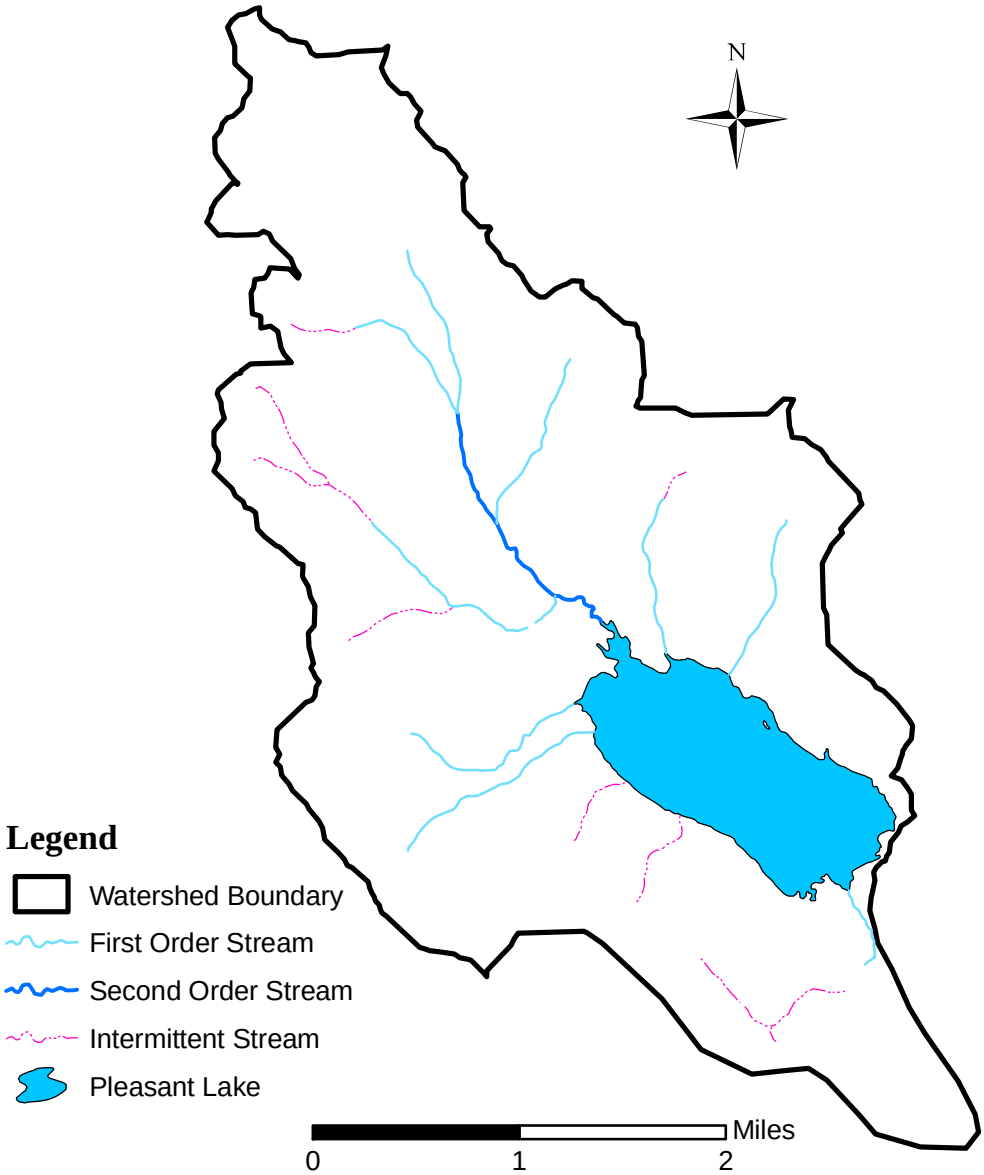
Assessment of Question: This question is adequate as stated.

Date Completed: November 2005

Investigator: Steven Hash

Drainage Network

Attribute 9: Question I



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Attribute 9: Watershed Characteristics

Category:

Question J: Rate of watershed development

Directions: Consult town planning boards, town Master Plans, regional planning commissions, or the NH Office of State Planning to obtain an estimate of the rate of development within the most recent 10 year period and within the immediate watershed area. Note whether the estimate is based upon acre/year or building permits/year.

Rationale: Knowing the rate of development within the watershed can help prioritize planning goals and objectives. Establishing development guidance priorities is the most efficient use of limited resources and is beneficial in protecting the natural characteristics of the waterbody.

Process Followed: Due to restrictions in the necessary data for calculating the rate of development for the Pleasant Lake Watershed, the calculation needed to be applied at the town, county, and state level. Working with the best available information, the rate of development for the Town of New London, Merrimack County, and New Hampshire were calculated using population data from the New Hampshire Office of Energy & Planning (OEP), which was manipulated to show the percent increase in population from 1990 to 2004. Data pertaining to 1990 and 2000 were from the United States Census Bureau, while the 2004 data was estimates calculated by the OEP. Furthermore, percentage of new housing structures was also used in determining the rate of development for the Town of New London, Merrimack County, and New Hampshire. Information from the United States Census Bureau concerning total housing units was manipulated to complete these calculations. On the town level, the Census Bureau only had information regarding total housing units for the year of 2000. Information on the county level was found for 1990 and 2000. On the state level, information was found for 1990, 2000, and 2004. Therefore, a 10 year comparison was completed for Merrimack County, and a 14 year comparison was completed for the state of New Hampshire. In order to complete any sort of comparison on the town level, Peter Stanley, the Town of New London Zoning Administrator, was contacted to retrieve any information regarding the number of housing permits issued for as many years as his facilities held records. Mr. Stanley had information on housing permits issued for new housing developments from 2000 to 2005. This information was used in completing a 5 year comparison for the Town of New London.

While there was no information concerning number of housing units on the watershed level, the calculation was completed using a variety of sources other than the OEP and Census Bureau. Geographic Information Systems (GIS) were used to find how many housing structures were in the watershed, based off data layers constructed by Cartographic Associates, Inc. Peter Stanley, the Zoning Administrator for the Town of New London was then contacted to determine how many permits were issues for new housing structures in the past four years. These numbers were then used along with the

data derived from GIS to calculate the percent increase in housing structures from 2001 to 2005 in the immediate Pleasant Lake Watershed.

Findings and Analysis:

	1990			2004	
	Population	**Housing Units**		**Population**	**Housing Units**
New Hampshire	1,109,117	503,904		1,306,000	575,671
Merrimack County	120,005	50,870		145,085	56,224 (2000)
New London	3,180	2,085 (2000)		4,435	2,225

On the state level, calculating the 14 year percent increase in population for the state of New Hampshire was completed as follows:

[(population 2004 - population 1990) / population 1990] x 100
-or-
[(1,306,000 - 1,109,117) / 1,109,117] x 100 = 17.75% Increase in Population

One the state level, calculating the 14 year percent increase in total housing structures was completed as follows:

[(housing 2004 - housing 1990) / housing 1990] x 100
-Or-
[(575,671 - 503,904) / 503,904] x 100 = 14.24% Increase in Housing

The remaining percent increases were calculated using the same logic as the previous examples. The results can be found in the following table:

	% Change: Population	**% Change: Housing Structures**
New London	39.47% (1990-2004)	6.71% (2001-2005)
Merrimack County	20.90% (1990-2004)	10.56% (1990-2000)
Pleasant Lake Watershed	N/A	2.99% (2001-2005)

Evaluation Criteria:

1) >25% / year
2) 15 – 25% / year
3) 7 – 15% / year
4) 0 – 7% / year
5) None within the past 5 years

Disclaimer: The group "0 – 7%" was chosen based off the rate of development for the Town of New London alone. The rate of development for the Town of New London was based solely on the percent change of housing structures from the years 2001 through 2005, and primary houses were the only structures used in the calculation. While this information is accurate and reliable, it would benefit interested

parties to look at the percent change of population over the fourteen year period indicated in the preceding table. As the reader can see, the percent change of population for New London in the fourteen year period was quite high, and was significantly higher than the whole of New Hampshire and Merrimack County. Furthermore, instead of using the rate of development for the immediate watershed as the number to base the evaluation off of, the entire town was used as incoming residents outside of the watershed have the potential to recreate at Pleasant Lake.

Sources:

American Factfinder. United States Census Bureau. http://factfinder.census.gov/home/saff/main.html

Stanley, Peter. Zoning Administrator. Town of New London. (603) 526-4821 Ext.16.

"State Data Center Library." New Hampshire Office of Energy & Planning. 27 Mar. 2006. http://www.nh.gov/oep/programs/DataCenter/library.htm

Assessment of Question: This question is adequate as stated.

Date Completed: March 2006

Investigator: Steven Hash

Attribute 10: Visual/Aesthetic Characteristics

Category: Unique or Outstanding Value

Question A: Scenic or natural features of interest visible from waterbody

Directions: Record the name(s) and locations (s) of any significant scenic or natural features of interest that can be viewed from the waterbody.

Rationale: The presence of significant scenic or natural features of interest that can be viewed from the waterbody.

Process Followed: Toured the lake by kayak and the surrounding area by car and foot. Also, consulted the Town of New London Master Plan and contacted members of the Pleasant Lake Protective Association for input. The Master Plan does list scenic resources for the town of New London, but none are located in the Pleasant Lake Watershed.

Findings and Analysis:
Mountains: Mount Kearsarge
Points: Kidder Point
Beaches: Elkins Beach
Islands: Blueberry Island

Evaluation Criteria:	**Score:**
1) None	1
2) At least 1	2
3) At least 2	3
4) At least 3	4
5) >3	5

Sources:
New London Planning Board. 1998. *New London Mater Plan, New London, New Hampshire.* Prepared with the assistance of the Upper Valley Lake Sunapee Regional Planning Commission.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005

Investigator: John Callewaert

Attribute 10: Visual/Aesthetic Characteristics

Category: Recreation

Question A: Scenic or natural features of interest visible from waterbody.

Directions: Record the name(s) and locations (s) of any significant scenic or natural features of interest that can be viewed from the waterbody.

Rationale: The presence of significant scenic or natural features of interest that can be viewed from the waterbody.

Process Followed: Toured the lake by kayak and the surrounding area by car and foot. Also, consulted the Town of New London Master Plan and contacted members of the Pleasant Lake Protective Association for input. The Master Plan does list scenic resources for the town of New London, but none are located in the Pleasant Lake Watershed.

Findings and Analysis:
Mountains: Mount Kearsarge
Points: Kidder Point
Beaches: Elkins Beach
Islands: Blueberry Island

Evaluation Criteria:	**Score:**
1) None	1
2) At least 1	2
3) At least 2	3
4) At least 3	4
5) >3	5

Sources:
New London Planning Board. 1998. *New London Mater Plan, New London, New Hampshire.* Prepared with the assistance of the Upper Valley Lake Sunapee Regional Planning Commission.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2005

Investigator: John Callewaert

Attribute 10: Visual/Aesthetic Characteristics

Category:

Question B: Scenic viewing opportunities of the waterbody

Directions: Using a map of your waterbody, mark the scenic locations from which the lake or pond can be viewed (ex. roadway pullovers, public parks, access sites, and public beaches) by the general public. Visit each location and on the same map shade in the **area of the waterbody** you are able to view from that spot. After visiting each location and shading in the area viewed, use the map to estimate the total percent of the lake viewed (percent of map that is shaded).

Rationale: Viewing areas allow the general public to gain an appreciation for the natural beauty of a lake or pond. Over time, these areas may also permit an evaluation of changes in land use along the visible shoreline.

Process Followed: Performed a windshield survey to determine the best viewing opportunities for the general public of Pleasant Lake. Locations were marked with a Global Positioning System (GPS) unit and later brought into the ArcMap 9.1 Geographic Information Systems program to perform viewsheds from the points. Pictures of the lake were also taken at the viewing locations.

Findings and Analysis: After completing the necessary data manipulation in ArcMap 9.1, it was determined that viewsheds were not the best possible way to determine the total percentage of lake viewable from the GPS points. This is because ArcMap does not take into consideration any forest cover or other land use. For this reason, the viewsheds produces from the GPS points showed areas of the lake that are impossible to view, due to forest cover, from each specific point. Therefore, it was determined that the pictures of the lake taken from each point were a more reliable way to determine the percentage of lake viewed from each location. A map with marked viewing locations and numbers corresponding to their respective pictures can be found on the following pages.

