BLAISDELL LAKE PROTECTIVE ASSOCIATION

New Hampshire Comprehensive Lake Inventory of Blaisdell Lake

Sutton, NH

The Community Based Research Project Team Fall 2007- Spring 2008
at Colby-Sawyer College

Photograph courtesy of Dr. Leon-C. Malan

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Table of Contents

Community and Environmental Studies Program Overview

The Community and Environmental Studies (CES) program at Colby-Sawyer College provides students with the opportunity to understand, integrate, and apply multiple disciples 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 there homes, place 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 areas 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 15 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 probe 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 report is a collection of information and analysis about the characteristics and conditions of the Blaisdell Lake watershed. The purpose of compiling this information was to provide the Blaisdell Lake Protective Association (BLPA) with useful information to be referenced in the creation of future management plans for the watershed. This report was completed through a cooperative relationship between the Institute for Community and Environment at Colby-Sawyer College and the BLPA. This information was collected between September 2007 and April 2008.

The primary goal at the beginning of this project was to complete a Comprehensive Lake Inventory created by the New Hampshire Department of Environmental Services. The inventory presents 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 Blaisdell Lake.

Overall the health of the lake is good, although there are a couple of areas of concern that will be important to address in order to ensure that it remains good. Because the Russell Pond stream has had high conductivity readings for a number of years, we tested other perennial and intermittent streams to see if there were other 'hot spots." We found another stream with high conductivity readings near the beach. We do not have an explanation for the high readings in the Russell Pond stream, it appears that the location near the beach is influenced by the road, and possibly by road salt.

Region-wide there has been a significant amount of development in shorelands and along ridgelines near waterbodies. The Blaisdell Lake watershed is not exempt from this trend, and you have witnessed some recent development in your shoreland and less in the watershed. It will become increasingly important to educate property owners as to the importance of limiting the amount of impervious surface in the watershed, and utilizing best management practices when building does take place. Additionally, conservation efforts focused in the watershed will help protect water quality.

There is some very good news in the lake inventory as well. The fact that Blaisdell Lake has no milfoil is no doubt tied to the vigilance of your Lake Hosts, and continued monitoring is important given that it is present in nearby lakes.

There are three areas related to water quality in which we did additional work beyond the scope of the Comprehensive Lake Inventory: Water chemistry testing (including conductivity, turbidity, pH, and flow-rate data pertaining to spring run-off), impervious surface, and conservation priorities for the watershed. We did this because each of these areas can be instrumental in affecting the water quality of Blaisdell Lake. Our analysis and recommendations concerning these areas are included in this report.

Acknowledgements

We would like to thank the individuals and the organizations that were very helpful to us in completing this portfolio.

- The Blaisdell Lake Protective Association (BLPA), our community partner and especially, Bruce Ellsworth, Chan Blodgett & Bill Hallahan

- The Town of Sutton, New Hampshire
  Betsy Forsham of the Conservation Commission
  Paul Parker of the Sutton Highway Department

- The New Hampshire Department of Environmental Services

- Bonnie Lewis, and the Lake Sunapee Protective Association (LSPA) water lab

- Colby-Sawyer College faculty
  Laura Alexander, John Callewaert, Nick Baer, Ben Steele, and especially Leon-C. Malan for his familiarity with the watershed and help with our data collection.

Without the contribution of these individuals & organizations our project would not have been possible.

Sarah Jean Champagne
Amanda Lea Lambert
Benjamin Harrison Taylor

May 2008

CHAPTER 1

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. Create a common understand of watershed characteristics for the Blaisdell Lake Watershed

The Inventory is organized into 10 attributes. Each attribute is designed to address a specific characteristic of the water body 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 three of us. We were able to work from our strengths and weaknesses to complete all 93 questions from 10 attributes. Some of the attributes 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 on 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 Blaisdell Lake Score?

Unique or Outstanding Value: 47/100

Questions in the category scored high because there are regulations that focus development in ways that maintain the water quality. Questions in this category scored low because there is no conserved land within the shoreline and very little within the watershed.

Recreational Value: 51/100

Questions in this category scored high because the lake is close to major transportation corridors and there are no restrictions on power boats. Questions in the category scored low because it has no major docking facilities or tournaments, which may be a strength from the BLPA perspective.

Susceptibility to Impairment: 53/100

Questions in this category scored high because the lake is accessible to over a half-million people year round in a 30-mile radius, and because there is so little protected land in the watershed. Questions in the category scored low because the pH level is at a acceptable level for a lake ecosystem and land use regulations are in place for building within the shoreland.

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

Recreational Value **Attribute and Associated Question**	Recorded Points	Possible Points
***Attribute 1*: Geographic, Spacial, and Demographic Information**		
C. Proximity to major transportation corridors (miles to nearest major roadway)	5	5
D. Total year round resident population w/in 30 mile radius (# of people)	4	5
***Attribute 2:* Physical Waterbody Characteristics**		
A. Surface water area (acres)	3	5
E. Shoreline configuration (i.e. shape)	2	5
F. Island presence/absence (# of islands)	1	5
***Attribute 3*: Water Quality Characteristics**		
F. Secchi disc transparency (meters)	3	5
***Attribute 4:* Biological/Ecological Characteristics**		5
A. Algal abundance	4	5
H. Specialized habitats, breeding or rearing areas (#of areas, structures)	1	5
***Attribute 5:* Recreational Characteristics**		
A. Type of watercraft use (% of total watercraft)	2	5
B. Average watercraft density on lake or pond (all types)	1	5
C. Private marine service/docking facilities (#)	1	5
E. Recreational fishing (i.e. types and # of game fish species pursued)	2	5
F. Occurrence of fishing tournaments/derbies (#/year)	1	5
G. Angler usage (# of anglers/acre)	1	5
K. Boat launches and access sites (#)	2	5
L. Other recreation and support facilities (#)	1	5
***Attribute 6:* Restrictions or Prohibited Uses**		
E. Power boat restrictions	5	5
F. Ski craft restrictions	5	5
***Attribute 9:* Watershed Characteristics**		
A. Watershed development and land use (% developed: % undeveloped)	3	5
***Attribute 10*: Visual/Aesthetic Characteristics**		
A. Scenic or natural features of interest visible from waterbody (# of	4	5

features)		
Total:	51	100

Susceptibility to Impairment **Attribute and Associated Question**	Recorded Points	Possible Points
***Attribute 1*: Geographic, Spatial, and Demographic Information**		
D. Total year round resident population w/in 30 mile radius (# of people)	4	5
***Attribute 2:* Physical Waterbody Characteristics**		
C. Mean water depth (feet)	3	5
D. Percent shoal area/littoral zone (% of waterbody <15')	2	5
I. Watershed area/lake area ratio	1	5
J. Hydraulic flushing rate (time waterbody flushes/years)	5	5
***Attribute 3*: Water Quality Characteristics**		
D. pH	1	5
E. Total phosphorus concentration (mh/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)	2	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)	3	5
***Attribute 5:* Recreational Characteristics**		
A. Type of watercraft use (% of total watercraft)	4	5
B. Average watercraft density on lake or pond (all types)	5	5
***Attribute 8:* Shoreland Characteristics**		
A. Shoreland development and use (% developed: % undeveloped)	5	5
D. Percent of impervious surface within the shoreland	2	5
H. Local land use regulatory measures within the shoreland	1	5
***Attribute 9:* Watershed Characteristics**		
A. Watershed development and land use (% developed: % undeveloped)	3	5
C. Protected land or land not available for development within the watershed (% of watershed area)	4	5
H. Local land use regulatory measures	3	5

Total:	53	100

Unique or Oustanding Value **Attribute and Associated Question**	Recorde d Points	Possibl e Points
***Attribute 1*: Geographic, Spacial, and Demographic Information**		
B. Waterbody elevation	2	5
***Attribute 2:* Physical Waterbody Characteristics**		
B. Maximum water depth (meters)	2	5
K. Basin morphometry (# basins)	1	5
L. Waterbody origin (natural/artificial)	3	5
***Attribute 3*: Water Quality Characteristics**		
F. Secchi disc transparency (meters)	3	5
***Attribute 4:* Biological/Ecological Characteristics**		5
C. Fish species diversity (# of species)	2	5
D. Avian species diversity (# of species)	4	5
E. Mammal species diversity (# of species)	3	5
F. Reptile & amphibian species diversity (# of species)	2	5
H. Specialized habitats, breeding or rearing areas (# of areas, structures)	4	5
K. Threatened and endangered plant/animal species and exemplary natural communities	1	5
***Attribute 7:* Unique Characteristics**		
A. Public drinking water supply (# households served)	1	5
B. Historic features in or around waterbody (#)	1	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	1	5
H. Local land use regulatory measures within the shoreland	5	5
***Attribute 9:* Watershed Characteristics**		
C. Protected land or land not available for development within the watershed	2	5
H. Local land use regulatory measures	3	
***Attribute 10*: Visual/Aesthetic Characteristics**		
A. Scenic or natural features of interest visible from waterbody (# of features)	2	5

Total:	47	100

Attribute 1: Geographic, spatial, and demographic information

Category:

Question A: Waterbody location in the state.

Directions: The information for this question can be obtained by consulting a USGS topographic map, NH GRANIT, or a similar map with detailed information about the waterbodies 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: Consulted a map of Blaisdell Lake from the NH GRANIT website, also referred to maps created using data from NH GRANIT.

Findings and Analysis:
Town: Sutton, NH
County: Merrimack
River Basin: Merrimack
State: New Hampshire
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. 7 February 2008. <http://www.granit.sr.unh.edu/>

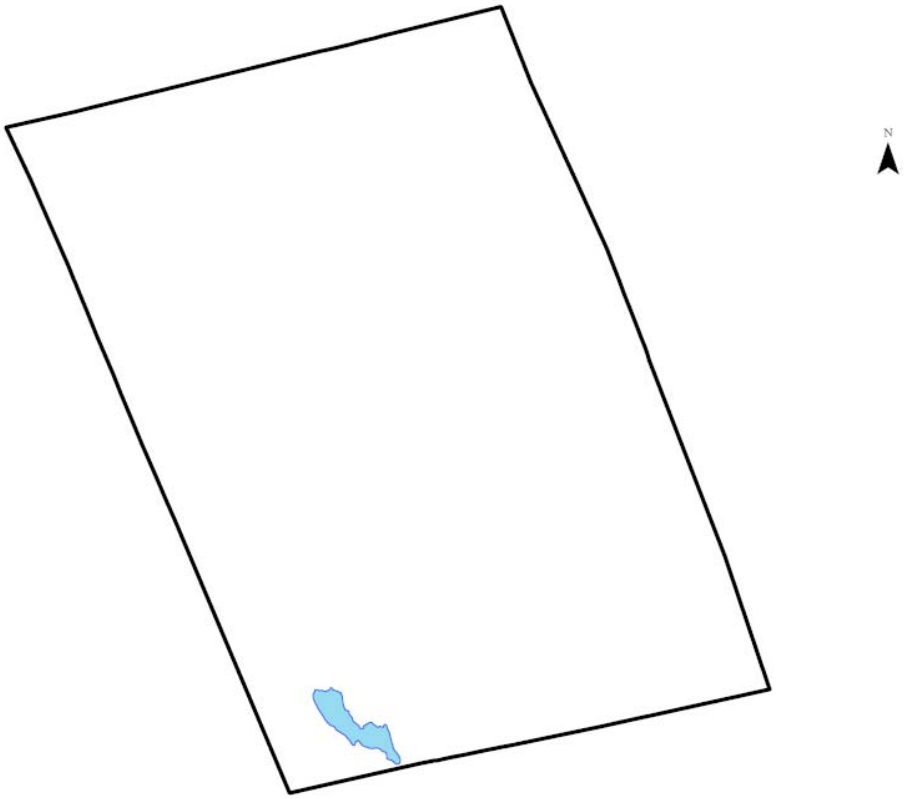
Assessment of Question: The question is adequate as stated.

Date Completed: February 2008

Investigator: Sarah Champagne

Waterbody Location in State

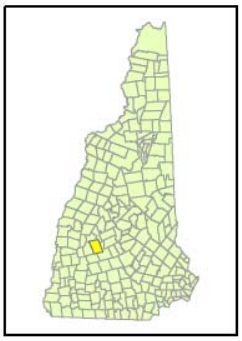
Attribute 1: Question C



Legend

Blaisdell Lake

Sutton



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Attribute 1: Geographic, Spatial, and Demographic Information

Category: Unique and Outstanding Value

Question B: Waterbody Elevation

Directions: Consult the NHDES Lake Trophic Reports for information regarding the lake or an alternative reliable source.

Rationale: Elevation is a relative indicator of waterbody uniqueness. There are fewer lakes and ponds located above 2,000 feet than low elevation lakes and ponds in New Hampshire.

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

Findings and Analysis: Blaisdell Lake sits at 827 ft. 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:

New Hampshire Department of Environmental Services. (n.d.). *Lake Eutrophication*. Retrieved October 15, 2007, from NHDES: http://www.des.state.nh.us/factsheets/bb/bb-3.htm

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

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 by consulting a USGS topographic map, NH GRANIT, or a similar map. 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: Consulted a map of Blaisdell Lake from the NH GRANIT website, also referred to maps created using data from NH GRANIT.

Findings and Analysis: I-89 is 3.08 miles from Blaisdell Lake, as the crow flies.