Evaluation Criteria:

1) No scenic viewing opportunities
2) Scenic viewing area(s) collectively allow <25% of waterbody to be observed
3) Scenic viewing area(s) collectively allow 25-50% of waterbody to be observed
4) Scenic viewing area(s) collectively allow 50-75% of waterbody to be observed
5) Scenic viewing area(s) collectively allow >75% of waterbody to be observed

Assessment of Question: I believe that for this particular questions, it is important to note other structures visible from the locations as well. If an individual visits one of the locations listed as a scenic opportunity of the lake, and there is a smokestack visible in

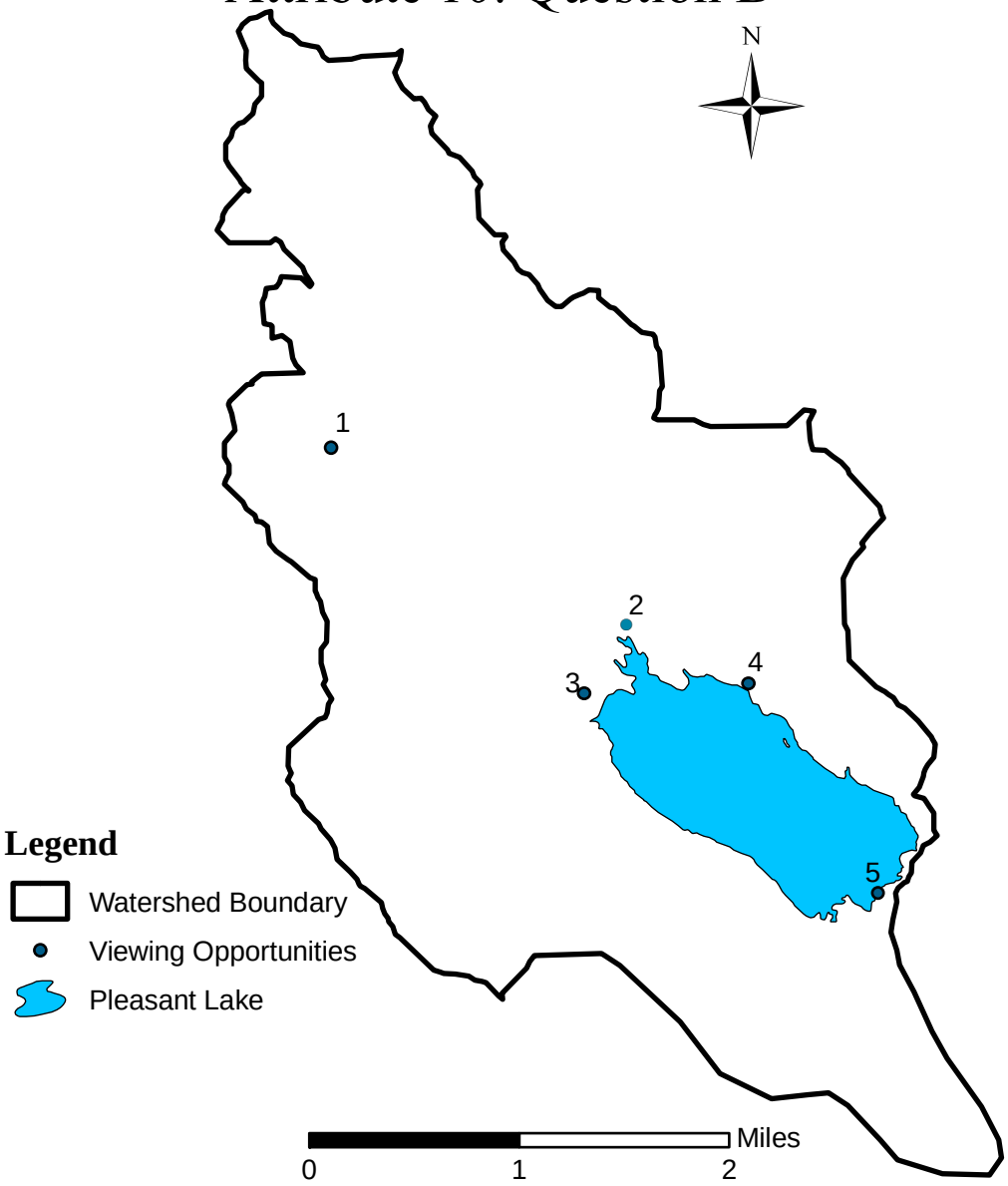
the distance, it will certainly take away from the aesthetically pleasing view of the lake. For this reason, I believe it will prove beneficial to also include any structures in the viewshed of each viewing location that has the potential to take away from the scenic viewing opportunity of each specific location.

Date Completed: November 2005

Investigator: Steven Hash

Scenic Viewing Opportunities of the Waterbody

Attribute 10: Question B



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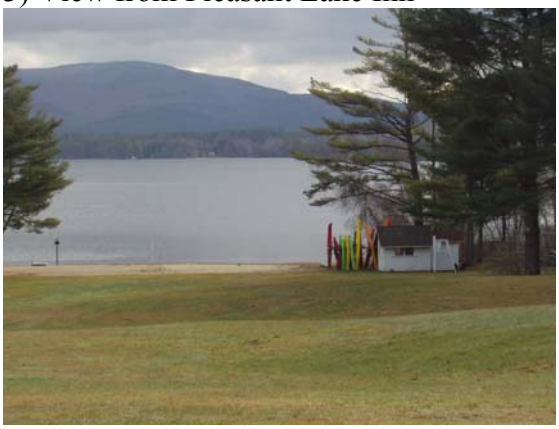
1) Morgan Hill Road

2) Lakeshore Drive

3) View from Pleasant Lake Inn



4) View from Lakeshore Drive

5) View from Elkins Beach

Attribute 10: Visual / Aesthetic Characteristics

Category:

Question C: Noise level at scenic viewing areas.

Directions: Gauge the levels of natural and unnatural detectable sounds at each of the scenic viewing areas identified above.

Rationale: The level of desirable noise varies from person to person, however noisy viewing areas, such as those next to busy roadways, will be less aesthetically pleasing than areas set in more remote areas.

Process Followed: Drove to the scenic viewing destinations and listened for a couple of minutes, noting all sounds natural and unnatural. The date was November 30, 2005. Weather was rainy, and foggy.
Scenic Views: Elkins Beach
Inn at Pleasant Lake
County Rd.
Highline Trail
Bunker Rd.

Findings and Analysis:

Elkins Beach – Natural: (birds) - Blue jays, Chickadees, and Herring Gulls. Running water (because of the heavy rain the past few days.) and coming from the Dam.
Unnatural: Cars- random not constant.

Inn at Pleasant Lake- Natural: (birds) – Blue jays, Chickadees, Crows.
Unnatural: Light car traffic in the distance, and one passing car.

County Rd. – Natural: (birds) – Chickadees, wind, and rain.
Unnatural: None- secluded area.

Bunker Rd. and Highline Trail not included in survey.

(Probable noise throughout the year)

Elkins Beach: Kids playing in the water, on the playground, Cars in the parking lot, Mechanical noise from Marshals Garage, Motor boats, cook-out noise, and many birds.

Inn at Pleasant Lake: Tennis balls from the two tennis courts, Kayakers on the water, Motor boats, Birds, Random car traffic.

County Rd.: Lots of birds, random hikers walking the foot paths. Very little vehicle traffic, maybe a faint buzz from the power lines on a quite day.

Sources: N/A

Assessment of Question: This question does not account for the different sounds that you will hear at different seasons. What is heard at one time of year, even time of day will vary quite a bit at different times of the year. Hence the additional Probable noise list.

Date Completed: November, 2005

Investigator: Matt Urban

Attribute 10: Unique Characteristics

Category:

Question D: Dominant land use visible from waterbody.

Directions: Estimate the percentage of visible undeveloped, agricultural, residential, and commercial land uses within the watershed from the waterbody. If you cannot view the entire watershed from one point, choose a variety of points on the waterbody. Using a map of the entire watershed, including the waterbody, mark your location. In different colors shade tin the types of land uses you see (undeveloped, agricultural, residential, and commercial). In the end you should have a map of visible land uses within your watershed as seen from the waterbody. Looking at the outline of the total viewable area of the watershed and comparing it to the areas of land use types that were shaded in, estimate the percentage for each type of land use viewed.

Rationale: Lakes and ponds that have little visible development tend to be more aesthetically pleasing than waterbodies with a heavily developed visible landscape surrounding them.

Process Followed: Used ArcGIS to perform a viewshed analysis from two points on the lake, the view from Elkins Beach and from the access road to the Slope and Shore private beach. Then used the Land Cover Assessment from GRANIT to determine the percentages of land use in the area determined to be visible.

Findings and Analysis:
Estimated percent:

% Forested:	89.02
% Agricultural:	3.70
% Residential and Commercial:	3.34

Evaluation Criteria:

1) Commercial of urban development dominate visible landscape.
2) Densely clustered residential development and occasional commercial land uses dominates visible landscape.
3) Residential and/or commercial development present are visible but interspersed with forested or other natural land use types.
4) Low density residential development present without any commercial development, but visible landscape dominated by natural vegetation and undisturbed land.
5) Entire visible landscape dominated by natural vegetation and undisturbed land.

Sources:

"New Hampshire Land Cover Assessment – 2001." NH Granit. University of New Hampshire. 22 Oct 2005 <http://www.granit.sr.unh.edu/>

Assessment of Question: This question is adequate as stated.

Date Completed: November 2005.

Investigator: Carly Rademaker

Attribute 10:

Category:

Question E: Odors present on a waterbody or at viewing locations.

Directions: Gauge the duration and intensity of natural and unnatural odors at various locations on the waterbody and at popular land-based viewing locations.

Rationale: The types and levels of detectable odors will affect the aesthetic value of the lake or pond being considered.

Process Followed: Went out and visited viewing locations around lake to judge if any odors were present.

Findings and Analysis: Around the lake area no offensive odors were present at the time viewing locations were visited. There were some sites such as the view from the Pleasant Lake Inn, and Bunker Road view sites where burning from wood stoves could be detected. However, wood stoves are a seasonal smell and will not be present in summer months when the lake is being used by tourists or visitors. The odor of wood burning may also be absent in different locations and on different days during the winter and fall seasons depending on use of stoves in the area.

Evaluation Criteria: **Score:**

1) Unnatural odors distinct and continuously present at more than 1 location
2) Unnatural odors distinct and continuously present at only 1 location
3) Unnatural odors intermittent dependent on production source(s) and wind direction at more than 1 location
4) Unnatural odors intermittent dependent on production source(s) and wind direction at only 1 location
5) Only natural odors detectable at all location(s)

Sources: Area visited November 30, 2005 by investigator.

Assessment of Question: Depending on seasonal influences results of this question may change, and day to day records are not reflected. Also, individual accounts of odor may be different.

Date Completed: November 2005

Investigator: Laurel Kenna

CHAPTER 3

Impacts of Development CHAPTER 3

Impacts of Development

Investigating the answers to the Comprehensive Lake Inventory stimulated further analysis into the impacts of development in the Pleasant Lake Watershed. Two questions related directly to current and potential development are the ones which addressed the amount of impervious surface and the rate of development in the shoreland area and the watershed (Questions 8D/9D and 8I/9J respectively). This essay integrates three pieces related to the impacts of development and how they affect the quality of Pleasant Lake; the amount of impervious surface in the shoreland and watershed, a build-out analysis to assess the impact of potential development in the watershed, and an analysis of the rate of development in the watershed.

Current research and literature concerning impervious surfaces show that impervious surfaces affect the amount of runoff in this way: the less area there is for water to percolate into the soil the more runoff will reach surface waters. The runoff water can carry pollutants such as gas, grease, and nutrients into water supplies.

During our review of related literature we recognized a gap in the research; we could not find any studies which addressed how different surfaces affected imperviousness. For example, how does gravel work as an impervious surface compared to bluestone, how much more runoff might asphalt create? We decided to create an experiment to address these questions by measuring how much water was collected running off of different surface types in a simulated rain event.

In the experiment we tested surfaces commonly found in the Pleasant Lake Watershed to understand how they affect runoff in a watershed system: asphalt, bluestone, gravel, and grass. We found that grass and bluestone surfaces create less runoff than gravel and asphalt surfaces. In fact grass and bluestone showed no runoff at all in the trials we ran. Gravel runoff varied largely across the different slopes and trials but was always consistently lower than the runoff from asphalt. The runoff from asphalt was always high; asphalt is certainly a highly impervious surface.

During our research we came across several studies conducted to determine thresholds of impact when looking at the amount of imperviousness in a watershed. A watershed with less than 10 percent impervious surface is considered protected, while a watershed with 10-30 percent is initially degraded or impacted. When a watershed exceeds 30 percent imperviousness it becomes highly degraded.[1] Our investigations determined that currently the entire Pleasant Lake Watershed is 3.48% impervious, meaning it is considered protected at this time.

When we limited our scope to look just at the shoreland of Pleasant Lake (which includes all land within 250 feet of the water's edge) we found a different story. The shoreland of Pleasant Lake is currently 17.70% impervious which puts it in the category

[1] Brabec, E., S. Schulte & P. Richards. "Impervious Surfaces and Water Quality: A Review of Current Literature and Its Implications for Watershed Planning." Journal of Planning Literature 16(2002): 499.

of being initially degraded. This means it will be even more important to play close attention to future development in the watershed and consider the possibility of converting certain impervious surfaces to more pervious surfaces if and where possible. For example, when an asphalt driveway starts to fall apart a landowner might want to consider replacing the asphalt with bluestone.

Another aspect of impervious surface we researched in our experiment was the effect of slope on the amount of runoff. Each of the four surfaces was tested at three different slopes (5, 10 and 25 percent) to see if steeper slopes created more runoff. The grass and bluestone had no runoff. Yet, in the cases of gravel and asphalt, steeper slopes significantly increased the amount of runoff created. This demonstrates that steep slopes can affect the amount runoff water that runs off of impervious surfaces.

In New London development is not permitted at slopes at or above 25%. The town's new zoning regulations also require erosion control measures for development on slopes between 15 and 25%. These new regulations are right in line with our findings and represent a very good step in the management of development in relation to slope.

Our investigations into the rate of development showed that the number of housing structures in the watershed is increasing by 2.99% per year (for specifics on how this percentage was calculated refer to Questions 8J and 9I in Chapter 2). This percentage, although relatively low, is an increase and thus management plans must address this trend. To help us further understand the watershed's potential for development growth a build-out analysis was completed.

A build-out analysis utilizes current zoning regulations and development to determine the maximum of parcels that are open for future development. We found that in a "worse-case scenario" of existing New London regulations, an additional 518 parcels could be developed in the watershed. These are parcels that are currently undeveloped or parcels that may be created by the division of existing parcels. There are currently 2,626 parcels in the Pleasant Lake Watershed.

The build-out can be integrated with many of our other findings to help create future management plans. Using rate of development it is possible to try to predict how fast development will occur, and how long it will take for the watershed to be "built-out". The build-out analysis can also help us to estimate how much new impervious surface can be created in the watershed. Currently, in New London, the average parcel has 0.14 acres of impervious surface. Using this number we can predict that, should an additional 518 parcels be developed in the future, 72.52 acres of new impervious surface would be created. When you add this number to the existing 6,606.22 acres in the watershed the watershed would increase from 3.5% impervious surface coverage to 4.6% impervious surface coverage.

The information regarding runoff on different impervious surfaces, and the effect of steep slopes, should be used when considering how new development in the watershed should proceed. It is easy to see how all of these different things: impervious surfaces, development, steep slopes, and the build-out work together and inform each other. By looking at each separately, and then integrated them together, they become a powerful tool for future management plans in the Pleasant Lake Watershed.

Impervious Surface Analysis & Maps

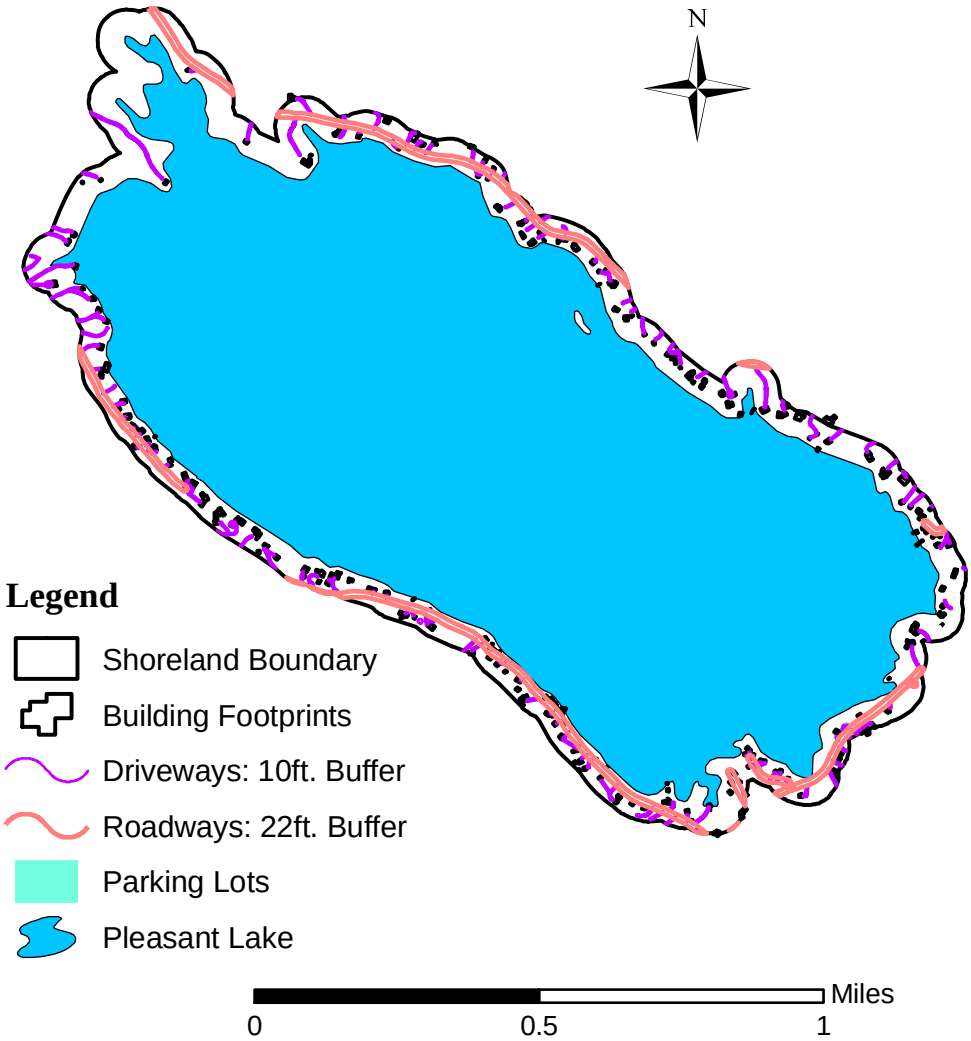
Addressing the impervious surface questions outlined in the Inventory proved especially difficult as there was no defined set of methodologies included with the Inventory. However, our group was able to create methodologies that used the best available information and data. Fortunately, the Town of New London has comprehensive Geographic Information Systems data that proved invaluable in completing the impervious surface Inventory question. Impervious surface calculations were completed using Geographic Information Systems (GIS) data and field work. GIS data layers constructed by Cartographic Associates, including building footprint, driveway, and roadway layers were used. Windshield surveys were employed primarily to ground-truth the data layers created by Cartographic Associates. While conducting the windshield surveys, width measurements were taken of numerous driveways and roadways to create average widths.

Any building structure, roadway, driveway, or parking lot that was missing from Cartographic Associate data, due to new features constructed after Cartographic Associates completed their data, were digitized into their respective layers. Driveway and roadway layers consist of spatially referenced linear data, and do not take into consideration width; therefore, the area they take up in the real world cannot be accounted for. The average widths calculated from the windshield survey measurements was then used in GIS to create buffers that represent an approximate width of the roads and driveways in real life. Driveways were assigned a ten foot width, while roadways received a twenty-two foot width. Once buffers were applied to driveways and roadways, the acreage of driveways, roadways, and building footprints could be calculated. The following table and maps represent the results for the impervious surface question regarding the shoreland and watershed:

Shoreland	**Acres**	**Watershed**	**Acres**
Building Footprints	5.39	Building Footprints	36.44
Roadways	15.98	Roadways	141.83
Driveways	7.7	Driveways	48.22
Parking Lots	0.1	Parking Lots	3.49
Combined Totals	**29.17**	**Combined Totals**	**229.98**
Shoreland Total	164.8	Watershed Total	6606.22
Percent Impervious	**17.70%**	**Percent Impervious**	**3.48%**

Impervious Surfaces: Shoreland

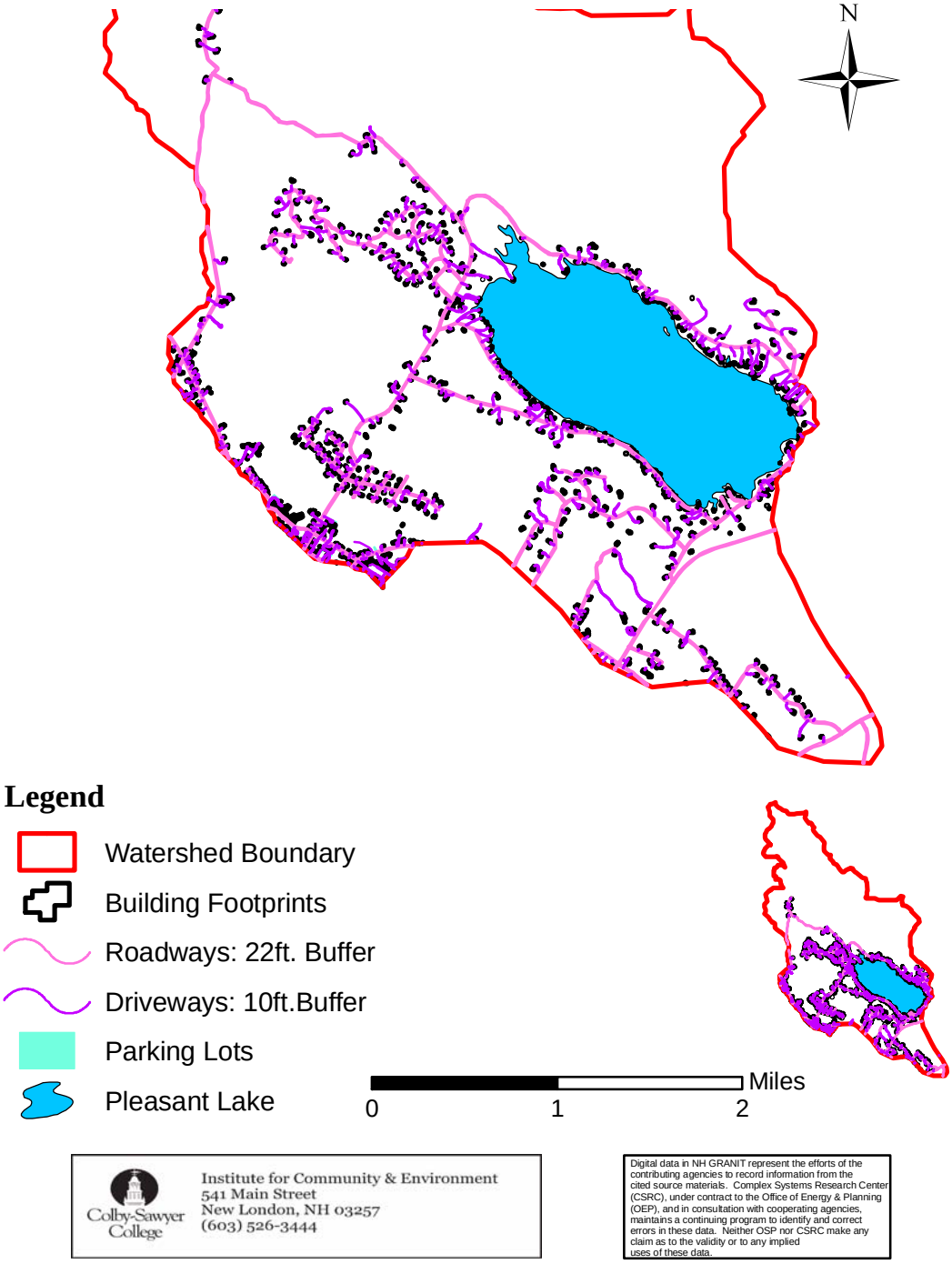
Attribute 8: Question D



Colby-Sawyer College
Institute for Community & Environment
541 Main Street
New London, NH 03257
(603) 526-3444

Impervious Surfaces: Watershed

Attribute 9: Question D



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Impervious Surface Experiment

After completing the necessary calculations to answer the impervious surface Inventory question, our group decided to extend our research on the topic of impervious surfaces. After reading multiple studies for a literature review on the issue, our group realized a gap in current literature pertaining to the percent imperviousness of various surface types. Therefore, we designed an experiment that could test the volume of runoff of various surface types set at different slopes. Our group hypothesized that certain surface types would produce larger amounts of runoff, and that all surface types would produce a larger amount of runoff at higher slopes.

METHODS

Surface Types

Our group chose four common surface types found in the Pleasant Lake Watershed, which are grass, gravel, bluestone, and asphalt. We choose these surfaces because gravel, bluestone, and asphalt represent the road and driveway surfaces in the watershed. In addition, several of the studies we read mentioned that mowed grass could potentially act like an impervious surface so we elected also to test that assumption.