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), SR-3 (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. 7 March 2008. <http://www.granit.sr.unh.edu/>

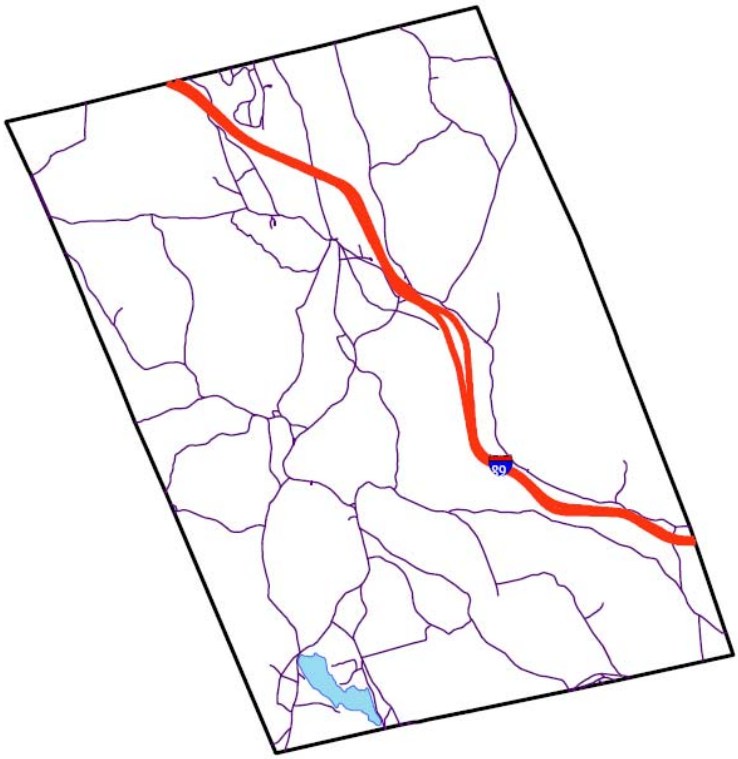
Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Sarah Champagne

Waterbody Location in State

Attribute 1: Question C

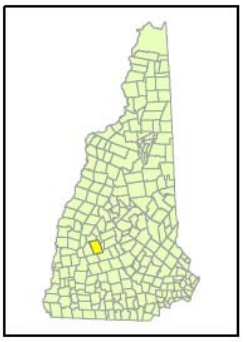


N

0 0.5 1 2 Miles

Legend

- Interstate
- Roads
- Blaisdell Lake
- Sutton



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Attribute 1: Geographical, Spatial and Demographic Information

Category: Recreation

Question D: Total year round resident population within 30-mile radius.

Directions: Consult the 2005 Population Estimates of New Hampshire Cities and Towns prepared by the NH Office of Energy and Planning to estimate the total year round resident population within a 30-mile radius* of the waterbodies 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 waterbodies 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 that people are willing to regularly travel to enjoy a lake or pond.

Process Followed: Referred to NH GRANIT, to determine the towns with in a 30 mile radius, then referred to the *2005 Population Estimates of New Hampshire Cities and Towns.*

Findings and Analysis:

New Hampshire Towns:

Acworth	888
Alexandria	1487
Allenstown	4991
Alstead	1959
Amherst	11538
Andover	2215
Antrim	2624
Bedford	20788
Belmont	7167
Boscawen	3912
Bow	7790
Bradford	1578
Bridgewater	1030
Bristol	3168

Canaan	3551
Canterbury	2239
Charlestown	4915
Chichester	2471
Claremont	12972
Concord	42076
Cornish	1708
Croydon	756
Danbury	1175
Deering	2058
Dorchester	377
Dublin	1537
Dunbarton	2540
Enfield	4857
Epsom	4564
Francestown	1571
Franklin	8667
Geoffstown	17705
Gilford	7306
Gilmanton	3431
Gilsum	805
Grafton	1230
Grantham	2450
Greenfield	1791
Groton	510
Hancock	1823
Hanover	10865
Harrisville	1100
Hebron	543
Henniker	4963
Hill	1076
Hillsborough	5723
Hooksett	13201
Hopkinton	5592
Jaffrey	5730
Keene	22770
Langdon	624
Lebanon	13511
Lempster	1088
Loudon	5096
Lyndeborough	1788
Manchester	109364
Marlborough	2095

Marlow	778
Meredith	6401
Mont Vernon	2370
Nelson	661
New Boston	5055
New Hampton	2135
New London	4362
Newbury	2027
Newport	6363
Northfield	5069
Orange	303
Pembroke	7336
Peterborough	6152
Pittsfield	4370
Plainfield	2419
Roxbury	241
Sailsbury	1266
Sanborton	2859
Springfield	1061
Stoddard	1000
Sullivan	784
Sunapee	3234
Surry	737
Sutton	1786
Temple	1526
Tilton	3648
Unity	1700
Walpole	3686
Warner	2934
Washington	971
Weare	8800
Webster	1774
Westmoreland	1863
Wilmot	1285
Windsor	221

New Hampshire Total Population (within a 30 mile radius): 508,526

Vermont Towns:

Hartland	3115
Rockingham	5076

Springfield	8792
Weathersfield	2859
West Windsor	1112
Westminster	3231
Windsor	3696
Vermont Total Population (within a 30 mile radius):	**24,766**
New Hampshire and Vermont Total Population (within a 30 mile radius)::	**533,292**

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**

Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. http://www.granit.sr.unh.edu/

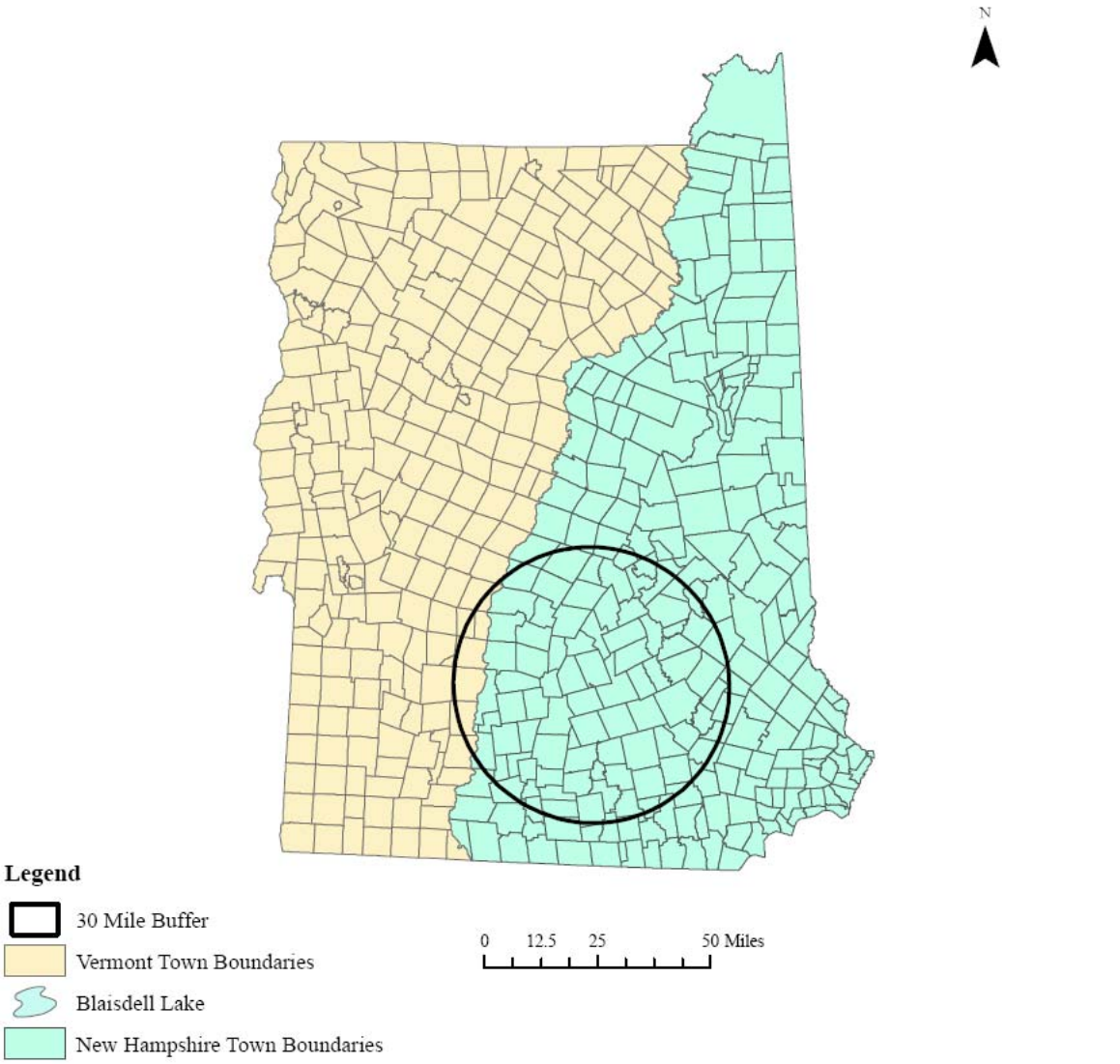
"Vermont Center for Geographical Information." VGIS Data Warehouse. VCGI. April 2008. http://www.vcgi.org.

"Population Finder." US Census Bureau. April 2008. http://census.gov/.

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Total Population Within a 30 Mile Radius
Attribute 1: Question D



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Attribute 1: Geographical, Spatial and Demographic Information

Category: Susceptibility to Impairment

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Sanborton	2859
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"Vermont Center for Geographical Information." VGIS Data Warehouse. VCGI. April 2008. http://www.vcgi.org.

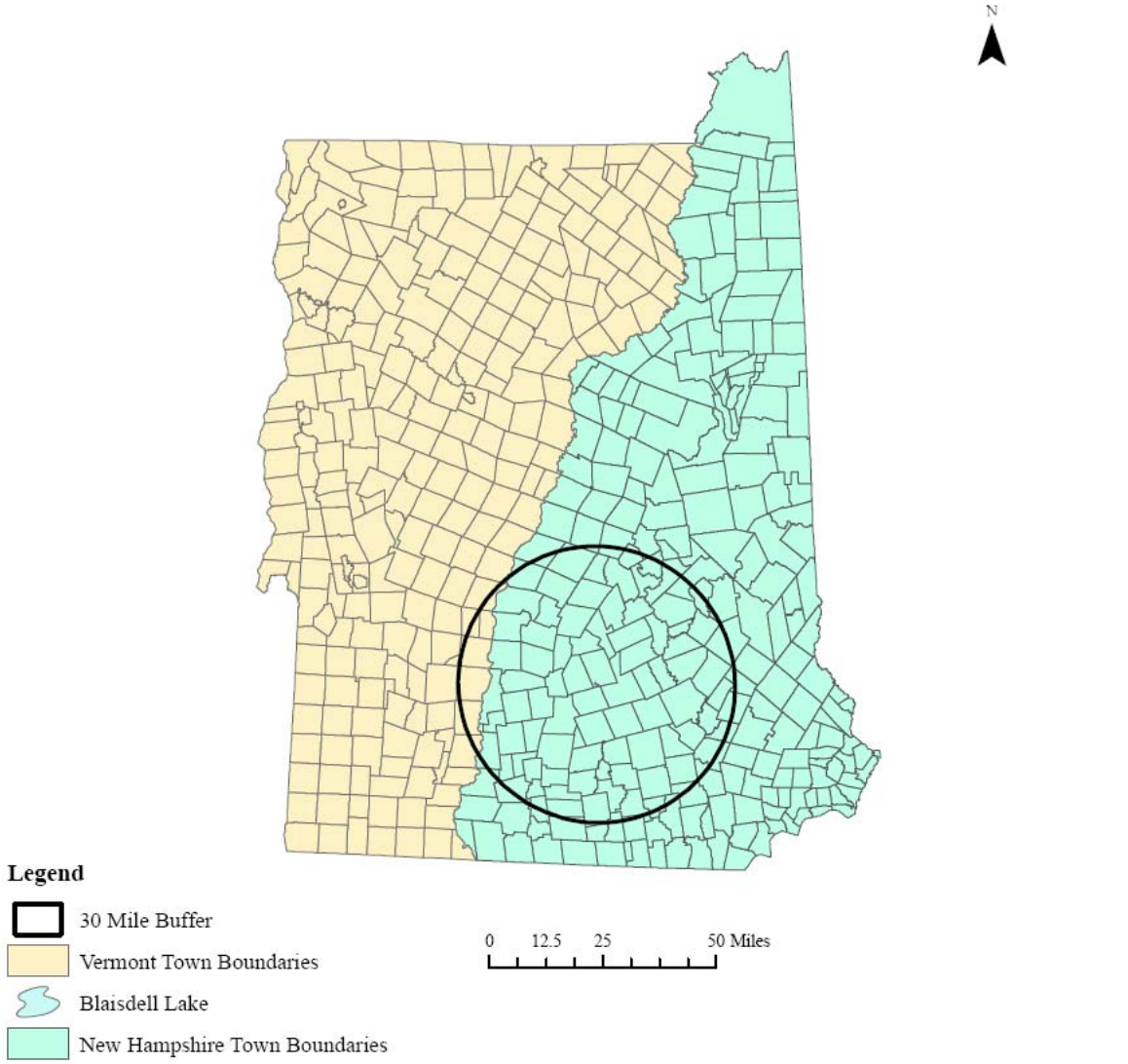
"Population Finder." US Census Bureau. April 2008. http://census.gov/.

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Total Population Within a 30 Mile Radius
Attribute 1: Question D



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Attribute 2: Physical Waterbody Characteristics

Category: Recreational Value

Question A: Surface Water Area

Directions: Consult the NHDES Lake Trophic Reports for information regarding the lake or an alternative reliable source.

Rational: Surface water area is an important consideration when developing a management plan, as larger waterbodies 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 waterbodies relative size as compared to other New Hampshire lakes and ponds.

Process Followed: consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake is reported to be 158.3 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 Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Unique or Outstanding Value

Question B: Maximum Water Depth (meters)

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to determine the maximum water depth.

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

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake is reported to be 13.1 meters deep.