Surface Types

Asphalt

Bluestone

Gravel

Grass

Lab Reproduction of Surface Types and Procedures

The need for replication in size throughout the surface types was of great importance, as we needed to control the amount of rainfall applied to each surface. To solve this problem stream tables were purchased. The hard plastic stream tables measured 48" x 14" with a 4" depth and sloping sides. The stream tables have small holes at the bottom center of one end which allows percolated water to run out of the table. The water which exits through this hole must be collected separately from the surface runoff. On the bottom edge of each surface a small piece of flashing was attached to all the water to run straight from the surface into a collection tray so it would not pool at the end of the table. A piece of sod was purchased and laid on top of loam in one stream table. The soil was added in order to make the grass fit the table accurately. A stream table was not needed for the asphalt surface so it was fitted straight into the impervious surface platform. The asphalt measured of 49" x 14" x 2.5". Three-quarter inch plastic tubing was cut in half and fit to the lengths of either side of the asphalt to eliminate water penetrating between the asphalt and wood during trials. To further ensure this water-tight seal, asphalt caulking was applied to the seam of the plastic tube and asphalt surface.

Construction Procedures and Methods

Construction:

Each impervious surface needed to be set at four different slopes. In order to achieve this, an impervious surface platform (ISP), and impervious surface riser (ISR) were constructed. Four ISPs were constructed to hold the individual tables and the ISR was used to raise each ISP to the different slope percentages. The simple design relies on a rope and pulley system.

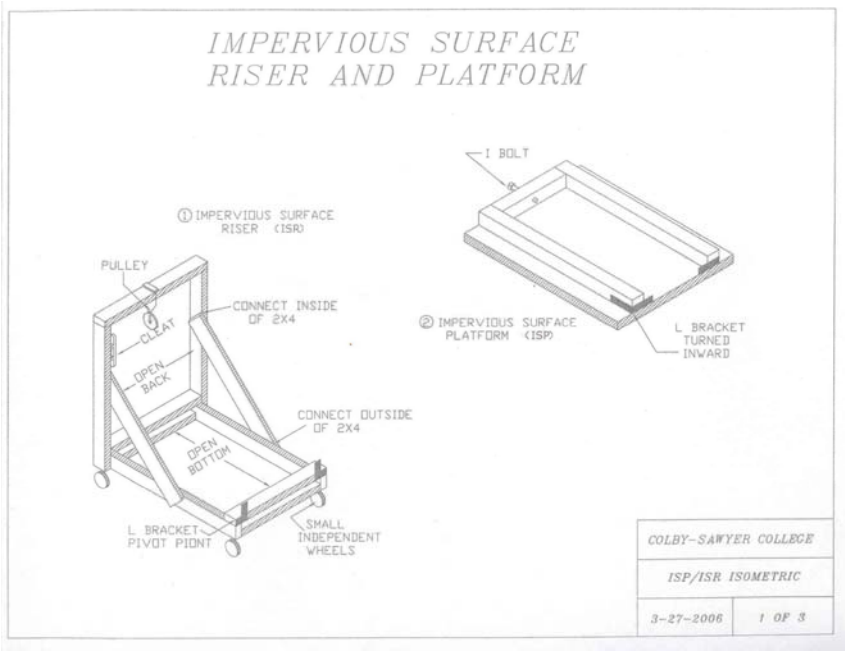
Tools:

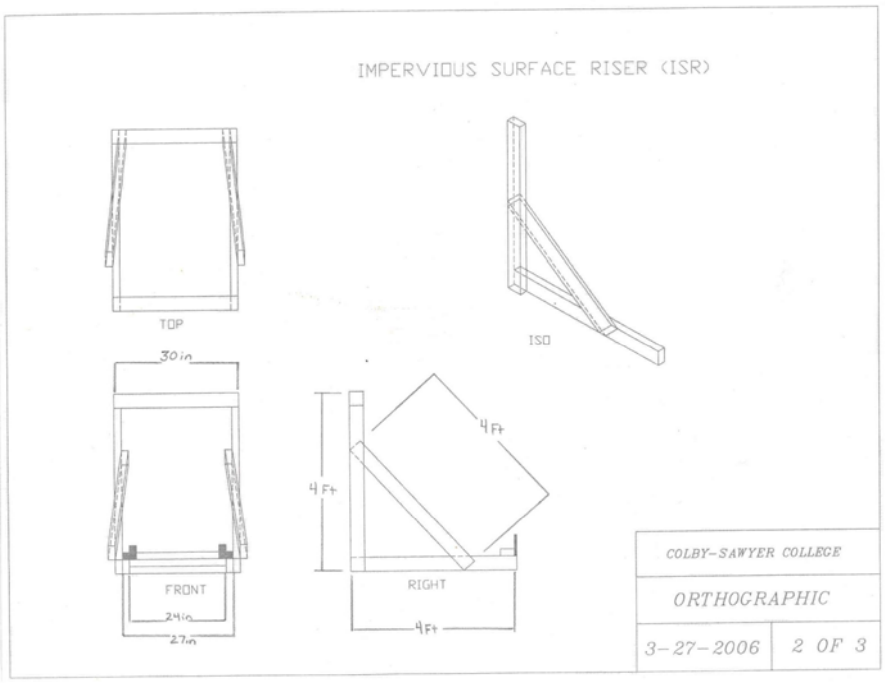
- Circular Saw
- Power Drill
- Screw-driver
- Wrench
- Safety Goggles
- Saw-horses
- Tape-Measurer

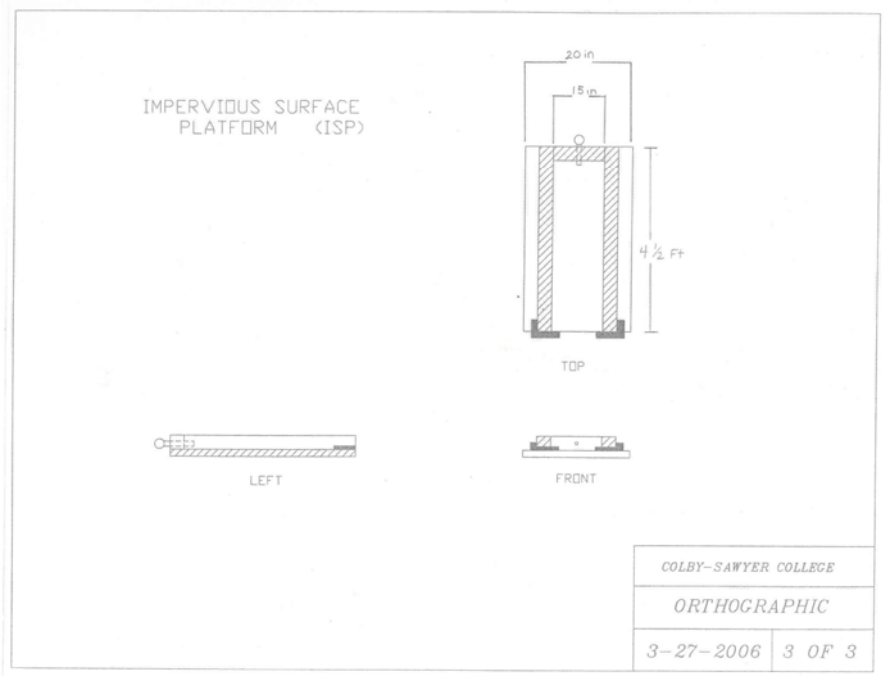
Materials:

- Plywood
- 2x4's
- 2" screws
- 1 ¼" screws
- Rope – static not dynamic to avoid stretch
- Pulley
- Cleat - with fitting bolts and washers
- (4) Wheels
- Carabineer
- Washer
- (3) Eye-bolts
- (8) L-brackets

Impervious Surface Riser (ISR) & Impervious Surface Platform (ISP):







In order to test the effect of various slopes construction of a riser was required to lift the ISP. Only one riser is required to be built because all ISP's are equipped with the hardware needed for being hoisted. However, make note that only having one riser reduces the speed because multiple trials could not be performed at the same time.

Rate Calculation

Using the 2-Year Frequency 24-hour Duration Rainfall information from the USDA Soil Conservation Service we determined that an average rain event would deposit 2.7 inches of water in a 24 hour period. This number was divided by 24 to get the amount of rain that would fall in 1 hour, 0.1125 in. This number was used to calculate the volume of water that would need to be released onto the surfaces over an hour by multiplying it by the dimensions of each surface type (width: 13 in, length: 48 in, depth: 1 in):

$$0.1125 \times 48 \times 13 \times 1 = 70.2 \text{ in}^3$$

This new number was then converted from cubic inches to liters:

$$70.2 \text{ in}^3 = 1.15 \text{ liters/hour}$$

Rain Event Calibration

To recreate this rainfall event for our experiment several methods were attempted before to determine which would work best. We first attempted to calibrate an

intravenous (IV) drip to release 1,150 ml of water over the period of one hour. This method was not very accurate or useful. The centralized drip was not at all representative of an actual rain event as the rainfall calculations for the surfaces were based on an entire use of the surface area. We also attempted calibrating a large container with a small spout but the spout proved unreliable and it was impossible to recreate the exact same rate of water release for each individual trial.

The method that we adopted was to have spurts of rainfall that would dump 1/4 of the 1,150ml at four intervals within an hour. The first spurt was released at the beginning of an hour and next three at 15, 30, and 45 minutes. Each spurt released 287.5 ml of water onto the surface being tested. When the full hour had elapsed the total amount of surface runoff that occurred was recorded. This technique enabled us to utilize the entire surface area and recreate the exact same rate of water release for every trial. We felt that it more accurately portrayed an actual rainfall event in which the intensity of rainfall varies dynamically.

Slope Calibrations

Three different degrees of steepness were chosen for this experiment based on regulations in the Pleasant Lake Watershed. The three slopes used were 5%, 10%, and 25%. Zoning regulations adopted in prohibit construction on slopes at or above 25%. Additionally erosion control measures must be taken for slopes between 15% and 24%. Based on this information our steepest slope was chosen to be 25%. The great majority of streets and driveways in the Pleasant Lake Watershed were observed to be around a 5% slope so that became our lowest slope. A 10% slope seemed to be a good intermediate slope to test for comparison.

The slope percentages convert as angle degrees as follows:

5% = 3°

10% = 6°

25% = 14°

5%

10%

25%

Water Collection and Measurement

We ran trials for each of the surfaces at the three different slopes. The trials were run for an hour each, the time beginning as the first pulse of 287.5 ml of water was released. The next three pulses were released at 15, 30, and 45 minutes. At the end of the hour period the total amount of water that had runoff into the catchment tray and bucket was measured using a 250ml graduated cylinder. The runoff was collected and measured at 60 minutes, 15 minutes after the last pulse was released.

DATA & ANALYSIS

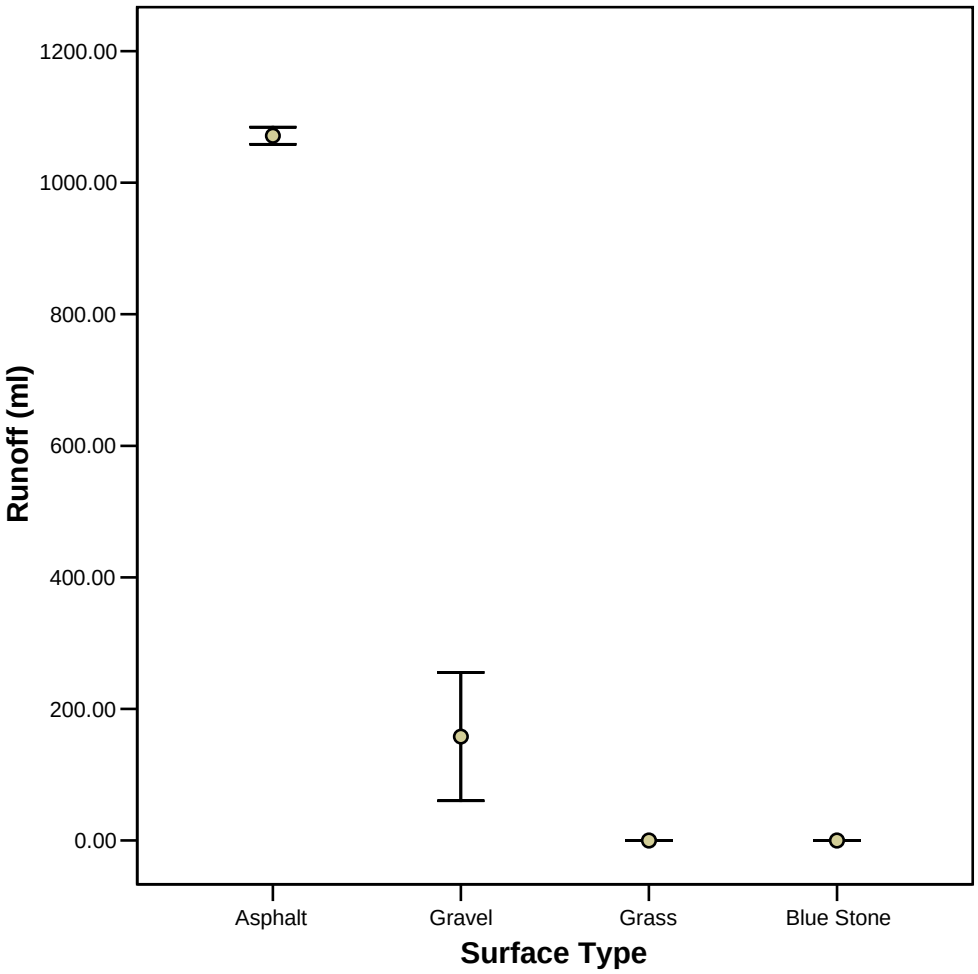
The runoff measurements gathered from the experiment show a significant difference between asphalt and gravel. The other two surfaces, grass and bluestone had no runoff at all three slopes. This table below illustrates the level of runoff from all three of the slopes, and for all five trial events. With an average of the total runoff, comparisons at all three slopes are more apparent.