Evaluation Criteria:	**Score:**
1) 0-7 meters (0-23 feet)	1
2) 7.1-15 meters (23.1-49.2 feet)	2
3) 15.1-30 meters (49.3-98.4 feet)	3
4) 30.1-45 meters (98.5-147.6 feet)	4
5) >45 meters (>147.6 feet)	5

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question C: Mean Water Depth (meters)

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to determine the mean water depth.

Rational: 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 *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake is reported to have a mean depth of 5.4 meters.

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 meters	5

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question D: Percent shoal area or littoral zone

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to estimate the area of the waterbody that is less than 15 feet in depth, not including islands or wetland areas.

Rational: A measure of the shallow, nearshore regions of a waterbody, commonly referred to as the littoral zone, is the area where aquatic plant growth is 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 invertebrates, and wildlife. In general, lakes or ponds with large littoral zones tend to have excessive plant growth compared to waterbodies that drop off fast and consequently have a small littoral zone.

Process Followed: Consulted the bathometric map in *NHDES Lake Trophic Reports.*

Findings and Analysis: Rough visual analysis based on bathometric map.

Evaluation Criteria:

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

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

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Recreational Value

Question E: Shoreline Configuration

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to determine shoreline configuration.

Rational: A ratio of shoreline length compared to waterbody surface area. A value equal to one is a lake or pond that is a perfect circle in shape. As the ratio increases and the waterbodies 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 *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake has a shoreline configuration of 1.66.

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 w/ 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 Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.
Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Recreational Value

Question F: Island(s) presence/absence

Directions: Consult a USGS topographic map, NH GRANIT, land use maps, National Wetlands Inventory (NWI) maps, and any natural resource maps on file in the town(s), or an alternative reliable source to determine the number of islands present. Note the scale of the map used.

Rational: The presence of islands provides additional habitat for shoreline birds and mammals. However, large islands (>1 acre) are likely to attract residential developments, increasing the potential for nonpoint source pollutants.

Process Followed: Consulted *USGS topographic* map*, NH GRANIT*, land use maps, *National Wetlands Inventory (NWI)* maps.

Findings and Analysis: No islands were listed on any map although there are emergent rocks on the southeastern side of the lake.

Number of islands: 0
Number >1 acre: 0
Number developed: 0
Source of information: *National Wetlands Inventory (NWI) maps*
Scale of map: 1:18,906

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:

U.S. Fish and Wildlife Services – Wetlands online mapper. *National Wetlands Inventory (NWI) maps*

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question G: Shoreline wetlands

Directions: Consult a USGS topographic map, NH Atlas and Gazetteer by Delorme, a National Wetlands Inventory (NWI) map(s), or conduct a trip around the lake to determine the extent of shoreline wetland areas. 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 completed. Note the scale of the map used.

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

Process Followed: Consulted the *NH GRANIT Data Mapper.*

Findings and Analysis: Within the Blaisdell Lake watershed there are 4 wetlands present.

Evaluation Criteria:

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

Sources:

New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) Data Mapper. 14 November 2007 <http://mapper.granit.unh.edu/viewer.jsp>

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question H: Watershed area

Directions: Consult the NHDES Lake Trophic Reports to obtain the watershed area. **Only the immediate watershed of the lake should be analyzed.** The immediate watershed includes the land area that drains directly into the waterbody or a tributary flowing to that waterbody. **Do not** include those sections of the watershed that drain into an upland lake or pond prior to flowing into the waterbody being analyzed. Likewise, **do not** include those sections of the watershed below the lake or pond.

Rational: Waterbodies are highly influenced by their watersheds (all of the land and water areas that drain into a particular waterbody). Features such as size, soil type, slope, geology, and vegetation all affect the conditions of the lake. Additionally, the type and extent of human activity in the watershed can also have an enormous impact on the waterbody.

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake has a watershed area of 1267 acres

Evaluation Criteria:

Blaisdell Lake watershed is 1267 acres

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question I: Watershed area/lake area ratio

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to obtain the watershed area and lake area. Use the watershed area/lake area formula to determine the watershed area/lake area ratio.
Ratio = Watershed Area / Lake Area (e.g., 5:1 Ratio = 10 acre Watershed Area / 2 acre Lake Area)

Rational: This ratio provides an estimate of the extent of the surrounding land area contributing surface water runoff to the waterbody. The size of the watershed is a key factor in determining the amount of nutrients in a waterbody. Typically, water quality decreases with an increase in the watershed area/lake area ratio. 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 waterbodies hydrologic cycle.

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake watershed is 1267 acres and the lake area is 158 acres

1267/158 =8.02 Ratio is 8.02:1

Evaluation Criteria:	**Score:**
1) Ratio ≥ 51:1	5
2) Ratio 36:1 – 50:1	4
3) Ratio 26:1 – 35:1	3
4) Ratio 11:1 – 25:1	2
5) Ratio ≤ 10:1	1

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Susceptibility to Impairment

Question J: Hydraulic flushing rate.

Directions: Consult the NHDES Lake Trophic Reports or an alternative reliable source to determine the hydraulic flushing rate.

Rational: This 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 internal nutrient cycles, while external nutrient sources are most influential to waterbodies with rapid flushing rates.

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake is reported to have a flushing rate of .30(yr^{-1})
1/.30 = x/1 x=3.33yrs Blaisdell Lake flushes once every 3.33yrs.

Evaluation Criteria:	**Score:**
1) Flushes more than 2 times per year	1
2) Flushes 1 – 2 times per year	2
3) Flushes once every 1 – 2 years	3
4) Flushes once every 2 – 3 years	4
5) Flushes once every 3 years or more	5

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Unique or Outstanding Values

Question K: Basin Morphometry

Directions: Investigate the overall shape and design of the waterbody. Determine if it is generally one continuous open water area (i.e. single basin or "bathtub") or if can be broken up into distinct sections (multiple basins). This question can best be answered by studying a USGS topographic map, NHDES Lake Trophic Reports, or a similar 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 the NHDES Lakes Program.

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

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake shows one basin.

Evaluation Criteria:	**Score:**
1) 1 basin	1
2) 2-5 basins	2
3) >5 basins	3

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category: Unique or Outstanding Values

Question L: Waterbody Origin

Directions: Consult the NHDES Lake Trophic Reports, the NH Official List of Public Waters, or an alternative reliable source to determine the waterbody origin.

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

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake was described as a natural lake with a raised dam.

Evaluation Criteria:	**Score:**
1) Human constructed impoundment that would exist as either a stream or river otherwise. (AI – Artificial Impoundment)	**1**
2) Naturally occurring waterbody with water level raised or controlled by damming. (RD – Raised by Damming)	**3**
3) Naturally occurring lake or pond without human controlled water levels. (N – Naturally Occurring)	**5**

Sources:

New Hampshire Department of Environmental Services – Dam Bureau. Official List of Public Waters. Feb 20th, 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

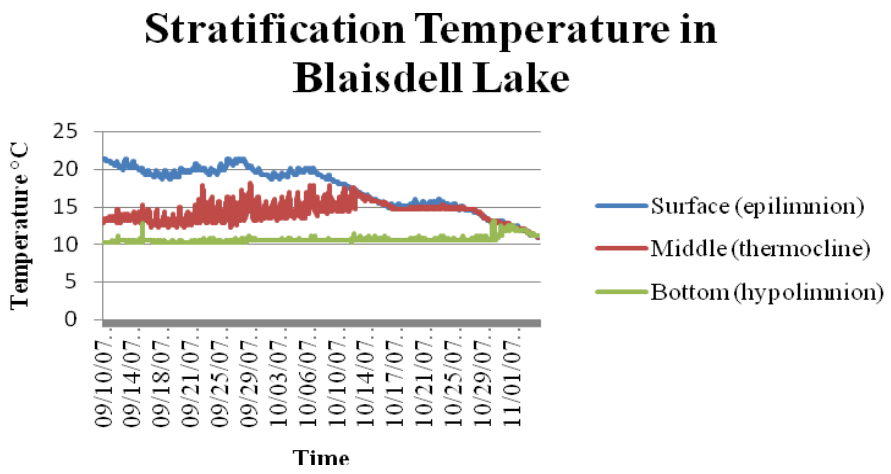
Question M: Stratification Characteristics

Directions: Consult the NHDES VLAP Annual Lake Reports, the NHDES Lake Trophic 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.

Rational: Summer thermal stratification is common to most New Hampshire lakes and ponds. However, since it creates distinct layers of water that do not 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 the sections of a waterbody available to fish and lead to the accumulation of nutrients. 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 (epiliminion) and lower layers converge allowing the water from all depths to mix completely.

Process Followed: Consulted the *NHDES VLAP Annual Lake Reports.* I also contacted Professor Nicholas Baer whose classes at Colby-Sawyer College collected temperature data to determine if turnover occurs.

Findings and Analysis: Annual lake reports confirmed Blaisdell Lake does experience summer thermal stratification.



Graph by Professor Nicholas Baer

The graph shows that in September there was a temperature difference between the epilimnion, thermocline, and the hypolimnion. In November the temperatures even themselves out as the water turns over. Turnover does occur in Blaisdell Lake.

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:

New Hampshire Department of Environmental Services – Watershed Management Bureau. Annual Lake Reports 2006.
Baer, N. (2008, April 28). Professor. (A. Lambert)

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question N: Flood storage ability

Directions: Consult the NH Office of Energy and Planning - NH Floodplain Management Program National Flood Insurance Program (NFIP) Maps to identify the waterbodies flood storage capacity. The Federal Emergency Management Agency (FEMA) has undertaken a massive effort of flood hazard identification and mapping to produce Flood Hazard Boundary Maps (FHBMs), Flood Insurance Rate Maps (FIRMs), and Flood Boundary and Floodway Maps. The waterbodies flood storage capacity should be based on the information contained in these maps. An additional source of information is the Bureau of Emergency Management at the NH Department of Safety.

Rational: Flood frequency is important to landowners along the waterbodies perimeter 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: Contacted Nancy McGrath at the *NHDES* Dam Bureau.

Findings and Analysis: McGrath's analysis of the inspection report from August 26, 2004 states low storm storage, only 175 acre feet storage between normal lake levels and the top of dam.

Evaluation Criteria:

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

Sources:

New Hampshire Department of Environmental Services, Dam Bureau (2004). *Inspection Report* Concord, NH

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question O: Average Water Level Alteration.

Directions: Contact the NHDES Dam Bureau to determine the number and ownership of any dams. If a dam is privately owned or owned by another state agency, contact them to inquire about the average seasonal drawdown(s). If the lake or pond does not have a water control structure on it, then consider the average natural level of water fluctuation. It is important to note that beaver activity can also affect water level.

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

Process Followed: Consulted the *NHDES Dam Bureau Inspection Report.*

Findings and Analysis: Every 5 years the logs are removed from the stop log bay and the lake is lowered by 5 feet to allow for routine maintenance.

Evaluation Criteria:

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

Sources:

New Hampshire Department of Environmental Services – Dam Bureau Inspection Report. August 26, 2004

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question P: Water Control Structure.

Directions: Contact the NHDES 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: Consulted the *NHDES Dam Bureau Inspection Report.*

Findings and Analysis:

Evaluation Criteria:

Size:	H:9ft L:150ft
Type:	Concrete faced masonry
Construction Date:	1916
Classification:	A
Owner:	Blaisdell Lake Protective Association
Date of Last Inspection:	July 7, 2004
Flowage Rights: yes/no	No
Ownership of Rights:	N/A

Sources:

New Hampshire Department of Environmental Services – Dam Bureau Inspection Report. August 26, 2004

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 2: Physical Waterbody Characteristics

Category:

Question Q: Inlets (tributaries).

Directions: Consult a USGS topographic map, NH GRANIT, Google Earth, or a similar map containing the waterbody. Identify and record the names and general locations (i.e. mark them on a topographic map or record their latitude and longitude) of all the perennial and intermittent streams and rivers draining into the lake or pond being considered. It may be necessary to visit each stream and river to verify its width. If there are no inlets (either intermittent or perennial) make note of this on the worksheet.

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 for fish and wildlife, and offer additional recreational opportunities.

Process Followed: Used the GRANIT streams network layer to indentify perennial and intermittent streams into Blaisdell Lake. Then we field-truthed other locations that were not available on the GRANIT data layer. Using ArcMap we constructed a map that shows each inlet (tributary), its location.

Findings and Analysis: Refer to map.
Perennial (year-round):
1. Russell
2. Brown
3. Billings
4. 114 Culvert

Intermittent (seasonal):
1.114-Russell (which runs into the Russell stream)
2. Malan
3. Icehouse
4. Howell
5. Day Cottage
6.Masciuli

Evaluation Criteria:
Perennial (year-round):
4 perennial streams all <10 ft width
Intermittent (seasonal):
6 intermittent all <10 ft width
Other known / documented water sources (i.e. springs):
N/A

Sources:

NH GRANIT. 20 March 2008. http://www.granit.sr.unh.edu.
Professor Leon Malan with field verification.