Surface	*Slopes (%)*	*Runoff (ml)*	*Average*
Asphalt	5%	1,063	1,057.4
		1,020	
		1,090	
		1,074	
		1,040	
	10%	1,064	1,065.2
		1,044	
		1,062	
		1,072	
		1,084	
	25%	1,102	1,091.4
		1,101	
		1,084	
		1,078	
		1,092	

Surface	*Slopes (%)*	*Runoff (ml)*	*Average*
Gravel	5%	0	0
		0	
		0	
		0	
		0	
	10%	0	122.2
		43	
		220	
		222	
		126	
	25%	212	531.4
		430	
		365	
		220	
		530	

Surface	*Slopes (%)*	*Runoff (ml)*	*Average*
Grass	5%	0	0
		0	
		0	
		0	
		0	
	10%	0	0
		0	
		0	
		0	
		0	
	25%	0	0
		0	
		0	
		0	
		0	

Surface	*Slopes (%)*	*Runoff (ml)*	*Average*
Bluestone	5%	0	0
		0	
		0	
		0	
		0	
	10%	0	0
		0	
		0	
		0	
		0	
	25%	0	0
		0	
		0	
		0	
		0	



Asphalt is consistent at all three slopes with minimal variation for each trial. On the other hand, gravel showed greater variance for each trial at all three slopes. Also apparent, is that asphalt and gravel created more runoff as the slope increased. Therefore, our hypothesis that runoff will be effected by different surface types, and that runoff will increase as slope increases, was supported. The results of this experiment should be considered an educational opportunity to teach communities about the effects of impervious surfaces and runoff.

Build Out Analysis

Build-out analyses are a relatively new addition to watershed management used to assess current zoning regulations and their effectiveness against ecologically inappropriate development within a town or watershed. They are useful for targeting areas for Best Development Practices. Build-out analyses provide projections of how the town could develop if the population trend continues and current zoning regulations remain the same. This will likely be of interest when a town updates its master plan or considers developing new zoning regulations. Build-out analyses can be used politically to support ordinances and other regulations, but it is also important to understand the limitations of the analysis. Knowing the potential for development is crucial in order to

calculate the potential increase in impervious surfaces within the watershed, as well as looking at potential habitat loss or changes in land use, which could negatively effect lake and stream health.

Our team used Geographic Information Systems (GIS), to estimate the projected build-out for the Pleasant Lake Watershed. Using specified methodology and possessing no personal knowledge of parcel ownership and biases, the team was able to accurately and candidly represent the potential for development within the watershed. This objective analysis is an impartial representation of what could occur within the watershed, rather than one based on current ownership or land use status.

Build-Out Analysis Methodology

Geographic Information Systems (GIS) software and digital data layers created for the town of New London by Cartographic Associates of Littleton, NH were used to complete this build-out analysis.

1) Using the New London parcel data layer, we overlaid the buildings layer to find out which parcels were developed. Parcels that already contained a structure or that could not be divided further (as determined by zoning), were removed.
    a. Example; a 3.9 acre lot in R2 which already has a building on it could not be divided and therefore could not be developed any further.

2) Removed parcels that fell within the Buffered Wetland Layer created by Cartographic Associates.

3) Created a steep slopes layer using GIS (Appendix I), and removed all slopes over 25%.
    a. The town of New London has constraints to development on steep slopes, as adopted by the 2006 zoning ordinance: (Appendix II)
        i. Regulating development on slopes between 15-24 percent with respect to erosion control measures.
        ii. Prohibiting development on slopes over 25 percent.

4) Using New London zoning regulations, we removed all parcels that were too small to be developed (R1/2 = < 2 acres, ARR = < 4 acres, CON = < 10, C = < 1000 sq. feet, FOR = < 25 acres).

5) Remaining parcels were divided based on zoning regulations to calculate the worst case scenario of how many times the parcel could be divided into smaller parcels.

6) Parcels that fell within two zoning areas were divided digitally and the acreage calculated for each zoning area, then the two parts were analyzed separately based on the zoning. Example: If a parcel fell within two zoning areas and each of the parcel sections were too small for further development in each zoning area, it was divided based on the zoning which was dominant on the parcel.

Results

The build-out analysis showed 518 potential developable parcels in the Pleasant Lake Watershed. The parcels were distributed as follows:

46	Agricultural / Rural Residential
6	Commercial
2	Conserved
22	Forested
1	Residential (Low Density)
441	Residential (High Density)

It is important to understand the impacts of potential development within the watershed. Development causes an increase in impervious surface effects and increases the likelihood that the water quality of the lake and its surrounding streams and wetlands will become degraded.

Rate of Development Analysis

One of the biggest challenges for our group throughout the year was answering the questions associated with Rate of Development. This is for the simple fact that Rate of Development can be calculated in a number of ways, and the Inventory offered no established methodologies. However, even without a defined set of steps for calculating Rate of Development, our group was able to develop methodologies that utilized the best available information from town, state, and federal sources. With the newly formulated methodologies and reliable information, our group was able to calculate the percent increase in housing structures for the state of New Hampshire, Merrimack County, Town of New London, and Pleasant Lake Watershed. Furthermore, we calculated percent increase in population for each, which the Inventory did not request, in order to paint a fuller picture of Rate of Development.

Due to the limitations of the data available for calculating the rate of development for the Pleasant Lake Watershed, the calculation needed to be applied at the town, county, and state level. Working with the best available information, the rates of development for the Town of New London, Merrimack County, and New Hampshire were calculated using population data from the New Hampshire Office of Energy & Planning (OEP). This information was analyzed to show the percent increase in population from 1990 to 2004. Data pertaining to 1990 and 2000 were obtained from the US Census Bureau, while the 2004 estimates were from OEP data. Furthermore, the percentage of new housing structures was also used in determining the rate of development for the Town of New London, Merrimack County, and New Hampshire. Information from the US Census Bureau concerning total housing units was manipulated

to complete these calculations. On the town level, the Census Bureau only had information regarding total housing units for the year of 2000. Information on the county level was found for 1990 and 2000. On the state level, information was found for 1990, 2000, and 2004. Therefore, a 10 year comparison was completed for Merrimack County, and a 14 year comparison was completed for the state of New Hampshire. In order to complete any sort of comparison on the town level, Peter Stanley, the Town of New London Zoning Administrator, was contacted for information regarding the number of housing permits. Mr. Stanley had information on housing permits issued for new housing developments from 2000 to 2005. This information was used in completing a 5 year comparison for the Town of New London.

While there was no information concerning number of housing units on the watershed level, the calculation was completed using a variety of sources other than the OEP and Census Bureau. Geographic Information Systems (GIS) were used to find how many housing structures were in the watershed, based off data layers constructed by Cartographic Associates. Peter Stanley, the Zoning Administrator for the Town of New London was then contacted to determine how many permits were issues for new housing structures in the past four years. These numbers were then used along with the data derived from GIS to calculate the percent increase in housing structures from 2001 to 2005 in the immediate Pleasant Lake Watershed.

Methods and results for calculating the percent increase in population and housing structures on the state, county, town, and watershed level are outlined below:

	1990			**2004**	
	Population	**Housing Units**		**Population**	**Housing Units**
New Hampshire	1,109,117	503,904		1,306,000	575,671
Merrimack County	120,005	50,870		145,085	56,224 (2000)
New London	3,180	2,085 (2000)		4,435	2,225

On the state level, calculating the 14 year percent increase in population for the state of New Hampshire was completed as follows:

[(population 2004 - population 1990) / population 1990] x 100
-Or-
[(1,306,000 - 1,109,117) / 1,109,117] x 100 = 17.75% Increase in Population

One the state level, calculating the 14 year percent increase in total housing structures was completed as follows:

[(housing 2004 - housing 1990) / housing 1990] x 100
-Or-
[(575,671 - 503,904) / 503,904] x 100 = 14.24% Increase in Housing

The remaining percent increases were calculated using the same logic as the previous examples. The results can be found in the following table:

	% Change: Population	% Change: Housing Structures
New London	39.47% (1990-2004)	6.71% (2001-2005)
Merrimack County	20.90% (1990-2004)	10.56% (1990-2000)
Pleasant Lake Watershed	N/A	2.99% (2001-2005)

It is easy to see by the results of calculating the percent increases in population that New London has seen a dramatic increase in the number of residents over the past fourteen years; the population of New London has increased at over two times the rate of the entire state of New Hampshire, and just about two times as fast as Merrimack County. If New London continues along the same trend-line, Pleasant Lake could see a large increase in the number of individuals who recreate there. Furthermore, the potential increase in impervious surfaces could prove extremely detrimental to the health of the lake and its corresponding watershed.

CHAPTER 4

Water Testing

Over the past few months our team has conducted a number of tests on the inlets and outlet of Pleasant Lake. These tests were conducted in order for us to better examine the lake and its overall composition and health within the watershed.

Flow

The first test conducted was a one time look at the flow rate of the six inlets and the outlet. Looking at flow rates for all of these streams allows us to determine possible sources for Pleasant Lake, e.g. streams or possible springs. Identifying these sources provides an important understanding of the characteristics and sources of the water in Pleasant Lake. Our glimpse at the flow rate showed that Pleasant Lake had an inflow of 1.019 m^3/sec and an outflow of 3.166 m^3/sec. The difference in these numbers suggests that the lake could have other sources for its water, such as springs. Nevertheless, further data collection is needed to determine whether these data are correct and consistent throughout the year. For example, this analysis could not account for intermittent streams/inlets.

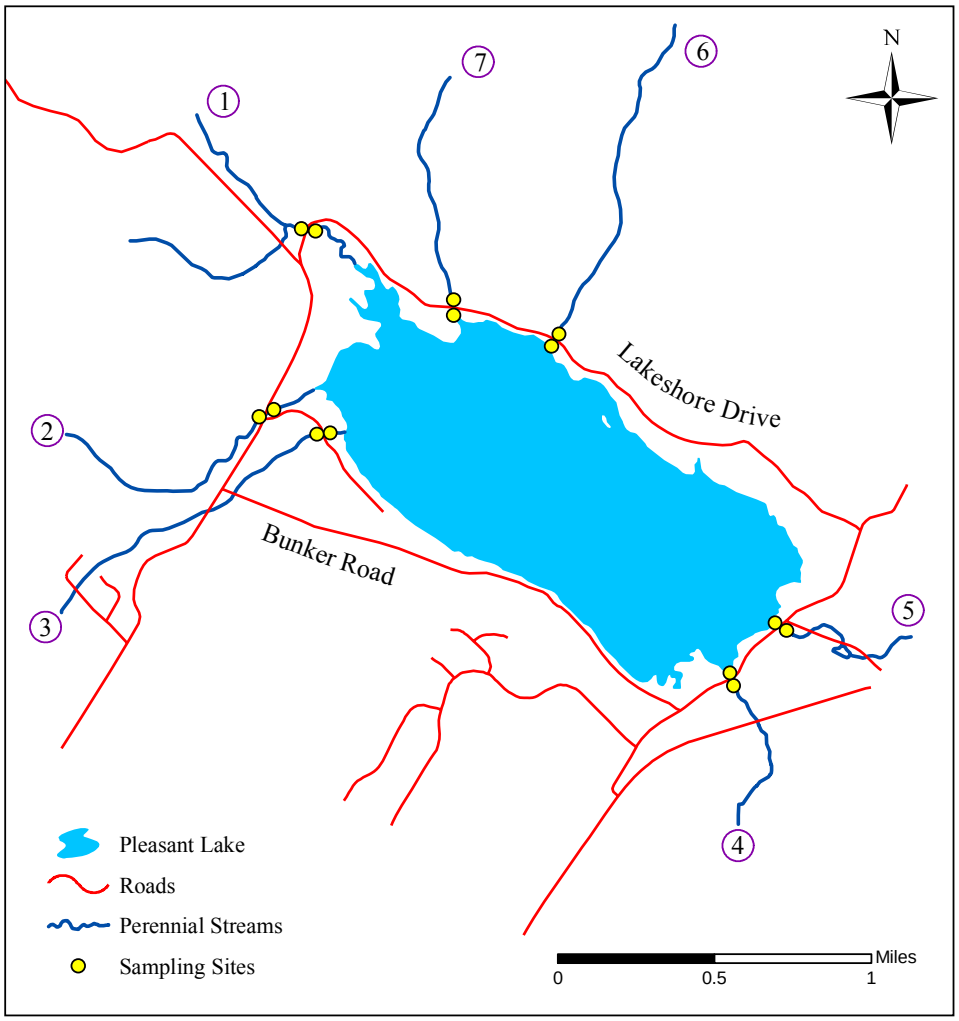
In-Flow (m^3/sec)

- Great Brook: .558
- Red Brook: .144
- Inlet B: .105
- White Brook: .090
- Inlet A: .063
- Low Plains: .059
- **Total: 1.019**

Out-Flow (m^3/sec)

- **Dam: 3.166**

Water Testing Sampling Sites



Perennial Streams Tested

1) Great Brook
2) White Brook
3) Red Brook
4) Low Plains Inlet
5) Outlet
6) Inlet B
7) Inlet A

Conductivity

Our team also looked at the overall water quality indicators, testing the pH, temperature, conductivity and turbidity of each inlet above and below the last place each stream crossed a road before entering the lake. (These were the same sites at which flow

measurements were taken.) Looking at these measurements allowed us to identify if there are any significant problems with the stream caused by external impacts. Conductivity measurements are particularly helpful in determining human impact on these streams. Through these tests we hoped to establish baseline data for the streams and provide information that will potentially lead to further investigation of the inlets. Identifying the locations with detectable differences or impact will be helpful to the local area when establishing best management practices or new zoning ordinances concerning stream protection.

Methods:

Our team collected two samples from each site, one above and one below the last road the inlet crossed before entering the lake. Each sample was collected in running water, using collection poles and bottles. After the water was collected, we brought it back to the water quality lab at Colby-Sawyer to test the pH, turbidity and conductivity of the samples. All water samples had to be warmed to 20-25 degrees Celsius before conducting the water testing. These tests were done every other week during the semester.

Results:

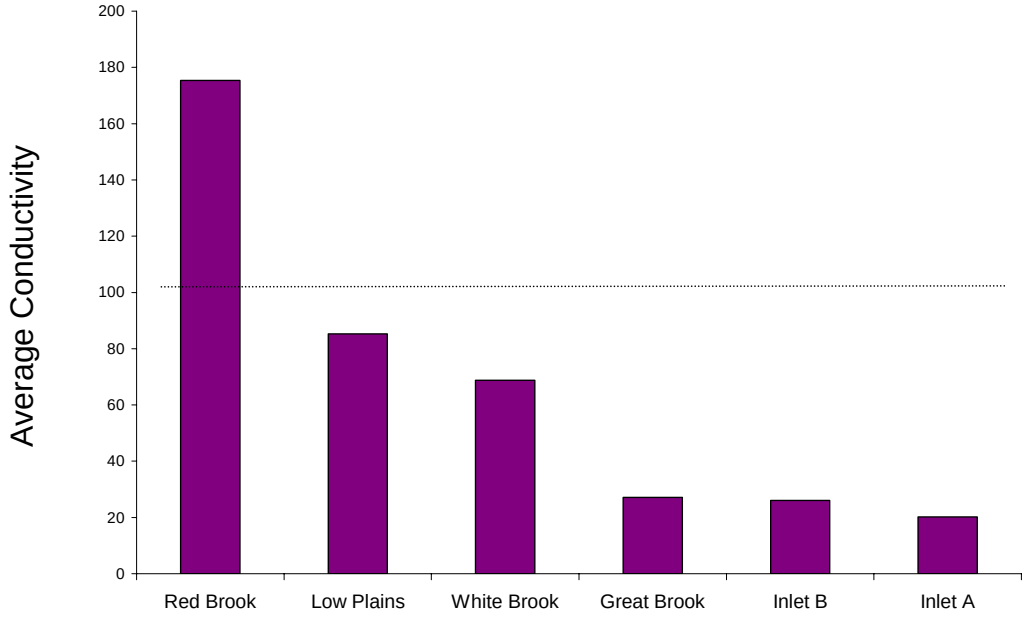
After collecting all the samples and looking at the results, it was clear to us that, in general, the pH and turbidity of the streams did not show signs of significant concern. For pH, that would be multiple readings below 5.5-6, and for turbidity it would be readings greater than 5 NTU.[2] However, the conductivity readings showed a significant difference between streams. Through our research, it was determined that a reading of 100 µS/cm or higher for conductivity was a sign of considerable human impact on a stream. The table on the next pages shows that Red Brook had a significantly higher conductivity reading suggesting that it was impacted by human influences.

Once the calculations were graphed and charted, a map was created using GIS that showed each individual inlets' subwatershed. This allowed us to look at each stream and how it was being impacted by impervious surfaces such as houses and roads. Once these numbers were analyzed we were able to look at the percent imperviousness in comparison to the conductivity. Looking at these numbers we were then able to suggest a positive correlation between impervious surface / human impact and conductivity within streams.

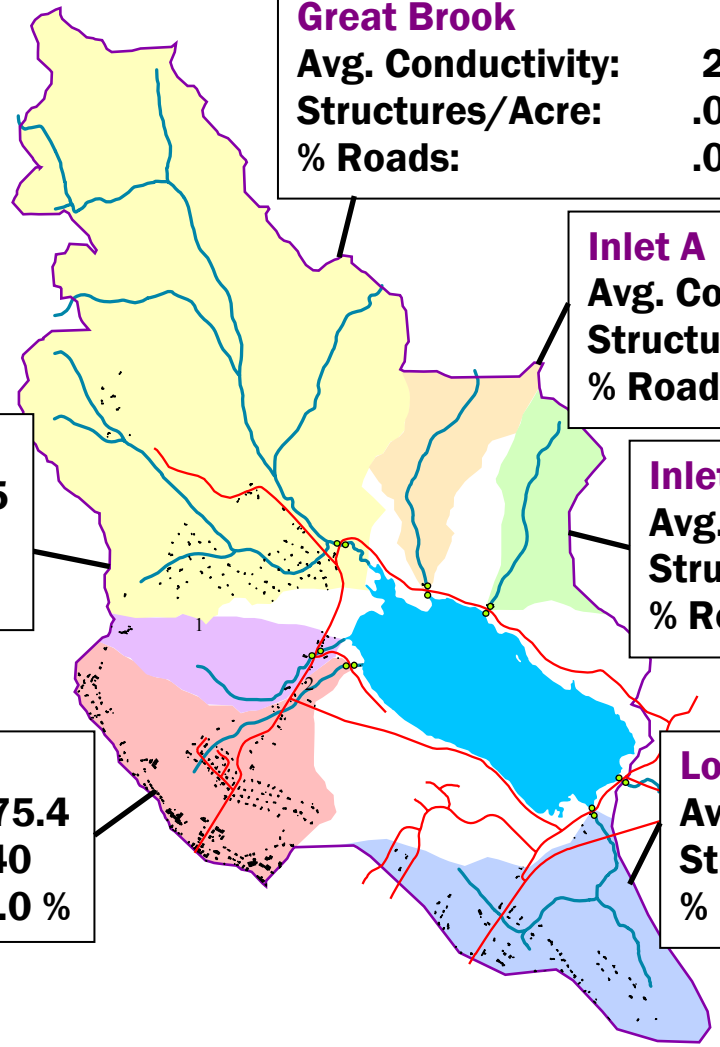
After analyzing the map showing the inlets' subwatersheds it was clear that conductivity was directly related to the amount of development within the sub-watershed. In conclusion, our results suggest that development and impervious surfaces which result from that development increase the conductivity of the streams, significantly impacting the watershed.

[2] Water on the Web. Understanding: Water Quality. http://waterontheweb.org/under/waterquality/, June 6, 2006

DATE	STATION NAME		pH	TEMP °C	COND. µS/cm	TURB. (NTU)
1/30/2006	Red Brook	above	6.56	22.6	171.9	3.89
1/30/2006	Red Brook	below	6.81	24.1	170.5	1.08
2/13/2006	Red Brook	above	6.84	23.1	185.5	1.81
2/13/2006	Red Brook	below	6.82	21.3	182.3	1.11
2/27/2006	Red Brook	above	6.37	24.3	168	1.74
2/27/2006	Red Brook	below	6.46	25	191.4	1.11
3/20/2006	Red Brook	above	6.50	24.5	178	0.74
3/20/2006	Red Brook	below	6.57	24.9	177	0.64
4/3/2006	Red Brook	above	6.49	23.2	165.2	0.73
4/3/2006	Red Brook	below	6.56	24.3	164.2	0.77
	Red Brook Average				**175.4**	
1/30/2006	Low Plains	above	6.15	24.6	86.3	0.46
1/30/2006	Low Plains	below	6.10	25	81	0.48
2/13/2006	Low Plains	above	6.20	23.1	89.3	0.49
2/13/2006	Low Plains	below	6.17	21.4	79.4	1.82
2/27/2006	Low Plains	above	5.97	23.8	104.6	0.49
2/27/2006	Low Plains	below	5.96	24.8	91.7	12.9
3/20/2006	Low Plains	above	6.18	22.3	92	1.14
3/20/2006	Low Plains	below	6.32	22	90	0.85
4/3/2006	Low Plains	above	5.84	22.4	69.8	0.87
4/3/2006	Low Plains	below	5.88	20.8	68.7	1.02
	Low Plains Average				**85.28**	
1/30/2006	White Brook	above	6.17	24.4	63	0.81
1/30/2006	White Brook	below	6.38	24.5	69.2	0.83
2/13/2006	White Brook	above	6.52	20.6	61.7	0.88
2/13/2006	White Brook	below	6.54	20.4	64.3	1.41
2/27/2006	White Brook	above	5.95	23	84	1.36
2/27/2006	White Brook	below	5.90	21.3	85.7	1.3
3/20/2006	White Brook	above	6.50	23.7	62	1.04
3/20/2006	White Brook	below	6.42	24	65	0.88
4/3/2006	White Brook	above	6.02	22.5	66.5	1.22
4/3/2006	White Brook	below	6.36	22	66.1	1.71
	White Brook Average				**68.75**	
1/30/2006	Great Brook	above	5.85	22.3	24.4	0.68
1/30/2006	Great Brook	below	5.97	24.9	25	0.47
2/13/2006	Great Brook	above	6.01	22.5	26.5	0.58
2/13/2006	Great Brook	below	5.93	23.3	26.7	0.75
2/27/2006	Great Brook	above	5.60	23	28.9	0.45
2/27/2006	Great Brook	below	5.76	24.8	28.9	2
3/20/2006	Great Brook	above	5.89	22	28.3	0.65
3/20/2006	Great Brook	below	5.97	20.5	28	1.09
4/3/2006	Great Brook	above	5.74	24.1	26.8	1.3
4/3/2006	Great Brook	below	5.90	21.9	27.9	2.07
	Great Brook Average				**27.14**	
1/30/2006	Inlet B	above	6.02	24	24	2.29
1/30/2006	Inlet B	below	6.25	24.8	24.2	0.35
2/13/2006	Inlet B	above	6.27	23.3	25.5	0.56
2/13/2006	Inlet B	below	6.25	23.3	25.7	0.71
2/27/2006	Inlet B	above	5.88	24.2	26.9	1.17
2/27/2006	Inlet B	below	5.95	23.9	27.8	0.8
3/20/2006	Inlet B	above	6.34	22.4	27	0.85
3/20/2006	Inlet B	below	6.35	24.7	28	0.53
4/3/2006	Inlet B	above	5.73	22.6	25.9	0.64
4/3/2006	Inlet B	below	5.81	23.9	26.2	0.8
	Inlet B Average				**26.12**	
1/30/2006	Inlet A	above	5.44	22.6	18.7	1.48
1/30/2006	Inlet A	below	5.40	20.1	19.1	0.67
2/13/2006	Inlet A	above	5.47	23.4	19.8	0.47
2/13/2006	Inlet A	below	5.51	20.8	19.8	0.38
2/27/2006	Inlet A	above	5.14	24.6	20.6	1.58
2/27/2006	Inlet A	below	5.22	21.5	20.8	1.3
3/20/2006	Inlet A	above	5.55	24.2	20	0.44
3/20/2006	Inlet A	below	5.68	23.1	20	0.66
4/3/2006	Inlet A	above	5.46	21.9	21.4	1.07
4/3/2006	Inlet A	below	5.39	20.6	22.3	1.09
	Inlet A Average				**20.25**	



Inlet	Mean Conductivity	Acres in Watershed	# of Structures	# Structures per Acre	Acres of Road	Acres of Road per Acre
Red Brook	175.4	626.49	252	0.4	58.4	9.00%
Low Plains Inlet	85.28	640.26	84	0.13	10.65	2.00%
White Brook	68.75	277.12	18	0.06	25.6	9.00%
Great Brook	27.14	2815.65	102	0.04	13.61	0.50%
Inlet B	26.12	291.08	1	0.003	0.17	0.01%
Inlet A	20.25	318.3	4	0.01	11.6	4.00%



Great Brook
Avg. Conductivity: 27.14
Structures/Acre: .04
% Roads: .05 %

Inlet A
Avg. Conductivity: 20.25
Structures/Acre: .01
% Roads: .04 %

Inlet B
Avg. Conductivity: 26.12
Structures/Acre: .003
% Roads: .01 %

White Brook
Avg. Conductivity: 68.75
Structures/Acre: .06
% Roads: 9.0 %

Red Brook
Avg. Conductivity: 175.4
Structures/Acre: .40
% Roads: 9.0 %

Low Plains
Avg. Conductivity: 85.28
Structures/Acre: .13
% Roads: 2.0 %

CHAPTER 5

Lake Related Policy

Policy is a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions (Merriam-Webster). The policy that is referenced within this portfolio suggests action that could affect lake management practices if ratified. In New Hampshire, legislation has to be passed by both the House and Senate. Many bills are passed in the House and are then turned down when they make it to the Senate. Legislation is written in attempt to enact new rules. The legislation is introduced as House Bills or Senate Bills. Four particular House Bills that are supported by the New Hampshire Lakes Association that may be of interest to the Pleasant Lake Protective Association are: HB162 – (Boating Speed), HB1407- (Milfoil), HB1673- (Mercury Emissions), and HB1140- (Loon Protection). We suggest that all members of the Association actively view the status of current legislation, and keep an eye out for new bills. This can be done by visiting the New Hampshire General Court's website (http://www.generalcourt.state.nh.us/ie/). From this site you can search for the status of any bill that is currently active. When surfing through all of the legislation that is on the House and Senate cutting board, it is important to keep with the pertinent policies that relate to the needs of the Association. One way to stick to the important issues is by visiting the New Hampshire Lakes Association's website to view the issues that they have listed as their key initiatives at: (http://www.nhlakes.org/).