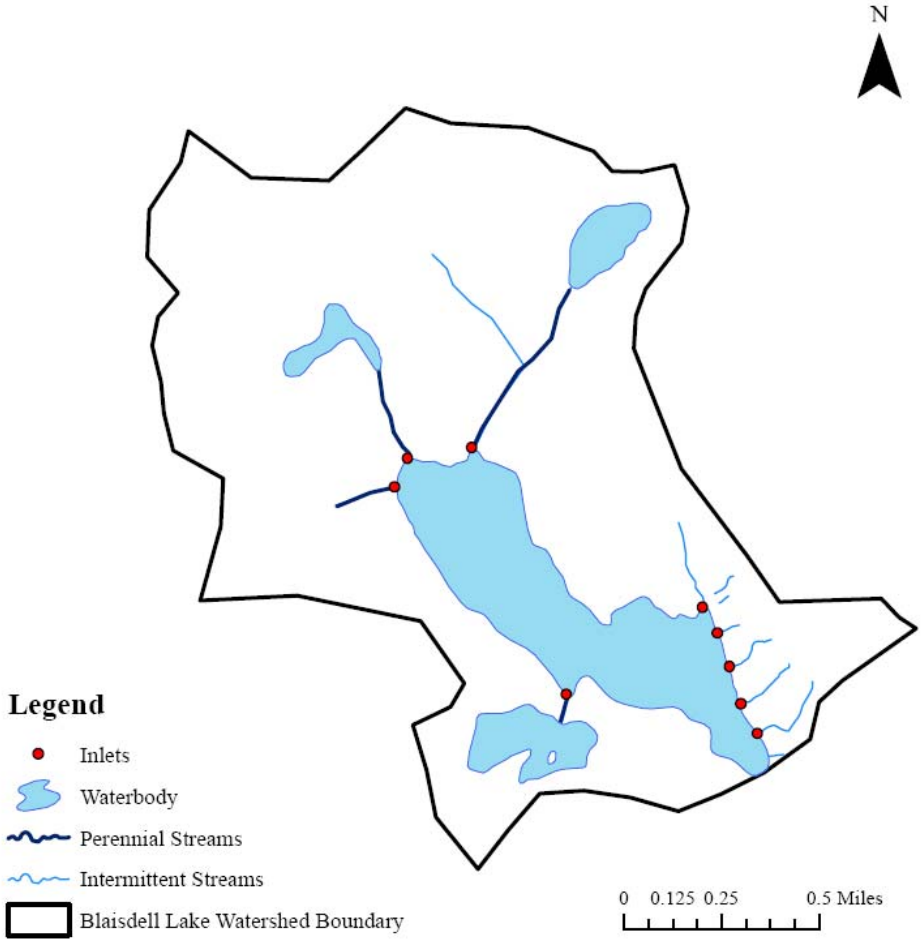
Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Amanda Lambert

Inlets

Attribute 2: Question Q



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Attribute 2: Physical Waterbody Characteristics

Category:

Question R: Outlets

Directions: Consult a USGS topographic map, NH GRANIT, Google Earth, or a similar map containing the waterbody identify and record the names and general locations (i.e. mark them on a topographic map or record their latitude and longitude) of all the streams and rivers draining out of the lake or pond being considered. If there are no outlets make note of this on the worksheet.

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

Process Followed: Used the GRANIT streams network layer to indentify and locate the outlet. Ground truth to confirm.

Findings and Analysis: Refer to map.
One outlet was located.

Evaluation Criteria:
Outlet Name: Blaisdell Lake Dam
Drains into the Merrimack River basin.

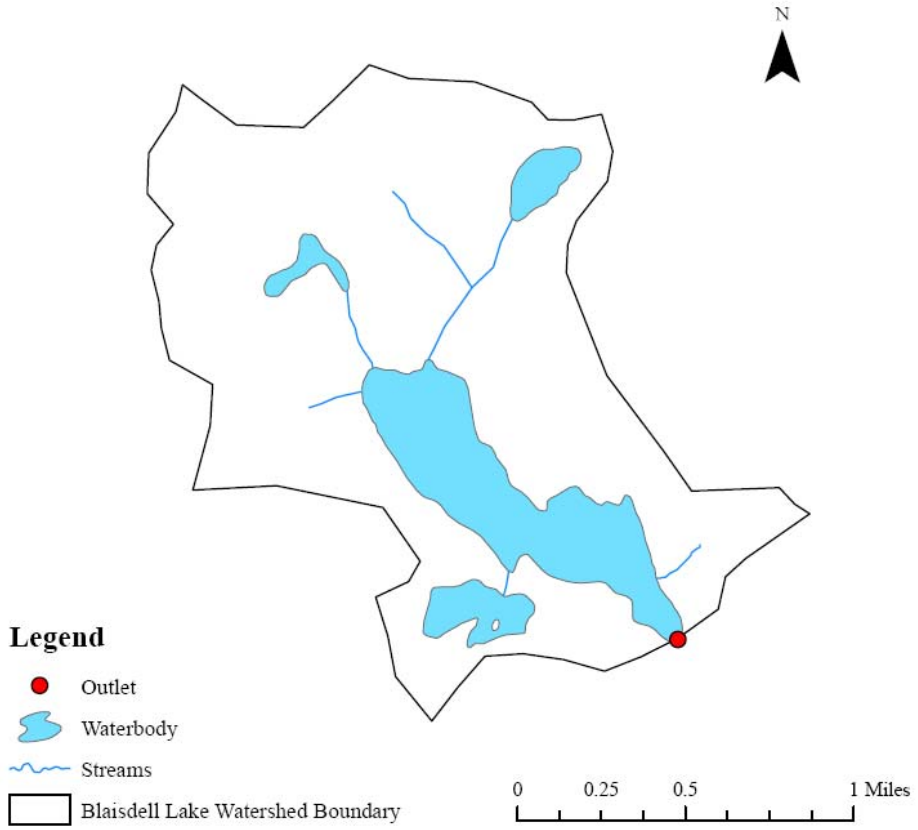
Sources:
NHGRANIT http://www.granit.unh.edu 30 March 2008

Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Amanda Lambert

Outlets
Attribute 2: Question R



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Attribute 3: Water Quality Characteristics

Category:

Question A: Waterbody trophic status

Directions: Consult the NHDES Survey Lake Data Summary for information regarding the trophic status of the lake. This document uses a technique that incorporates multiple water quality parameters developed by NHDES and provides an overall classification system. Alternative methods are acceptable, but you should note the parameters used in determining the lake or pond's trophic status.

Rational: A waterbodies 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 the waterbodies natural trophic state is important when developing specific actions for a management plan.

Process Followed: Located in the *NHDES Survey Lake Data Summary.*

Findings and Analysis: Blaisdell Lake is classified as being oligotrophic. This means that Blaisdell Lake carries characteristics following clear water, high dissolved oxygen content, cold water fishery, and low plankton growth and productivity. It is similar to many of the lakes in the area.

Evaluation Criteria:

1) Eutrophic
2) Mesotrophic
3) Oligotrophic

Sources:

New Hampshire Department of Environmental Services. (n.d.). *Lake Eutrophication*. Retrieved October 15, 2007, from NHDES: http://www.des.state.nh.us/factsheets/bb/bb-3.htm

Assessment of Question: question adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category:

Question B: Alkalinity or Acid Neutralizing Capacity (ANC)

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH Lay Lakes Monitoring Program (LLMP) reports, or an alternative reliable source to determine the alkalinity.

Rational: 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: Consulted the New Hampshire Volunteer Lake Assessment Program.

Findings and Analysis: The Alkalinity of Blaisdell Lake is 7.7 mg/L. The lower the ANC or Alkalinity reading, the more the lake is vulnerable to acid precipitation.

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)

Sources:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: question adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category:

Question C: Calcium concentration

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an 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. Zebra mussels require calcium for shell growth and need levels less than 9 mg/L for colonization.

Process Followed: Consulted the *NHDES Lake Trophic Reports.*

Findings and Analysis: Blaisdell Lake has a calcium concentration of 3.2 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) >12.0 mg/L

Sources:

DES Water Supply & Pollution Control Division-Biology Bureau. (n.d.). Retrieved October 15, 2007, from NHDES: http://www.des.nh.gov/wmb/lakes/lake_water/documents/trophic_reports/Blaisdell.pdf

Assessment of Question: question adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question D: pH

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the pH. If the waterbody regularly stratifies be sure the data was collected from the epilimnion (i.e. the upper layer of water extending from the surface to the thermocline).

Rationale: A lake or pond's 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 of 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 current *NHDES VLAP Annual Lake Reports.*

Findings and Analysis:

Station Name:	Year	Min.	Max.	Mean
BL-Generic	2000	7.34	7.52	7.45
BL- Billings Inlet	2005	6.28	6.58	6.44
BL-Brown Inlet	2005	6.42	6.87	6.64
BL-Deep Spot Epilimnion	2005	6.63	7.05	6.87
BL-Deep Spot Hypolimnion	2005	5.88	6.25	6.11
BL-Deep Spot Metalimnion	2005	6.29	6.88	6.61
BL-Outlet	2005	6.33	7.00	6.72
BL-Russel Inlet	2005	6.45	6.79	6.61

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:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question E: Total Phosphorous Concentration

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake 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 upper 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 current *NHDES VLAP Annual Lake Reports.*

Findings and Analysis: (in mg/L)

Station Name:	**Year**	**Min.**	**Max.**	**Mean**
BL-Generic	1993	.005	.007	.0059
BL- Billings Inlet	2005	.01	.018	.00132
BL-Brown Inlet	2005	.012	.039	.0028
BL-Deep Spot Epilimnion	2005	.005	.009	.0073
BL-Deep Spot Hypolimnion	2005	.009	.017	.00138
BL-Deep Spot Metalimnion	2005	.005	.011	.0078
BL-Outlet	2005	.005	.008	.006
BL-Russell Inlet	2005	.007	.017	.0118

Utilizing the values from the 3 different layers and the outlet the findings represents a range from .005 mg/L to .007 mg/L, best represent the Evaluation Criteria 2.

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:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question F: Secchi Disc Transparency

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rationale: 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 *New Hampshire VLAP Annual Lake Reports.*

Findings and Analysis:

Station Name:	Year	Minimum (meters)	Maximum (meters)	Mean (meters)
BL, Deep Spot	2001	4.8	6.2	5.58
	2002	4.4	6.8	5.54
	2003	4.5	7.0	5.5
	2004	4.5	6.0	5.05
	2005	4.75	6.0	5.38

Evaluation Criteria:	Score:
1) <1 meter (<3.28 feet)	**5**
2) 1.0 – 4.0 meters (3.28-13.1 feet)	**4**
3) 4.1 – 8.0 meters (13.1-26.2 feet)	**3**
4) 8.1 – 12.0 meters (26.3-39.4 feet)	**2**
5) > 12.0 meters (>39.4 feet)	**1**

Sources:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Unique or Outstanding Value

Question F: Secchi Disc Transparency

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rationale: 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 *New Hampshire VLAP Annual Lake Reports.*

Findings and Analysis:

Station Name:	Year	Minimum (meters)	Maximum (meters)	Mean (meters)
BL, Deep Spot	2001	4.8	6.2	5.58
	2002	4.4	6.8	5.54
	2003	4.5	7.0	5.5
	2004	4.5	6.0	5.05
	2005	4.75	6.0	5.38

Evaluation Criteria:	Score:
1) <1 meter (<3.28 feet)	**1**
2) 1.0 – 4.0 meters (3.28-13.1 feet)	**2**
3) 4.1 – 8.0 meters (13.1-26.2 feet)	**3**
4) 8.1 – 12.0 meters (26.3-39.4 feet)	**4**
5) > 12.0 meters (>39.4 feet)	**5**

Sources:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Recreational Value

Question F: Secchi Disc Transparency

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the transparency.

Rationale: 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 *New Hampshire VLAP Annual Lake Reports.*

Findings and Analysis:

Station Name:	Year	Minimum (meters)	Maximum (meters)	Mean (meters)
BL, Deep Spot	2001	4.8	6.2	5.58
	2002	4.4	6.8	5.54
	2003	4.5	7.0	5.5
	2004	4.5	6.0	5.05
	2005	4.75	6.0	5.38

Evaluation Criteria:	Score:
1) <1 meter (<3.28 feet)	**1**
2) 1.0 – 4.0 meters (3.28-13.1 feet)	**2**
3) 4.1 – 8.0 meters (13.1-26.2 feet)	**3**
4) 8.1 – 12.0 meters (26.3-39.4 feet)	**4**
5) > 12.0 meters (>39.4 feet)	**5**

Sources:

NHDES. (2005). New Hampshire Volunteer Lake Assessment Program. Concord: NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category:

Question G: Hazardous material spill event(s)

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

Rational: 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 that 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, identify any past spills that have occurred and document if the problem persists.

Process Followed: Located in the *NHDES One Stop Database Remediation and Initinal Response Spill Site.*

Findings and Analysis: Blaisdell Lake has had no hazardous materials spills in or around the waterbody.

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:

NHDES. (n.d.). *ORCB Site Results*. Retrieved October 15, 2007, from NHDES: http://www2.des.state.nh.us/OneStop/ORCB_Site_Results.aspx?Town=SUTTON&Address=&Name=Blaisdell+Lake&SiteNumber=&FacilityId=&Owner=&ProgramInterest=&Project=%

Assessment of Question: question adequate as stated.

Date Completed: October 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category:

Question H: Other Water Quality Concerns

Directions: Contact the NHDES Lakes Management and Protection Program or an alternative reliable source 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: Consulted the *NHDES Lakes Management and Protection Program.* Also, consulted the US Environmental Protection Agency's *Window to My Environment* which provides interactive maps and tools to answer questions about environmental conditions affecting air, land and water in local communities.

Findings and Analysis: There is no landfill, or other possible concerns in that similar category that would rise a problem within the Blaisdell Lake watershed. The results from the *Window to My Environment* query (see next page) also revealed that there are no Superfund, toxic release, water discharge, air emissions or hazardous waste cites near Blaisdell Lake.

Evaluation Criteria:

Problem Identification: N/A
Suspected Source of Problem: N/A
Status of Problem: N/A
Source of Information: NHDES Lakes Management and Protection Program

Sources:

New Hampshire Department of Environmental Services. (2006). *Onestop Solid Waste Landfills Information.* NHDES.

U.S. Environmental Protection Agency, (2007). Window to My Environment. Retrieved November 7, 2007, Web site: http://www.epa.gov/enviro/html/em/index.html

Assessment of Question: The question is adequate as stated but adding another source such as EPA's *Window to My Environment* should be considered.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category: Susceptibility to Impairment

Question I: Historic Point Source Discharges

Directions: Consult the NHDES Lakes Management and Protection Program or another reliable source to determine if the waterbody has any historic point source discharges.

Rationale: Although a point source polluter may not presently exist on the lake, a historic 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 human inputs can be important when devising a nonpoint source nutrient reduction strategy.

Process Followed: Contacted Jacquie Colburn, Lakes Coordinator
NH DES whom used the DES Surface Water Quality Assessment
Report at: http://www.des.state.nh.us/WMB/swqa/303dList.html to confirm the lack of existence of historic point discharges.

Findings and Analysis: There are no historic point discharges in the Blaisdell Lake area.

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:
Colburn, Jacqiue. "Blaisdell Lake Inventory." Email to Sarah Champagne. 28 November 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 3: Water Quality Characteristics

Category:

Question J: Listed in the NH 305(b) or 303(d) Surface Water Quality Reports.

Directions: Consult the most recent NH 305(b) and 303(d) Surface Water Quality Reports submitted by NHDES to the U.S. Environmental Protection Agency (EPA). Note whether the waterbody is listed on 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 in the NH 305(b) and 303(d) Surface Water Quality Reports.

Findings and Analysis: Blaisdell Lake is not on either NH 305(b) or 305(d) Surface Water Quality Reports, indicating there are no impairments to the surface water quality

Evaluation Criteria:

1) Listed on 305 (b) or 305(d)
2) Not listed on 305 (b) or 305(d)

Sources:

New Hampshire Department of Environmental Services - Watershed Management Bureau. NH 305(b) and 303(d) Surface Water Quality Reports. 2006 ed.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 4: Biological/Ecological Characteristics

Category: Susceptibility to Impairment

Question A: Algal Abundance; chlorophyll *a* level

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the algal abundance.

Rationale: The algal abundance in a waterbody is a function of water temperature, the amount of sunlight it receives, and the 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: Consulted the New Hampshire Department of Environmental Science (NHDES) Lake Trophic Reports and the NHDES Volunteer Lake Assesment Program (VLAP) Annual Lake Reports.

Findings and Analysis: When looking at the data given from the 1990 NHDES Lake Trophic Reports, the algal abundance in Blaisdell Lake was at a good level. When looking at the 2006 NHDES VLAP Annual Lake Reports, algal abundance ranged from 2 to 6mg/M3 (milligrams per cubic meter).

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 then desirable)	**3**
4.) 3.0-5.0 µg/L (good)	**2**
5.) > 3.0 µg/L (good)	**1**

Sources:

Lake Trophic Data. (1991). Retrieved October 31, 2007, from Department of Environmental Services Water Supply and Pollution Control Division Web site: http://www.des.nh.gov/wmb/lakes/lake_water/documents/trophic_reports/Blaisdell.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category: Recreation

Question A: Algal Abundance; Chlorophyll *a* level

Directions: Consult the NHDES Lake Trophic Reports, NHDES VLAP Annual Lake Reports, UNH LLMP reports, or an alternative reliable source to determine the algal abundance.

Rationale: The algal abundance in a waterbody is a function of water temperature, the amount of sunlight it receives, and the 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: Consulted the New Hampshire Department of Environmental Science (NHDES) Lake Trophic Reports and the NHDES Volunteer Lake Assesment Program (VLAP) Annual Lake Reports.

Findings and Analysis: When looking at the data given from the 1990 NHDES Lake Trophic Reports, the algal abundance in Blaisdell Lake was at a good level. When looking at the 2006 NHDES VLAP Annual Lake Reports, algal abundance ranged from 2 to 6mg/M3 (milligrams per cubic meter).

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 then desirable)	3
4.) 3.0-5.0 µg/L (good)	4
5.) > 3.0 µg/L (good)	5

Sources:

Lake Trophic Data. (1991). Retrieved October 31, 2007, from Department of Environmental Services Water Supply and Pollution Control Division Web site: http://www.des.nh.gov/wmb/lakes/lake_water/documents/trophic_reports/Blaisdell.pdf

Assessment of Question: The question is adequate as stated

Date Completed: October 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category:

Question B: Algal Community Composition

Directions: The scientific community is in the process of developing a methodology to best determine the algal community composition. At this time, please disregard this question. Consult the NHDES Lake Trophic Reports, UNH LLMP reports 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 important when assessing the condition of the lake or pond as well as developing specific strategies and objectives for the management plan.

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 New Hampshire 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 the lake shore, keep children and pets out of the water and notify NHDES so that the scum can be tested for the presence of toxins.

Process Followed: Consulted the 1990 NHDES Lake Trophic Reports and the web site "Introduction to the Chrysophyta" as cited below.

Findings and Analysis: There are currently no blue-green algaes in Blaisdell, this is an indicator of a healthy lake. Although there is no blue-green algae found in Blaisdell, there are a few other types of algae found in the lake.

Algae Present	Percentage
• Tabellaria: Green Algae (Diatom)	30%
• Dinobryon: Golden Brown Algae	20%
• Uroglenopsis: Golden Brown Algae	15%

Evaluation Criteria:
<10% blue-greens
10.0-30.0% blue-greens
30.1-50.0% blue-greens
50.1-70.0% blue-greens
>70% blue-greens

Sources:

Lake Trophic Data. (1991). Retrieved October 31, 2007, from Department of Environmental Services Water Supply and Pollution Control Division Web site: http://www.des.nh.gov/wmb/lakes/lake_water/documents/trophic_reports/Blaisdell.pdf

Waggoner, B (1995, 6 20). Golden Algae. Retrieved October 31 2007, from Introduction to the Chrysophyta Web site: http://www.ucmp.berkeley.edu/chromista/chrysophyta.html

Assessment of Question: The question is adequate as stated

Date Completed: October 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category: Unique or Outstanding Value

Question C: Fish Species Diversity

Directions: Consult the NH Freshwater Fishing Guide or an alternative reliable source 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: Consulted the 2004 NH Freshwater Fishing Guide. Also consulted Leon Malan in a personal interview.

Findings and Analysis: Shows that there are four species of fish in Blaisdell Lake.

- Smallmouth Bass
- Pickerel
- Horned Pout
- Sunfish
-

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:

(2004). An Angler's Guide to the Granite State's Best Freshwater Lakes, Ponds, Rivers, and Streams. Retrieved October 31, 2007, from New Hampshire Fish and Game: Freshwater Fishing Guide Web site: http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/FW_Fishing_Guide.pdf

Malan, L (2007,11,14). Interview on Blaisdell.

Assessment of Question: This question adequate as stated.

Date Completed: October 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category: Unique or Outstanding Value

Question D: Avian Species Diversity

Directions: Consult the "Avian Community Checklist" in Appendix B for a listing of birds in New Hampshire that use lake and/or pond habitat. Using the checklist, identify the avian species sighted in and around the waterbody. Work with the NHDES Lakes Program, 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, either for 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: Consulted the "Avian Community Checklist" to identify the avian species around Blaisdell Lake.

Findings and Analysis: Lists represent avian species that were found on the checklist and also avian species that were not found on the checklist but identified around Blaisdell Lake.

- On Checklist
  - Common Loon
  - Common Merganser
  - Canada Goose
  - Osprey
  - Common Yellowthroat
  - American Black Duck
  - Mallard
  - Hooded Merganser
  - Double Crested Cormorant
  - Great Blue Heron
  - Spotted Sandpiper
  - Bald Eagle
  - Red-Shouldered Hawk
  - Red-winged Blackbird
  - Common Grackle
  - Swamp Sparrow
  - Belted Kingfisher

Not on Checklist

- American Goldfinch
- Black-throated Blue Warbler
- Black-throated Green Warbler
- Blue Jay
- Cedar Waxwing
- Black Capped Chickadee
- Chipping Sparrow
- Downy Woodpecker
- Eastern Kingbird
- Eastern Wood-Pewee
- Indigo Bunting
- Mourning Dove
- Northern Flicker
- Song Sparrow
- Vireo
- White-breasted Nuthatch
- Wood Thrush

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:

Malan, L (November 14, 2007). Species list collected over time.

Assessment of Question: This question is adequate as stated

Date Completed: November 2007

Investigator: Benjamin Taylor

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 New Hampshire that use lake and/or pond habitat. Using the checklist, identify the mammal species sighted in and around the waterbody. Work with the NHDES Lakes Program, 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: Consulted the "Mammals Checklist" to identify the mammal species around Blaisdell Lake. Also consulted Leon Malan, Blaisdell Lake Protective Association member, in a private interview.

Findings and Analysis: The list below represents mammal species that were found on the checklist.

On Checklist

- Black Bear
- Beaver
- Little Brown Myotis
- Mink
- Moose
- Muskrat
- Racoon
- River Otter

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

Sources:

Malan, L (2007,November 14). Interview on Blaisdell

.

Assessment of Question: The question is adequate as stated

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category: Unique or Outstanding Value

Question F: Reptile and Amphibian Diversity

Directions: Consult the "Reptile and Amphibian Checklist" in Appendix B for a listing of all reptiles and amphibians in New Hampshire that use lake and/or pond habitat. Using the checklist, identify those species sighted in and around the waterbody. Work with the NHDES Lakes Program, NH Fish and Game, or local conservation organizations to obtain the information necessary for this question.

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 no current information is 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: Consulted the "Reptile and Amphibian Checklist" to identify the reptiles and amphibian species around Blaisdell Lake. Also consulted Leon Malan, Blaisdell Lake Protective Association member, in a private interview.

Findings and Analysis: Lists represent avian species that were found on the checklist and also avian species that were not found on the checklist but identified around Blaisdell Lake.

On Checklist	Not on Checklist
- Eastern Painted Turtle	- Red-backed Salamander
- Snapping Turtle	
- Red-spotted Newt	
- Eastern Ribbon Snake	

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:

Malan, L (2007, November 14). Interview on Blaisdell.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category:

Question G: Aquatic Macro-Invertebrate Community Composition

Directions: The scientific community is developing an effective methodology for determining the macroinvertebrate community composition. At this time, please disregard this question. Use local knowledge and consult the NHDES Lake Trophic Reports to obtain the information about the aquatic macroinvertebrate community in the waterbody.

Rational: Aquatic macroinvertebrates are those organisms that primarily inhabit lakes, ponds, and rivers that do not have backbones. Similar to reptiles and amphibians, this group of animals is often overlooked when assessing lakes and ponds. Freshwater mussels are examples of macroinvertebrates, which are sensitive to water quality changes. Mussels filter water and may show signs of bioaccumulation, a higher concentration of toxins in their tissues than in their surrounding environment. Take this opportunity to become familiar with the different types of aquatic macroinvertebrates that inhabit the lake or pond.

Process Followed: Used the NHDES Lake Trophic Reports to asses this question correctly.

Findings and Analysis: Findings indicate that there are two major groups of macro-invertebrates in Blaisdell watershed.

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

Sources:

New Hampshire Department of Environmental Services – Water Supply & Pollution Control Division- Biology Bureau. NHDES Lake Trophic Reports. 1991.

Also used local observational knowledge from the Colby-Sawyer faculty

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 4: Biological/ecological Characteristics

Category: Recreation

Question H: Specialized Habitats, Breeding or Rearing Areas in the Watershed

Directions: Identify any specialized habitats such as breeding and rearing areas on the waterbody and within the watershed. Some types of specialized habitats may include beaver lodges, loon nesting areas, heron rookeries. Contact the NHDES Lakes Management and Protection Program 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 (e.g., 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 (e.g., 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: Used observational knowledge students and faculty from Colby-Sawyer College.

Findings and Analysis: Findings indicate that there is a beaver dam and lodge in Russell Pond.

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: Used observational knowledge students and faculty from Colby-Sawyer College.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/ecological Characteristics

Category: Unique and Outstanding Value

Question H: Specialized Habitats, Breeding or Rearing Areas in the Watershed

Directions: Identify any specialized habitats such as breeding and rearing areas on the waterbody and within the watershed. Some types of specialized habitats may include beaver lodges, loon nesting areas, heron rookeries. Contact the NHDES Lakes Management and Protection Program 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 (e.g., 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 (e.g., 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: Used observational knowledge students and faculty from Colby-Sawyer College.

Findings and Analysis: Findings indicate that there is a beaver dam and lodge in Russell Pond and Brown Pond.

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: Used observational knowledge students and faculty from Colby-Sawyer College.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category: Susceptibility to Impairment

Question I: Exotic Aquatic Plants

Directions: Consult the Exotic Aquatic Plant Sites in New Hampshire Map from NHDES, the Inland Fisheries Division of the NH Fish and Game Department and the UNH Center for Freshwater Biology to determine the exotic plants and/or animals that occur in the lake or pond as well as its proximity to the nearest waterbody with an exotic species.