Boating Speed HB 162

Steve Hash

Overview of Topic:

Recreation is often the primary use of public lakes and ponds around the country. Any individual who has visited a lake or pond open for recreation in the summer can bear witness that recreation comes in many different forms. The issue for much of the general public, specifically shoreland residents, becomes how much recreation is too much. Limnologists may state that any form of recreation degrades a lake, and that they should be left pristine; even if that means the lake is covered with biologically important algae, which can take away from the aesthetical pleasure derived from the lake. However, it is quite ambitious to believe that the general public would allow scientists to close down lakes for biological purposes. Our society is rather anthropocentric, meaning the majority would rather see a lake destroyed by recreation than closed down to it. Therefore, it is important for interested groups to act as stewards, and devise a way to control the intensity of recreation to minimize the degradative effects.

Stakeholders:

Stakeholder groups concerned with this particular policy are quite large. The first group is all individuals using affected waters for recreation. However, there are sub-groups within these stakeholders. For instance, the boating public would surely be outraged, as those individuals possessing speed boats surely paid a large sum of money for their boats. This bill limits the potential of their expensive speed boats, almost making their owning the boats pointless; speed boat owners would oppose this bill. Even more important are the numerous individuals who do not own a speed boat, whose recreational day might consist of some quiet fishing. Speeding around lakes in power boats is one way to disrupt this hobby. Furthermore, families with small children might be affected, as parents would not want their children exposed to such reckless behavior as excessively speeding in boats.

Beyond the recreational public, lake associations will be interested in this bill. Even if a particular lake association's waterbody of interest is not currently affected by speed boats, New Hampshire's continuously changing population brings the potential for every lake in the state to someday be affected. Therefore, lake associations would surely support this bill. At a large scale, residents across the entire state of New Hampshire whose towns may rely on the economic income from the boating public would be affected. The passing of this bill would force speed boaters to recreate elsewhere, possibly outside the state of New Hampshire, if they do not wish to comply with imposed speed limits.

While the various groups of stakeholders differ radically in their interests concerning recreation on public waters, common ground must be found in order to make this bill work. Issues of multiple-use for specific resources are a consistent theme throughout the public sector. While one group may want to speed across a lake at fifty miles an hour, another may want to spend a peaceful day down at the lake, and the

bottom line is that both groups have rights that allow them to perform these tasks as long as they are within the law. While conventional policy procedures do not generally take into consideration the issue of multiple-use, contemporary policies "generally involve coordination between economic and environmental goals, innovative techniques for area management, scientific input into planning, and cooperation between people who have traditionally disagreed over the handling of natural resources" (Vig & Kraft 325). If interested/affected parties take into consideration this issue of multiple-use, then there may be hope for House Bill 162 to be passed, and hope for future policies regarding natural resources.

Policy:

One particular policy that is dealing with such as issue is House Bill 162, which 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. House Bill 162 is sponsored by James P. Pilliod of Belmont, who believes "fear…thousand and thousands of people are in fear of the lake now -- that's not right…it isn't the data on accidents…it's the fear…fear…fear…that's driving the bill" (NHPR). Supporters believe that this bill will help reinforce the family-oriented recreational mission of the state of New Hampshire (NHLA). No family could possible enjoy all the wonderful attributes of New Hampshire's pristine lakes with massive speedboats zipping by constantly throughout the day, forcing individuals to move elsewhere; possibly moving outside the state for their recreational needs and sending their money into other states' economies. Furthermore, safety plays a major role in the proposition of the bill. Families with small children would surely feel safer recreating in a lake or pond that did not have large speedboats cruising by at high speeds. It should be noted that the New Hampshire Lakes Association supports the passing of this bill, and encourages any interested parties to contact New Hampshire's state senator.

There are as many, if not more individuals who are opposed to this bill, claiming that the monetary benefits from allowing these large speedboats on their lakes far outweigh the possible disadvantages. They believe the influx of money from the boating public for gas, launching, etc… should be reason enough to allow these boats on lakes. Some opponents believe that New Hampshire's lakes suffer from some problem; they refuse to believe it is boat speeds. Merrimack Republican Chris Christensen for example, "while we may have a perceived problem…..speed is not a problem" (NHPR). While it seems as though the general public is cut right down the middle with this recreation related issue, a recent poll shows the exact opposite. A June 2005 survey conducted by the American Research Group found that sixty-four percent of all adults in the state of New Hampshire supported boat speed limits, while only twenty-two percent opposed them (American Research Group, Inc). The general public wants a law to be passed enforcing specified speed limits on lakes and ponds in New Hampshire. It is hard to believe that with such support from the general public this bill has not already been passed.

Policy Critique:

This bill is just one of many that deal with boat related issues on lakes and ponds of New Hampshire. This bill would go hand in hand with House Bill 1168, which would establish a commission whose purpose would be to determine the best way in which boating safety could be optimized, which would further support the recreational mission of the state of New Hampshire. This bill is also supported by the New Hampshire Lakes Association. Also, this bill would surely help House Bill 1624 get passed, as it deals with allowable levels of boat noise. This bill would modify "…boat noise limits, increases the compliance of boats and increases the penalties for certain boat noise violations" (NHLA). This New Hampshire Lakes Association supported bill would also have better luck getting based by the House if the boat speed limit bill was passed, as lower speed limits would help reduce boat noise. Not only would there be penalties for exceeding posted boat speed limits, but there would also be penalties for the noise associated with excessive speeds, possibly creating a new source of income for the state of New Hampshire that could replace the income from big boating crowds.

Recommendations:

This particular piece of policy proves extremely important for Pleasant Lake and the Pleasant Lake Protective Association. If HB 162 were to pass, it would affect all public lakes and ponds in New Hampshire, unless there are already established, stricter speeding laws; Pleasant Lake is public water, and would therefore fall under the bill. Currently, Pleasant Lake does not see a large amount of speedboats on its waters. However, after completing our Build-Out Analysis for the Town of New London, Pleasant Lake could be looking at an increase in overall recreation in the coming decades. With this potential increase in recreation could come a large speed-boating crowd, which is where HB 162 would come into play. Furthermore, with the influx in residents, and potentially large speedboats, could introduce a large increase in the noise heard around Pleasant Lake, which is where the other water related House Bills would have the potential to regulate. Unfortunately for the Pleasant Lake Protective Association and the entire Pleasant Lake Watershed, House Bill 162 was killed by the New Hampshire State Senate on March 16th 2006 by a vote of fifteen to nine. While this does not pose a particularly large problem for Pleasant Lake presently, the potential impact could be felt within the coming decades, as New Hampshire's population is growing rapidly with every year. Even though House Bill 162 did not pass, the hope for a boat speed limit on Pleasant Lake is not lost. According to Chapter 270:12 Operating Restrictions, under New Hampshire Title XXII concerning navigation, harbors, and coast surveys:

> *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).*

Therefore, if its members wish to do so, the PLPA can circulate a petition, and gain only twenty-five signatures to campaign for a maximum speed limit for their lake. Fortunately for the Pleasant Lake Protective Association, they possess lake hosts that have the potential to educate the boating public on their impact on other recreational activities. I believe that the strong presence of the Pleasant Lake Protective Association around the lake, as made by all their members and lake hosts, is the largest defense the watershed has against excessive recreation. Their continued efforts to protect their lake, and future opportunities to educate the public on the effects of recreation on fragile lake ecosystems, can ensure the health and integrity of their lake for generations to come.

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Milfoil HB 1407

Matt Urban

One key initiative for the New Hampshire Lakes Association is Milfoil. As a result of growing concern over this topic, a new bill has been introduced, House Bill 1407. This bill was established in order to, "ensure continued funding for milfoil prevention and education, such as the Lake Host Program, by maintaining the $3 fee from boat registrations, set to expire in 2008." This bill is sponsored by Representative Richard B. Drisko of Hollis. As a participating member of the NHLA, the PLPA should understand the current legislation that's being proposed. Pleasant Lake does not have Milfoil at this point, but understanding and supporting this legislation will keep the Milfoil out.

The Department of Environmental Services (DES) has written about milfoil within their Weed Watcher Kit. This is one way for smaller lake associations to learn about exotic aquatic plants. The DES writes,

> *Eurasian Milfoil…is a submerged aquatic plant with whorled feather-like leaves that appear to have been clipped on the end. Eurasian Milfoil can grow up to 10 feet and exhibits a reddish shoot near the surface. It forms dense mats of tangled plants in lake and ponds…Eurasian Milfoil, which originally came to this country from Europe and Asia is a serious nuisance to many lake residents.* ***Once introduced to a lake (usually by boats) it grows and spreads very quickly, ultimately ruining valuable shorefront property.*** (NHDES)

Milfoil could be considered by some to be a, "Third generation of ecological problems." Based off of what Vig and Kraft, authors of, Environmental Policy write. Milfoil issues when analyzed are cause for concern, "The same is true for the third generation of ecological problems, such as global climate change and **protection of biodiversity**" (Vig et al. 25). When milfoil enters a lakes system it's inevitable that it will increase the odds of decreasing that lakes biodiversity by choking other species out.

Overview of Topic:

Milfoil- HB1407

The concern that caused this bill to be so apparent is that in 2008 the financial support for Milfoil prevention and education will disappear. This is an issue for many people because without Milfoil prevention their lakes are more susceptible. Chances of becoming infested with the invasive weed increase.

Stakeholders: (Who supports this legislation?)

Richard B. Drisko:

Richard B. Drisko is the Vice Chairmen of the Election Law Committee for the NH House of Representatives. He represents Hillsborough County and has currently served three terms. Not only does he support House Bill 1407, he supports many others including bills that have similar agendas such as, HB1317 titled, *relative to the control or*

eradication of exotic aquatic weeds and requiring a review by the department of agriculture, markets, and food, the department of environmental services, the fish and game department, and the department of resources and economic development, evaluating the current permitting process for special permits for aquatic applications of pesticides to control or eradicate exotic aquatic weeds and making recommendations to improve the process. , and HB1701 titled, *relative to boat fee agents of the department of safety, increasing the boat registration fee, and relative to the prevention of exotic aquatic weeds.*

New Hampshire Lakes Association (NHLA):
The NHLA has listed Milfoil as one of its key initiatives. The reason is because NHLA is dedicated to protecting all of New Hampshire's lakes and ponds. Also, "Thanks to a competitive state grant through the Milfoil and Other Exotic Aquatic Plants Prevention Grant Program, NHLA has been helping to prevent the spread of exotic aquatic weeds through a *Lake Host Program*" (NHLA).

New Hampshire's Department or Environmental Services (NHDES)
The NHDES has always been a strong supporter of milfoil prevention.
They have established a "Weed Watcher Kit" with a program to educate and get the public to help prevent the spread of exotic invasive plant species in New Hampshire's lakes.

Boaters Paying For Registration:
It's possible that boaters will be opposed to HB1407. The reason: they may feel that their lake is clean. Thus, may feel that the additional fees that are drawn from their boat registrations are adding unnecessary fees to their yearly registration renewal.

Policy:

> **HB1407**: "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" (State of New Hampshire General Court).