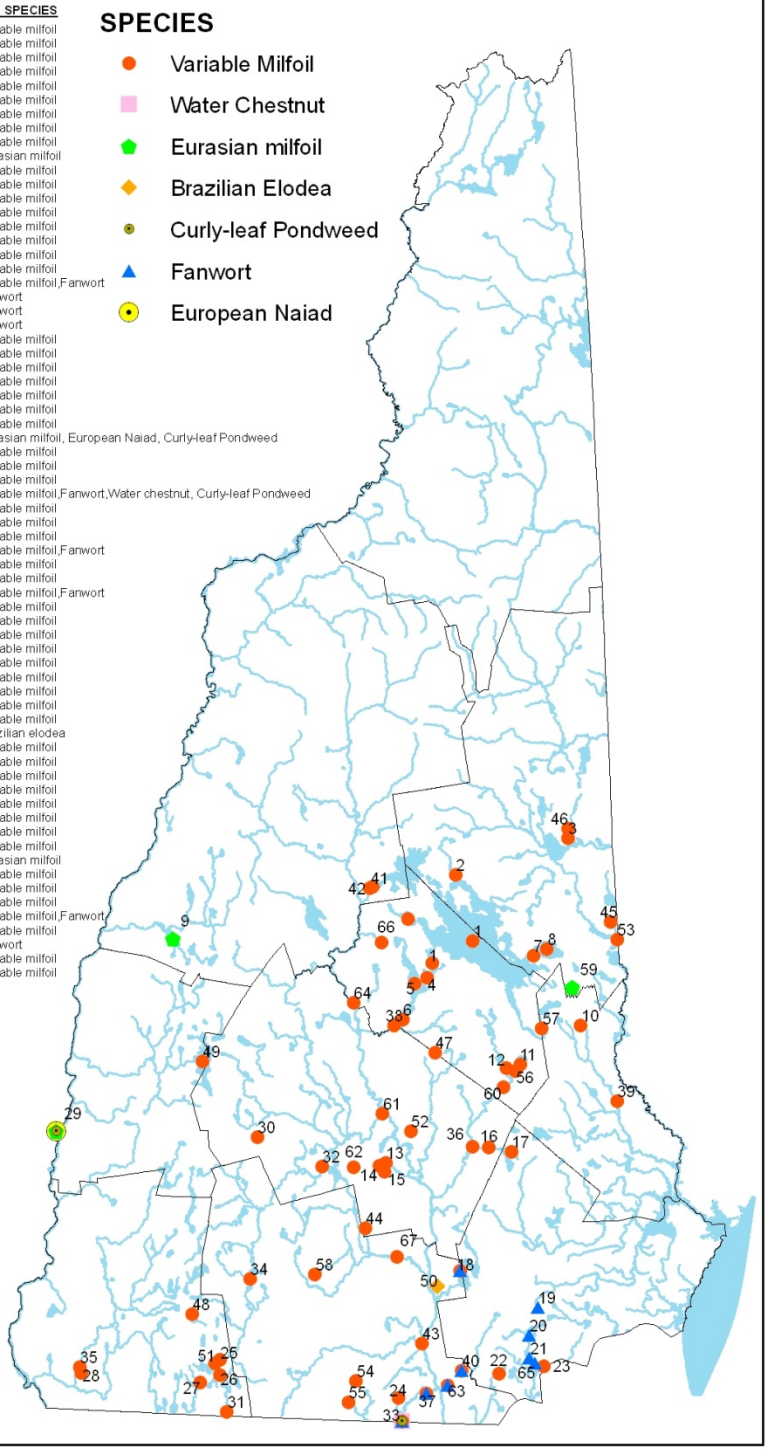
Rationale: Exotic aquatic species refers to those plant or animal species that are not native to New Hampshire waterbodies. Currently there are nine invasive aquatic plants known to occur in New Hampshire: variable milfoil, fanwort, water chestnut, Eurasian milfoil, Brazilian elodea, water naiad (*Najas minor*), curly-leaf pondweed, purple loosestrife, and common reed. 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.

Process Followed: Consulted the Exotic Aquatic Plant Sites in New Hampshire Map.

Findings and Analysis: Found that there were no exotic aquatic plants in Blaisdell Lake, although the exotic plant sites map does indicate variable milfoil in Lake Sunapee and Lake Massasecum which are both within a ten mile radius of Blaisdell, so the importance of this question is still very high.

EXOTIC AQUATIC PLANT SITES IN NEW HAMPSHIRE

Site #	Year	Waterbody (TOWN)	SPECIES
1	1990	Paugus Bay (Laconia)	Variable milfoil
1	1970	Winnipesaukee Lake (Gilford)	Variable milfoil
2	1975	Lees Pond (Moultonborough)	Variable milfoil
3	1995	Ossipee Lake (Broad Bay) (Freedom)	Variable milfoil
4	1990	Opechee Lake (Laconia)	Variable milfoil
5	1995	Winnisquam Lake (Meredith/Belmont)	Variable milfoil
6	1995	Silver Lake (Tilton)	Variable milfoil
7	1980	Crescent Lake (Wolfeboro)	Variable milfoil
8	1995	Wentworth Lake (Wolfeboro)	Variable milfoil
9	2000	Mascoma Lake (Enfield)	Eurasian milfoil
10	1998	Sunrise Lake (Middleton)	Variable milfoil
11	1990	Locke Lake (Barnstead)	Variable milfoil
12	1995	Suncook Lakes (Barnstead)	Variable milfoil
13	1990	St Paul's School Pond (Concord)	Variable milfoil
14	1990	Little Turkey Pond (Concord)	Variable milfoil
15	1990	Big Turkey Pond (Concord)	Variable milfoil
16	1998	Bixby Pond (Epsom)	Variable milfoil
17	1990	Northwood Lake (Northwood)	Variable milfoil
18	1995	Massabesic Lake (Auburn)	Variable milfoil,Fanwort
19	1980	Phillips Pond (Sandown)	Fanwort
20	1965	Big Island Pond (Derry)	Fanwort
21	1965	Arlington Mill Reservoir (Salem)	Fanwort
22	1995	Cobbetts Pond (Windham)	Variable milfoil
23	1996	Captain Pond (Salem)	Variable milfoil
24	1990	Flints Pond (Hollis)	Variable milfoil
25	1995	Cheshire Pond (Jaffrey)	Variable milfoil
26	1990	Contoocook Lake (Jaffrey)	Variable milfoil
27	1975	Pearly Pond (Rindge)	Variable milfoil
28	1998	Forest Lake (Winchester)	Variable milfoil
29	1995	Connecticut River (Charlestown)	Eurasian milfoil, European Naiad, Curly-leaf Pondweed
30	1995	Massasecum Lake (Bradford)	Variable milfoil
31	2000	Monomonac Lake (Rindge)	Variable milfoil
32	2000	Hopkinton Lake/Dam (Hopkinton)	Variable milfoil
33	2000	Nashua River (Nashua)	Variable milfoil,Fanwort,Water chestnut, Curly-leaf Pondweed
34	2000	Powder Mill Pond (Hancock)	Variable milfoil
35	2000	Ashuelot River (Winchester)	Variable milfoil
36	2000	Little Suncook River (Epsom/Northwood)	Variable milfoil
37	2000	Mine Falls Pond (Nashua)	Variable milfoil,Fanwort
38	2000	Winnipesaukee River (Tilton)	Variable milfoil
39	2000	Cocheco River (Rochester)	Variable milfoil
40	2000	Robinson Pond (Hudson)	Variable milfoil,Fanwort
41	2000	Squam River (Ashland)	Variable milfoil
42	2000	Squam Lakes (Holderness/Ashland)	Variable milfoil
43	2000	Horseshoe Pond (Merricmack)	Variable milfoil
44	2000	Gorham Pond (Dunbarton)	Variable milfoil
45	2000	Belleau Lake (Wakefield)	Variable milfoil
46	2000	Danforth Pond (Freedom)	Variable milfoil
47	2000	Rocky Pond (Gilmanton)	Variable milfoil
48	2001	Dublin Lake (Dublin)	Variable milfoil
49	2001	Sunapee Lake (Sunapee)	Variable milfoil
50	2001	Nutts Pond (Manchester)	Brazilian elodea
51	2001	Contoocook River (Jaffrey)	Variable milfoil
52	2002	Turtle Pond (Concord)	Variable milfoil
53	2002	Balch Lake (Wakefield)	Variable milfoil
54	2002	Melendy Pond (Brookline)	Variable milfoil
55	2002	Potanipo Lake (Brookline)	Variable milfoil
56	2002	Brindle Pond (Barnstead)	Variable milfoil
57	2003	Jones Pond (Stumpfield Pond) (New Durham)	Variable milfoil
58	2003	Scobie Pond/Haunted Lake (Francestown)	Variable milfoil
59	1992	Mountain Pond (Brookfield)	Eurasian milfoil
60	2003	Barnstead Parade Pond/Suncook (Barnstead/ Pittsfield)	Variable milfoil
61	2004	Merricmack River (Boscawen/ Cantebury / Concord)	Variable milfoil
62	2004	Kimball Pond (Hopkinton)	Variable milfoil
63	2004	Ottarnic Pond (Hudson)	Variable milfoil,Fanwort
64	2004	Pemigewasset River (Sanbornton)	Variable milfoil
65	2005	Wilson Lake (Salem)	Fanwort
66	2006	Lake Pemigewasset (Meredith)	Variable milfoil
67	2006	Piscataquog River (Goffstown)	Variable milfoil



Map Document: (H:\BIOLOGY\EXOTICS\Maps\ExoticUpdates\UpdateMilfoilMapwList.mxd) 1/2/2007 -- 11:41:49 AM

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:

Exotic Aquatic Plant Sites in New Hampshire. (2006). Retrieved November 14, 2007, from New Hampshire Department in Environmental Services Web site: http://www.des.nh.gov/wmb/exoticspecies/milfoil_list.htm

Assessment of Question: The question is adequate as stated

Date Completed: October 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/ecological Characteristics

Category: Susceptibility to Impairment

Question J: Exotic aquatic animal species

Directions: Consult the Exotic Aquatic Plant Sites in New Hampshire Map from NHDES, the Inland Fisheries Division of the NH Fish and Game Department and the UNH Center for Freshwater Biology to determine the exotic plants and/or 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 nine invasive aquatic plants known to occur in New Hampshire: variable milfoil, fanwort, water chestnut, Eurasian milfoil, Brazilian elodea, water naiad (Najas minor), curly-leaf pondweed, purple loosestrife, and common reed. 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 are of primary concern. Such species include alewife (a type of herring), the Japanese live-bearing snail, and the zebra mussel. Currently, 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: Consulted John Viar via e-mail from the NH Fish and Game Department to help clarify the question.

Findings and Analysis: Findings indicate that there are no aquatic exotic animals in Blaisdell Watershed. The closest findings of exotic aquatic animals are Rock Bass which are found in Lake Sunapee and Black Crappie which are found in Lake Massasecum.

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:

Personal communication with John Viar, Fisheries Biologist, NH Fish and Game Department via e-mail, November 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

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 the Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns document to identify the status of any "aquatic" plants or animals* listed either by the state or federal government as threatened or endangered and for any natural "exemplary" communities occurring in or around the waterbody's shoreland area (250 feet from the high water mark) or in and around other open waters such as small ponds, streams and rivers within the immediate watershed.

Rationale: Plants or animals listed as endangered or threatened, either by the state or nationally, along with "exemplary" natural communities will require additional efforts to ensure their continued existence. 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. Exemplary natural communities are those occurring that are not common in New Hampshire or that may be common, but have a unique feature such as being an old growth forest. The occurrence of endangered and threatened species as well as "exemplary" natural communities within the watershed indicates that there are special characteristics about that area that permit their existence. A management plan should identify these species or areas and recognize that their protection is critical.
*Only note those species within the immediate lake watershed.

Process Followed: Consulted the Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns. It must be noted that this list was organized by town, so in order to know which species are in the immediate watershed, local knowledge was needed.

Findings and Analysis: Found that there are no endangered species in the immediate watershed but there are threatened species:

Threatened:

-Common Loon

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:

New Hampshire Natural Heritage Bureau. (July 2007). Retrieved November 14, 2007,http://www.dred.state.nh.us/divisions/forestandlands/bureaus/natural heritage/documents/townlists.pdf

Used local knowledge from Colby-Sawyer faculty and students

Assessment of Question: The question is adequate as stated

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 4: Biological/Ecological Characteristics

Category:

Question L: NH Natural Heritage State Rank and Global Rank

Directions: Consult the NH Division of Forests and Lands Natural Heritage Bureau (NHB) Rarity and Ranking to identify the plant or animal of greatest concern that resides within the watershed of interest. Then determine its "flag" ranking by the NHB. The species chosen can be any animal or habitat of local or global interest. Depending on the species selected, its "flag" ranking will determine the appropriate point value.

Rational: The "flag" rank by the NHB 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 NHB Rarity and Ranking in order to find the animal, plant or habitat that is in the greatest concern.

Findings and Analysis: Findings indicate that there are several species that have high importance when looking at rarity. It must be noted that these species were found underneath the town of Sutton and not the immediate watershed. These species include:

- The Common Loon
- The Great Blue Heron
- The Blanding's Turtle
- The Wood Turtle

Evaluation Criteria:

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

Sources:

New Hampshire Natural Heritage Bureau, (2008). *Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns*. Concord, NH:

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Susceptibility to Impairment

Question A: Type of Watercraft

Directions: Estimate the average percentage of both petroleum and non-petroleum powered watercraft in use on the waterbody during four mid-summer days. Watercraft survey instructions are included in Appendix C to assist in the estimate.

Rationale: Lakes and ponds that support or allow watercraft use can become crowded in the summer months. In addition, if the percentages of power and non-power boats are known, the needs and desires of these different types of watercraft users can be considered in future waterbody access plans.

Process Followed: Given the data from August 12th of 2007 that Leon Malan had collected, we completed the *Type of Watercraft Survey*.

Findings and Analysis: Findings indicate that during a summer day there are more powerboats on Blaisdell Lake than there are non-powerboats.

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

Sources:

Observation from Leon Malan.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question A: Type of Watercraft

Directions: Estimate the average percentage of both petroleum and non-petroleum powered watercraft in use on the waterbody during four mid-summer days. Watercraft survey instructions are included in Appendix C to assist in the estimate.

Rationale: Lakes and ponds that support or allow watercraft use can become crowded in the summer months. In addition, if the percentages of power and non-power boats are known, the needs and desires of these different types of watercraft users can be considered in future waterbody access plans.

Process Followed: Given the data from August 12th of 2007 that Leon Malan had collected, we completed the *Type of Watercraft Survey*.