Policy Critique:

Since this bill is a continuation of a pre-existing bill, there is little to be scrutinized regarding the proposed bill. The strength of the bill is that it's currently a bill

that is active It has been passed and adopted by the House, and is under current committee review in the Senate by the Environment and Wildlife. The proposal for continuation also clearly demonstrates the benefit and expectations of what this bill accomplish up to the year 2010. The clarity of purpose is strength as well for this bill. In addition, a possible strength is that other bills up for assessment are dependent on this bill passing, primarily HB1701. However, this ambitious technique of relying on one bill to pass can be seen as a weakness too if the other bill is not passed. This could be a weakness because HB1701 can only take effect once HB1407 is passed. Therefore, hypothetically, if the house or senate is not in favor of HB1701, they may be less willing to pass HB1407 knowing it will prevent HB1701 even making it to review. This can be a weakness because the important bill will only be as good as the bill seen as the weakest link.

Related Bills Concerning Milfoil:

HB1317: "This bill changes certain criteria for the control of exotic aquatic weeds and requires a report from the department of agriculture, markets, and food, the department of environmental services, the fish and game department, and the department of resources and economic development that evaluates the current permitting process for special permits for aquatic applications of pesticides to control or eradicate exotic aquatic weeds and makes recommendations to improve the process. These recommendations for rules change or legislation, or both, will be reported to the exotic weeds and species committee" (State of New Hampshire General Court).

HB1701:

"This bill: I. Requires agents of the department of safety who collect boat fees to remit the fees to the department of safety.

II. Increases the boat registration fee.

III. Applies the increase in the boat registration fee to exotic aquatic weed control" (State of New Hampshire General Court).

Recommendations:

House Bill 1407 is a bill that all lake associations should vote for. The small fee that boaters endure is worth the overall benefit that goes into milfoil prevention and education. Essentially, the very same policy has been active since 2003 without any issues. The continuation of this bill will ensure the quality of New Hampshire lakes beyond the year 2008. There are many people and well respected organizations that support this bill, and is in the best interest of others to vote for this bill to pass.

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Mercury Emissions HB 1673

Carly Rademaker

Overview of Topic:

Mercury is a naturally occurring silver-white poisonous metallic element found in air, soil, and water. Pure mercury is a liquid but when coal is burned mercury is released into the atmosphere. Eventually this mercury settles into water or onto land where it may then be washed into the water. Coal-burning power plants are by far the largest human-caused source of mercury emissions in this country. Burning of hazardous wastes, production of chlorine, spilling mercury, and the improper treatment of wastes containing mercury also lead to increased releases into the environment (Mercury).

Once in the water, mercury is absorbed by certain microorganisms that change it into methylmercury, a highly toxic form of mercury that is then able to build up in fish, shellfish, and any other animals that eat fish – including humans. Human exposure to high levels of mercury can cause damage to the brain, heart, kidneys, lungs, and immune systems of all ages of people. It is even more harmful in the bloodstreams of unborn babies and young children as it harms the development of their nervous system, impairing the child's ability to think and learn (Mercury). Birds and animals that prey on fish may also ingest high levels of mercury that can lead to death, decreased reproduction, slower growth and development rates, and abnormal behaviors.

In 2002 New Hampshire proposed the Clean Power Act which mandated mercury caps on any mercury releasing plant or facility. The hope was to protect human health as well as the natural environment. Although the NHDES initiated legislation to start requiring these caps in 2009 lawmakers in the state ruled it too uncertain and costly to undertake and thus the bill was defeated (Mercury Emissions Reductions).

Stakeholders:

There are many different people and organizations through out the state and the country that are, or should be concerned with HB1673. All levels of government in New Hampshire are the first obvious stakeholders. If this bill is passed by the House all businesses across the state will have to adhere, accordingly all courts and lawmakers will have to enforce it as well. Neighboring state governments, such as those in Maine and Vermont, may also take notice of this bill as cleaner air reaches across state boundaries.

All New Hampshire residents are affected by this bill as all residents use air and drink water. All citizens of the US living East of New Hampshire will also receive the benefits of cleaner air, and cleaner lakes with healthier fish if this bill is passed. Air and water pollution does not follow and political boundaries. New Hampshire is a state full of lakes and fish that would be and are affected by mercury that settles out of the air.

Specific citizens who will have greater stake or interest in this water health are those in environmental groups, those who like to fish or enjoy any activity on the water,

and property owners. Environmental groups will like this bill as it promotes cleaner living and the health of various animal species, specifically fish. It is also the possible improved health of fish that will interest fisherman and those you like to be active on lakes. Cleaner air with less mercury promotes healthier, more sustainable lakes and fish populations. Cleaner lakes also increase the property values of homes and lands around lakes which may interest anyone with land in these areas.

Coal-burning plants and all other industry involved with the products that these plants produced have a very large stake in mercury emission policies. If passed this bill will mean the installation of costly scrubbers, the large expense will increase operating costs which may raise the price of products produced and decrease incomes of various businesses. The higher expenses may also reach consumers in the form of price increases (Mercury Emissions Reductions). Although this is a hard effect to measure it will have a significant impact on any plants required to install scrubbers.

Policy:

Within the past year the Public Service of New Hampshire (PSNH) along with the New Hampshire Lakes Association (NHLA), law makers, and other groups has been working to develop HB 1673. It is supported by State Representative Lawrence C. Ross of Peterborough. Ross is a Republican assigned to the Committee of Science, Technology, and Energy and is also supporting bills concerning reducing regional greenhouse gases, cleaner air resources, and renewable energy sources. He has a strong history of supporting and sponsoring legislation in support of better environmental practices. Other supporters of HB 1673 include Peter H. Burling (D), Bob Odell (R), Roy D. Maxfield (R), and other representatives from both parties.

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.

The report for this bill has been filed and there have been several work sessions to discuss and modify the bill over the past few months. The last hearing of the bill was on the 12th of January and currently there are no future hearings scheduled (State of New Hampshire General Court).

Policy Critique:

Mercury emissions have been conclusively linked to human health issues when people consume fish exposed to high levels of mercury on a regular basis. Pregnant women are among those who are most at risk from this threat. Due to this information this bill definitely addresses a concern that is current and valid. In the absence of policy and action to improve the release of mercury into the air the conditions of fish and other aquatic animals will only decrease further.

In New Hampshire this is a particularly valid issue because of the high number of lakes in the state and the statewide advisory on fish consumption because of the potential exposure to mercury (New Hampshire Department of Health and Human Services). Many people fish and recreate on the lakes which are known for their health and beauty. The

value of lakefront property is sky-rocketing as is the awareness of lake quality issues and a rise in the concerns over problems such as mercury. This makes it a good time to address mercury emissions and ways to reverse the negative trends we have been seeing.

There will be considerable opposition to this bill, especially from proponents of industry over environment and any businesses involved in a chain of production and sale with a company that does burn coal and would have to install scrubbers. Yet this bill is smart in that it tries to offer remedies to decrease the negative impacts it will impose on such businesses. Offering incentives for quick and excellent performance is a great idea.

Not only can the incentives help to decrease hostile feelings of the bill but may encourage some plants to go above and beyond the requirements and really make a significant decrease in their mercury emissions. Incentives have been shown to reduce installation expenses and increase cooperation and compliance. This idea of coordination between environmental and economic interests is a new stage in environmental policy in the United States (Vig et. al).

Recommendations:

I would strongly recommend that the Pleasant Lake Protective Association (PLPA) support this bill. However, small price increases may be seen if enforced by the Public Service of New Hampshire which supplies the town with electricity. With no expense this bill can only bring benefit to Pleasant Lake as on overall reduction of mercury emission throughout New Hampshire could possibly result in lower levels of mercury in the lake.

Currently, mercury is problem of growing concern throughout New Hampshire. Bills such as HB 1673 can act as preventative measures for the lake to help correct problems before they really begin, which is a much smarter way to go about environmental problem solving. By supporting this bill the PLPA may encourage other lake associations to do the same and end up helping the bill to pass.

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Protection Zones for Nesting Loons HB 1140

Laurel Kenna

Overview of Topic:

Loon populations across NH have decreased dramatically, and have been documented on the state of New Hampshire's threatened species list (www.wildlife.state.nh.us). Due to this decrease in numbers, and status of the loon population, protection of nesting sites has become a priority, but more is needed to understand fully how to identify and protect these sites. The passing of house bill 1140 established a committee to study potential areas and enforcement of protection zones for nesting loons. Many organizations and individuals have taken interest in this bill as stakeholders, and continue to watch the progress of the committee which will come under review in November of this year to establish the protection sites and regulations of those areas. Nevertheless it is important to understand that finding solutions to wide spread problems, such as this one, require a substantial amount of cooperation among national and international researchers and legislators. Furthermore, extensive collaboration means that reaching many of the goals on that national or international level to come at a slower rate, due to lagging support and research, or outdated technologies. Not all states or countries have the same availability of resources and support for these type of projects making effective participation more difficult for some localities (Vig 25).

Stakeholders:

Paul Mirski, the representative who sponsored this bill, is a republican, and served 5 terms as representative for Grafton county, and lives in Enfield, NH. As a member of the fish and game committee Mirski was able to take on this bill allowing for it to eventually be adopted by the house of representative on January 4th of this year. Currently the bill is in committee in the senate, and under review by the Environment and Wildlife committee (www.gencourt.state.nh.us). Along with the federal and state stakeholders, and the Fish and Game Department, other organizations such as The Loon Preservation Committee (LPC), which is affiliated with the Audubon Society of New Hampshire, are very involved with the research and progress of this bill and its committee. The NH Lakes Association is also watching this bill and identified the bill as one they support. Others that might also be stakeholders include lake property owners and the general public, due to the fact that these areas may include some of our favorite lake designations and anchor spots. Moreover the NH Sportsman Political Action League (www.nhspal.org), and the American Sport fishing Association (www.asafishing.org) have also listed this bill on their websites. NHSPAL supports the bill, and its cause, noting the importance of protecting loons as a threatened species in NH, while the ASFA only lists the bill as a watched policy.

Policy:

House Bill 1140

Along with this bill other policies that have taken affect which impact loons and loon behavior, including their nesting sites and production rate, are the Mercury Impacts

on Loons listed in the Clean Water Act (CWA), and Senate Bill 487 Protecting loons against lead sinkers (www.gencourt.state.nh.us). These bills along with the creation of this committee have vastly increased the loon's ability to become reestablished and help us to better understand and protect the loon populations in NH.

It is fortunate that NH is not alone in this fight to help preserve and protect loon nesting sites. States such as Massachusetts, Vermont, and New York have all passed legislation including lead sinkers protecting areas where loons and other birds could potentially become affected by them. Furthermore, like New Hampshire, states such as Massachusetts have began using tools, such as Biomap, to document and help continue research on nesting sites in the Quabin and Wachusett Reservoirs, where the majority of nesting loons are located in Massachusetts, while also documenting other sites where they have been located. Along with Northeastern states some Midwestern states have also passed similar legislature, and done research in regards to loon nesting sites and other important habitats, most are locations where loons have also been placed on the endangered species list. Together with these other states NH will be able to add to current and future research in loon preservation and having a wide spread cooperation will help these birds survive, and hopefully flourish.

Policy Critique:

Because this bill has not gone under official review it is hard to determine its effectiveness at this time. However, a few organizations, such as local loon protective associations in New Hampshire, and Vermont, have conducted successful research of a similar manner and hopefully this will reflect the upcoming results of the committee's research and findings. The final review for this committee and bill will be conducted November of 2006 and will help to outline new regulations for loon nesting sites in NH, as well as release their findings and new information on nesting behavior of loons.

Recommendations:

It is important to realize this bills relevance to Pleasant Lake. The Pleasant Lake Protective Association (PLPA) should focus on this bill as well, watching it and making sure that their loon nesting site meets the determined regulations or recommendations. Moreover the Association should be sure that they currently are protecting and preserving the loon nesting sites on their own, and educating lake visitors of the importance of the site. Keeping the site safe from boats, not using lead sinkers and other measures to be sure that the site is kept in optimal health for nesting loons will encourage the birds to use this area and perhaps will increase non impact viewing opportunities of loon behaviors for residents and visitors to observe.

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New Hampshire Loon Preservation Committee. NH Audubon Society. March 2006. http://www.loon.org/

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CHAPTER 6

Communication Resources

The students in CES301/302 demonstrate their communication skills by using different forms of media to inform the public about the project that was completed. Using media such as newsletters, public service announcements, press releases, brochures, and flyers are all important to the public. These forms of media are a powerful tool that agencies may use to communicate to different stakeholders and can be used to generate interest or action of stakeholders within a community. This chapter includes various communication resources completed by the students.

We used several sources to complete this assignment but we primarily worked with:

Jacobson, Susan. Communication Skills for Conservation Professionals. Washington, DC: Island Press, 1999.

Project Newsletter & Presentation Flyer