Findings and Analysis: Findings indicate that during a summer day there are more powerboats on Blaisdell Lake than non-powerboats.

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:

Observation from Leon Malan.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Susceptibility to Impairment

Question B: Average watercraft density on lake or pond

Directions: Refer to the "Average Watercraft Density Survey" in Appendix C 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 waterbodies 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: Consulted the *2005 Sutton Master Plan* to find the acreage of the lake. Then completed the *Average Watercraft Density Survey*

Findings and Analysis:

To estimate the number of watercraft per day:

A. Average the two weekday counts ((week day one + week day two)/2).
B. Multiply number from A by 5.
C. Add the two weekend counts (weekend day one + weekend day two).
D. Add totals from B and C.
E. 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.

During this study August 12th (Sunday), September 12th (Wednesday), September 17th (Monday), September 29th (Saturday) were used.

A. (0+0)/2= 0
B. 0*5=0
C. 25+0= 25
D. 0+25= 25
E. 25/7= 3.5

3.5 watercrafts a day/158 acres in Blaisdell Lake = .02 watercrafts per 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:

Chapter VI: Natural Resources. (2005). Retrieved November 14, 2007, from Town of Sutton New Hampshire Web site: http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/master_plan

Observation from the Community Based Research project class at Colby-Sawyer College.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question B: Average watercraft density on lake or pond

Directions: Refer to the "Average Watercraft Density Survey" in Appendix C 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 waterbodies 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: Consulted the *2005 Sutton Master Plan* to find the acreage of the lake. Then completed the *Average Watercraft Density Survey* using the data collected by Leon Malan on August 12th 2007 (Sunday).

Findings and Analysis:

To estimate the number of watercraft per day:

A. Average the two weekday counts ((week day one + week day two)/2).
B. Multiply number from A by 5.
C. Add the two weekend counts (weekend day one + weekend day two).
D. Add totals from B and C.
E. 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.

During this study the following dates were used: August 12th (Sunday), September 12th (Wednesday), September 17th (Monday), September 29th (Saturday).

F. (0+0)/2= 0
G. 0*5=0
H. 25+0= 25
I. 0+25= 25
J. 25/7= 3.5

3.5 watercrafts a day/158 acres in Blaisdell Lake = .02 watercrafts per 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:

(2005). Chapter VI: Natural Resources. Retrieved November 14, 2007, from Town of Sutton New Hampshire Web site: http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/master_plan

Observation from the third-year project class at Colby-Sawyer.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question C: Private Marine Service / Docking Facilities

Directions: By using local tax maps or personal knowledge determine and identify the name(s) and location(s) of all the privately owned marine service or docking facilities that surround the waterbodies perimeter.

Rationale: Knowing the locations of all the service and docking facilities will assist in estimating the number of boats that use the waterbody. 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: Consulted local tax map of Blaisdell Lake.

Findings and Analysis: Findings indicate that there are no private marine services. The beach on Blaisdell Lake is managed by the Blaisdell Lake Protective Association.

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:

Observational knowledge from Colby-Sawyer faculty and students.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category:

Question D: Other water dependent 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: Observed lake activities.

Findings and Analysis: There are many different types of recreational activities on Blaisdell Lake. Some of these activities include:

- Recreational Fishing
- Swimming
- Canoeing
- Kayaking
- Sailing
- Wakeboarding/Waterskiing/Knee boarding
- Snorkeling

Evaluation Criteria:

Activities for consideration:
- recreational fishing, waterfowl hunting
- swimming, snorkeling, SCUBA, canoeing, kayaking, sailing, waterskiing, knee boarding
- commercial boat tours, seaplanes, other

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

Sources:

Observation from Colby-Sawyer College students in September, October 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question E: Recreational Fishing

Directions: Find the waterbody in the NH Freshwater Fishing Guide 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 warm water 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 waterbodies recreational fishery.

Process Followed: Consulted the NH Freshwater Fishing Guide.

Findings and Analysis: Findings indicate that there are several warm water species in Blaisdell lake including:

- Smallmouth bass
- Largemouth Bass
- Pickerel
- Horned Pout

Evaluation Criteria:	**Score:**
1) Single warm water 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:

Freshwater Fishing Guide. (2004). Concord : New Hampshire Fish and Game Department.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question F: Occurrence of fishing tournaments/derbies

Directions: Consult the NH Fish and Game's Fishing Tournaments in New Hampshire listing 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 one to two 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: Consulted the Fishing Tournaments in New Hampshire.

Findings and Analysis: Findings indicate that there have been no fishing tournaments in the last several years.

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

Sources:

Gries, G (2007). A Summary of New Hampshire Black Bass Tournament Data. Retrieved November 7, 2007, http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/bass_tournament_data.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

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: Consulted the Angler Survey Instructions in Appendix C.

Findings and Analysis:
To estimate the number of anglers fishing per day:

A. Average the three weekday counts ((week day one + two + three)/3)
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 number from D by 7

During this study the following dates were used: August 12th (Sunday), August 21st (Tuesday), September 12th (Wednesday), September 17th (Monday), and September 29th (Saturday)

A. (2+0+0 = 2)/3 = .67
B. .67 X 5 = 3.35
C. 1 + 0 = 1
D. 3.35 + 1 = 4.35
E. 4.35 / 7 = .62 (anglers per day)
F. .62/185 = .00392 (anglers per acre)

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:

Observation by CES 301 students, Colby-Sawyer College, fall 2007.

Assessment of Question: This question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category:

Question H: Ice Dependent 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: Consulted Leon Malan in a personal interview.

Findings and Analysis: Determined that there are three different recreational activities that go on during the winter. These activities include:

- Ice fishing
- Snowmobiling
- Cross-country skiing

Evaluation Criteria:

Activities for consideration:
- ice skating
- ice sailing
- ice fishing
- on-ice racing
- snowmobiling
- ice strip airports
- other

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

Sources:

Malan, L (2007,November 14, 2007). Interview on Blaisdell.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category:

Question I: Non-water Dependent 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: Used observational knowledge from the Colby-Sawyer Community and Environmental Science students and faculty.

Findings and Analysis: Findings indicate that there are several types of non-water dependent activities. Some of these would be:

-Bird Watching
-Scenic Driving
-Picnicking
-Walking/Hiking
-Horseback Riding

Evaluation Criteria:

Activities for consideration:
- picnicking
- walking / hiking
- bike / horseback riding
- camping
- scenic driving
- other

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

Sources:

Used observational knowledge from the Colby-Sawyer Community and Environmental Science students and faculty.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category:

Question J: Commercial Seasonal Camps

Directions: By using local tax maps, personal knowledge, and the NHDES Licensed Youth Recreation Camp list determine and identify the name(s) and location(s) of any extended-stay (>1 week) summer 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: Consulted the *NHDES Licensed Youth Recreation Camp* list.

Findings and Analysis: Findings indicate that there is only one camp called Camp Wabasso uses this lake during the summer session of July 2nd through August 19th.

Evaluation Criteria:

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

Sources:

(2007). Licensed Youth Recreational Camps. Retrieved November 26, 2007, Web site: http://des.nh.gov/dwgb/YouthCamps/Licensed_Youth_Recreation_Camps.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 5: Recreational Characteristics

Category: Recreation

Question K: Boat Launches and Access Sites

Directions: By using local tax maps, the NH Atlas and Gazetteer by Delorme, and the NH Department of Resources and Economic Development's NH Public Access and Put Ins, determine and identify the name(s), location(s), and owner(s) of all public and private boat launching site(s) for the waterbody. Consult the NH Fish and Game Department's Public Access Boating and Fishing Sites in New Hampshire to obtain information regarding public launches. Information on municipal owned and private launches should be collected from each town.

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 activities they should also be designed and characteristics of the waterbody.

Process Followed: Consulted the NH Department of Resources and Economic Development's *NH Public Access and Put Ins*. Also used information from the NH Fish and Game Department's *Public Access Boating and Fishing Sites in New Hampshire*.

Findings and Analysis: Findings indicate that there is only one access site to the waterbody which is the beach.

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

Sources:

Outdoor Recreation . Retrieved November 28, 2007, from New Hampshire fish and Game Department Web site:
http://www.wildlife.state.nh.us/Outdoor_Recreation/access_sites_table.htm

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor
Attribute 5: Recreational Characteristics

Category: Recreation

Question L: Other Recreation and Support Facilities

Directions: By using local tax maps and websites, the NH Division of Parks and Recreation Parks at a Glance, and the NH Atlas and Gazetteer by Delorme determine and identify the name(s), location(s), and owner(s) of any parks, camping, or swimming facilities that occur on a waterbodies 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. Since they can also concentrate shoreline and near shore recreational activities they must also be designed and maintained in a manner that protects and matches the natural characteristics of the waterbody.

Process Followed: Used observational and local knowledge from Colby-Sawyer students and faculty to answer the question.

Findings and Analysis: Findings indicate that there are no other recreation or support facilities in the Blaisdell Watershed.

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: Used observational and local knowledge from Colby-Sawyer students and faculty to answer the question.

Assessment of Question: Access was denied when trying to enter the NH Division of Parks and Recreation Parks at a Glance website.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 6: Restrictions or Prohibited Uses

Category:

Question A: Public Swimming Facility Postings* Imposed because of Threats to Human Health.

Directions: Consult the NH Public Beach Inspection Advisories and the NH 305(b) and 303(d) Surface Water Quality Report.

Rational: Postings of public swimming facilities are a nuisance and concern to visiting recreational users and beach goers as well as community property owners. Awareness of the frequencies and locations of such closures is useful in prioritizing water quality protection efforts. Please list the locations and reasons for all closures, however for the evaluation, use only public beach closings.

* *A posting occurs when high numbers of toxic cyanobacteria occur or when E. coli or Enterococci bacteria exceed NH state standards (See NHDES environmental fact sheet WD-BB-41). In the cases of E. coli or Enterococci, high bacterial 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: Consulted Alicia Carlson from the New Hampshire Department of Environmental Services.

Findings and Analysis: No samples exceeded the state standard of 88 counts of E. coli per 100 mL of water since 1993, therefore no swimming advisories have been posted.

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:

Alicia Carlson from the New Hampshire Department of Environmental Services

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category:

Question B: Fish Consumption Limits Due to Threats to Human Health.

Directions: Consult the NHDES Environmental Health Program brochure Is it Safe to Eat the Fish We Catch? Mercury and Other Pollutants in New Hampshire Fish for any fish consumption limits due to threats to human health.

Rational: 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 NHDES Environmental Health Program brochure *Is it Safe to Eat the Fish We Catch? Mercury and Other Pollutants in New Hampshire Fish.*

Findings and Analysis: No specific restrictions are listed for fish consumption for Blaisdell Lake.

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:

The Blaisdell Lake Property Owners Association, Inc. *By-Laws and Association History*, *Sutton, New Hampshire*. (2001, July 28).

New Hampshire Freshwater Fishing Digest(2007). Retrieved October 20, 2007,from New Hampshire Fish and Game Web site: http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/FW_Fishing_Digest_07.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category:

Question C: Recreational Fishing Restrictions

Directions: Consult the 2007 NH Freshwater Fishing Digest, published by the NH Fish and Game Department for a list of statewide and waterbody-specific fishing regulations and restrictions.

Rational: 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 *2007 NH Freshwater Fishing Digest* and Blaisdell Lake Protective Association By-Laws and Association History.

Findings and Analysis: No specific recreational fishing restrictions listed.

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:

The Blaisdell Lake Property Owners Association, Inc. *By-Laws and Association History*, *Sutton, New Hampshire*. (2001, July 28).

New Hampshire Freshwater Fishing Digest. (2007). Retrieved October 20, 2007,from New Hampshire Fish and Game Web site: http://www.wildlife.state.nh.us/Fishing/Fishing_PDFs/FW_Fishing_Digest_07.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: October 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category:

Question D: Waterbody is Designated as a Drinking Water Supply

Directions: Consult Administrative Rule Env-Ws 386, Protecting the Purity of Regulated Watersheds or with the assistance of NHDES, consult the NHDES One Stop Public Water Systems list.

Rational: Lakes or ponds that serve as a current, emergency, or 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: Consulted *2007 Administrative Rule Env-Ws 386, Protecting the Purity of Regulated Watersheds*

Findings and Analysis: There was no record of Blaisdell Lake being used as any kind of drinking water source. Through observation of pipes running from houses into the lake there may be some water use from Blaisdell for non-drinking purposes.

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:

NHDES, Env-Ws 386 Protecting the Purity of Regulated Watersheds New Hampshire Code Of Administrative Rules. Retrieved November 7, 2007, from Rules For Protecting The Purity Of Regulated Watersheds Web site: http://www.des.nh.gov/rules/env-ws386.pdf

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category: Recreational Value

Question E: Power Boat Restrictions.

Directions: Consult the list of waterbodies with watercraft-specific restrictions in the 2006 List of Restricted Bodies of Water published by the NH Department of Safety – Division of Safety Services.

Rational: The enactment of power boat restrictions or prohibitions can be effective in protecting surface water quality or sensitive aquatic and near shore 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 watercraft must be considered equally when developing recreational use policies.

Process Followed: Consulted the *2006 List of Restricted Bodies of Water*

Findings and Analysis: There are no restrictions listed for Blaisdell 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:

Restricted Bodies of Water. Retrieved November 7, 2007, (Updated May 15, 2007). from New Hampshire Department of Safety, Bureau of Marine Patrol Web site:
http://www.nh.gov/safety/divisions/ss/marinepatrol/restricted.html

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category: Recreational Value

Question F: Ski Craft Restrictions.

Directions: Consult the list of waterbodies with ski craft-specific restrictions in the 2006 List of Restricted Bodies of Water published by the NH Department of Safety – Division of Safety Services

Rational: 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. In New Hampshire, 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 three or more passengers. Finally, under RSA 270:74, the use of ski craft is prohibited on all public bodies in New Hampshire that are less than 75 acres in size

Process Followed: Consulted the *2006 List of Restricted Bodies of Water.*

Findings and Analysis: There are no restrictions listed for Blaisdell Lake.

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:

Restricted Bodies of Water. Retrieved November 7, 2007, (Updated May 15, 2007) from New Hampshire Department of Safety, Bureau of Marine Patrol Web site: http://www.nh.gov/safety/divisions/ss/marinepatrol/restricted.html

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 6: Restrictions or Prohibited Uses

Category:

Question G: Lake Surface Areas with Restrictions/Limitations

Directions: With assistance from the NHDES Lakes Management and Protection Program 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 restrictions would be beneficial. You should also consider the size of the waterbody when assessing the number of restrictions.

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

Process Followed: Consulted the *NHDES Lakes Management and Protection Program* website.

Findings and Analysis: There are no specific restrictions listed for Blaisdell Lake.

Evaluation Criteria:

Restrictions for consideration:

- critical wildlife habitat areas
- areas where non-native plants are present
- specific zones where watercraft speed is limited; no wake zones
- specific zones where a particular surface water activity is prohibited (e.g., no rafting zone)
- mooring fields

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:

Lakes Management and Protection. Retrieved November 7, 2007, from New Hampshire Department of Environmental Services Web site: http://www.des.nh.gov/wmb/lakes/

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert
Attribute 6: Restrictions or Prohibited Uses

Category:

Question H: Restricted Activity Times

Directions: Consult the list of waterbodies with watercraft restrictions in the 2006 List of Restricted Bodies of Water published by the NH Department of Safety – Division of Safety Services and list any activities on the lake or pond that are restricted **to certain times of the day**.

Rational: Realizing that there may be high recreational demands placed upon popular lakes and ponds, "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 *2006 List of Restricted Bodies of Water*

Findings and Analysis: There are no restrictions listed for Blaisdell Lake.

Evaluation Criteria:

Type and timing of restricted activities	Restrictions for considerations: **1)** No time restrictions **2)** 1 time restriction **3)** 2 or more restrictions
Power boating	1
Non- power boating	1
Other	1
Water-dependent activities	1
On-water commercial activities	1
Non-water dependent activities	1
Ice-dependent activities	1
Camp-sponsored activities	1
Fish tournaments	1
Other	1

Sources:

Restricted Bodies of Water. Retrieved November 7, 2007, (May 15, 2007). from New Hampshire Department of Safety, Bureau of Marine Patrol Web site: http://www.nh.gov/safety/divisions/ss/marinepatrol/restricted.html

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

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 Public Water Systems list to locate the Public Water Systems in the towns surrounding the waterbody. Note 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 and watershed activities. A management plan should identify areas that are deficient in their protection measures or where the current protection measures are loosely enforced.

Process Followed: Consulted the *NHDES One Stop Public Water Systems.*

Findings and Analysis: Blaisdell Lake has no public water supply.

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

Sources:

New Hampshire Department of Environmental Services. NHDES One Stop Public Water Systems.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 7: Unique Characteristics

Category: Outstanding and Unique Values

Question B: Historic Features in or Around the Waterbody.

Directions: Consult the NH Division of Historic Resources NH State Register of Historic Places and the National Register of Historic Places and/or a local historical association to identify any features that are recognized by a local/state/national historic 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 waterbodies 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: Consulted the *NH State Register of Historic Places.*

Findings and Analysis: Blaisdell Lake has no registered historic places within its watershed.

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:

Colburn, Jackie. (Jcolburn@des.nh.gov) "Blaisdell Lake Inventory" Email to Sarah Champagne. (schampagne@colby-sawyer.edu) Received November 28th, 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Sarah Champagne

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question C: Educational 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 quality.

Process Followed: Contacted Jackie Colburn, Lakes Coordinator
NH DES.

Findings and Analysis: Blaisdell Lake has no specifically designated educational facilities or sites.

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 waterbodies natural characteristics	**3**
3) At least one facility with both outside and inside facilities designed to educate the public about the waterbodies natural characteristics	**5**

Sources:

Colburn, Jackie. "Blaisdell Lake Inventory." Email to Sarah Champagne. 28 November, 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 7: Unique Characteristics

Category: Unique or Outstanding Value

Question D: Research or Scientific Study

Directions: Record the name(s) and affiliation(s) or any institutions 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 one or two 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 sharing and protection efforts.

Process Followed: Contacted Jacquie Colburn, Lakes Coordinator
NH DES.

Findings and Analysis: Blaisdell Lake has not been involved in any research or scientific study prior to the Fall of 2007.

Sources:

Colburn, Jackie. "Blaisdell Lake Inventory." Email to Sarah Champagne. 28 November 2007.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

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 a volunteer monitoring program such as the Lakes Lay Monitoring Program (LLMP) by contacting the University of New Hampshire NH Water Resources Research Center or consulting the NHDES Volunteer Lake Assessment Program (VLAP) List of Lakes and Ponds or the New Hampshire Lakes Association's Lake Host Program. Include any type of regular volunteer monitoring efforts.

Rationale: Identifying if 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 tool to simultaneously gather basic information about various lake characteristics and to raise the awareness of a waterbody as a community resource.

Process Followed: Consulted the *NHDES Volunteer Lake Assessment Program (VLAP) List of Lakes and Ponds.*

Findings and Analysis: Blaisdell is a part of the *NHDES Volunteer Lake Assessment Program (VLAP).*

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:

New Hampshire Department of Environmental Services. (2007). *VLAP List.* NHDES.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Sarah Champagne

Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question A: Shoreland Development and Land Use

Directions: Using aerial photos, local tax maps, NH GRANIT, and USGS topographic maps construct a map indicating the location and approximate amount of medium density residential, high density residential, commercial, industrial, institutional, and major roads, within 250 feet of the high water mark around the entire waterbody. Town planning departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: Identifying the percentage of each land use type 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: After obtaining a digitized parcel layer we were able to calculate the acreage in the Blaisdell watershed shoreline. We traveled out to the field with our Global Positioning Systems (GPS) and took points to show where houses were in the shoreline. After finding this information we were able to compare our points with the parcel data obtained earlier in order to determine which parcels were developed. A structure on a parcel meant that parcel was developed. We also compared parcel data to aerial photos in order to be more accurate.

Findings and Analysis: Findings indicate that there is no commercial, industrial, or institutional land in use right now on the shoreline. Yet there is undeveloped and developed land in the shoreline. It was found that there was 9.46% undeveloped land and 90.54% medium and high density residential development in the shoreline.

Findings indicate the following:

-Medium Density Residential: 45.42%
- High Density Residential: 54.58%
- Commercial: 0%
- Industrial: 0%
- Institutional: 0%

Total % Developed: 100%

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, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. <http://www.granit.sr.unh.edu/>

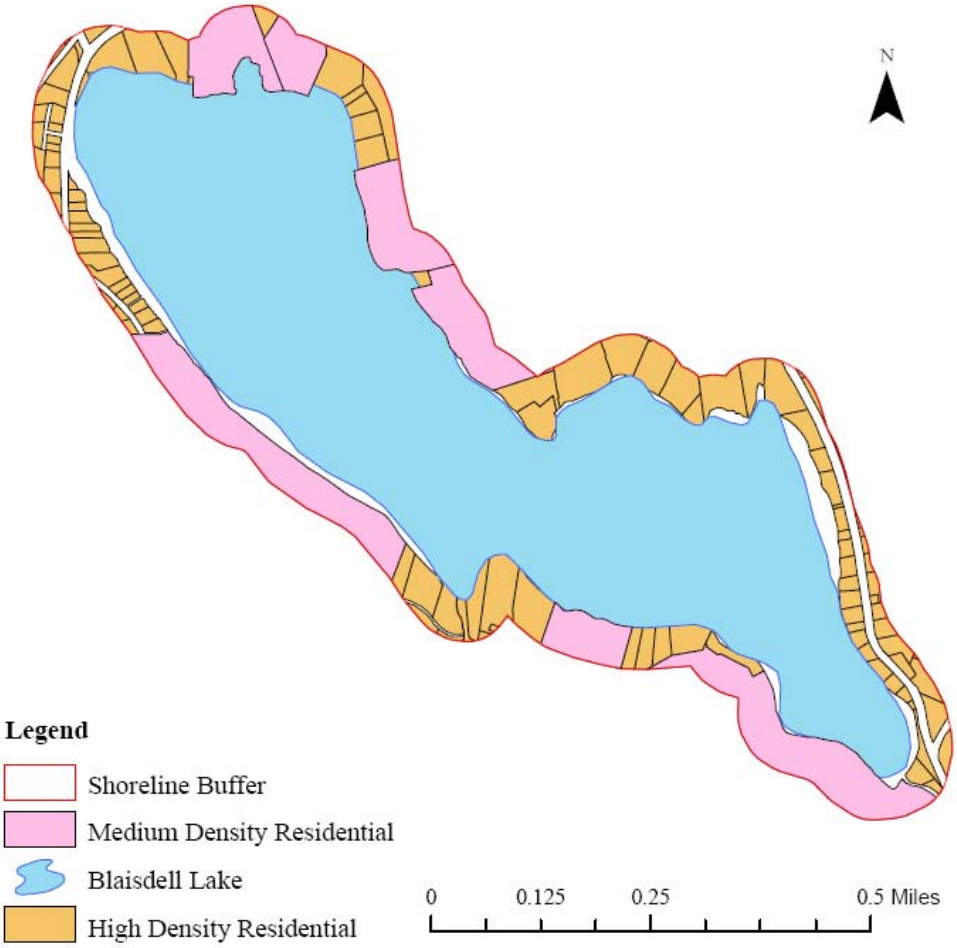
Assessment of Question: The only problem the group faced when answering this question was matching the points that we had taken in the field to the parcel data that we were given. There were some parcel layers that were very big, but still had a structure on them so we had to call them "developed" when they may appear undeveloped on an aerial photograph.

Date Completed: April 2008

Investigator: Benjamin Taylor

Undeveloped Land within Shoreline

Attribute 8: Question A



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Attribute 8: Shoreland Characteristics

Category:

Question B: Shoreland Ownership

Directions: By using local tax maps and NH GRANIT 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 commissions may be able to offer assistance in generating a map of the lake shoreland.

Rational: 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: Data retrieved from New Hampshire GRANIT was used in the ArcGIS 9.1 Geographic Information Systems program. Specifically, the national hydrography data layer was used to pinpoint Blaisdell Lake and buffered it by 250ft identify the shoreland. No public or conservation lands were located in this area.

Findings and Analysis: The shoreland is completely privately owned.

Private (acres)	256.23
Shoreland (acres)	256.23

Evaluation Criteria:

1) All private; no public land
2) All public; no private land
3) Mix of public and private land
* Public lands = government owned or maintained; conservation land; power company land.

Sources:

"GRANIT" Complex Systems Research Center. University of New Hampshire. 30 March 2008. http://granit.sr.unh.edu

Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Amanda Lambert

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 the information and maps from questions 8-A & 8-B as well as NH GRANIT identify all land that is protected from future development within the shoreland area (area within 250 feet of the high water mark) around the entire waterbody 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 in feet and shoreland area in acres. Note the ownership of 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 land you recognize potential partnerships for future lake management.

Process Followed: Referred to NH GRANIT.

Findings and Analysis: Blaisdell Lake has no protected land or land not available for development on its shore. Blaisdell Lake Protective Association owns the beach.

Evaluation Criteria: Percentage of total protected shoreland	**Score:**
1) 0%	**1**
2) 1-10%	**2**
3) 11-25%	**3**
4) 26-50%	**4**
5) >50%	**5**

Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. <http://www.granit.sr.unh.edu/>

Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Sarah Champagne

Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question D: Percent of Impervious Surface within the Shoreland

Directions: Using the information and maps from questions 8-A, 8-B, and 8-C calculate the land use for high density residential, medium density residential, commercial, industrial, institutional, and major roads. Do not include any unbuildable areas of land. Multiple each land use category by its impervious cover coefficient: medium density residential = 0.278, high density residential = 0.444, commercial = 0.722, industrial = 0.534, and institutional = 0.344. Add up the impervious area for each land use and major roads. Divide by the subwatershed area and multiply by 100.

Rationale: The amount of impervious area is important in determining stormwater runoff quantity and quality. Shoreland areas that provide little area for stormwater infiltration into the soil (i.e. high percentage of impervious surfaces) 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 used to effectively mitigate 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. Students carefully estimated the length and width of each building, road, driveway, and any other impervious surface within the shoreline of Blaisdell Lake. We marked a waypoint at each of these structures with a Global Positioning System (GPS) in order to show where these houses were in the shoreline. The group recorded the dimension of each structure and road. We calculated the square footage from our data and converted it to acres. We calculated the acreage in the shoreland using the x-tools extension in ArcGIS. By adding up each category and then dividing by the total acreage in the shoreline, we were able to calculate the total impervious surface percentage in the shoreline.

Findings and Analysis: Findings indicate that the impervious surface percentage for Blaisdell Lake shoreline is 2.20. This is good because the less impervious surface there is in a shoreline the less likely that shoreline will have problems like erosion. See chart for more details:

	Acres
Structures	2.742
Roads	1.588
Driveways	1.312
Shoreland	256.3
Percent Impervious	2.20%

Evaluation Criteria:	**Score**
1) >25%	**5**
2) 16 – 25%	**4**
3) 5 – 15%	**3**
4) 1 – 5%	**2**
5) no impervious shoreland within 250' of high water mark	**1**

Sources:

Gray, James (2007). Retrieved April 17, 2008, from Google Earth Web site: earth.google.com

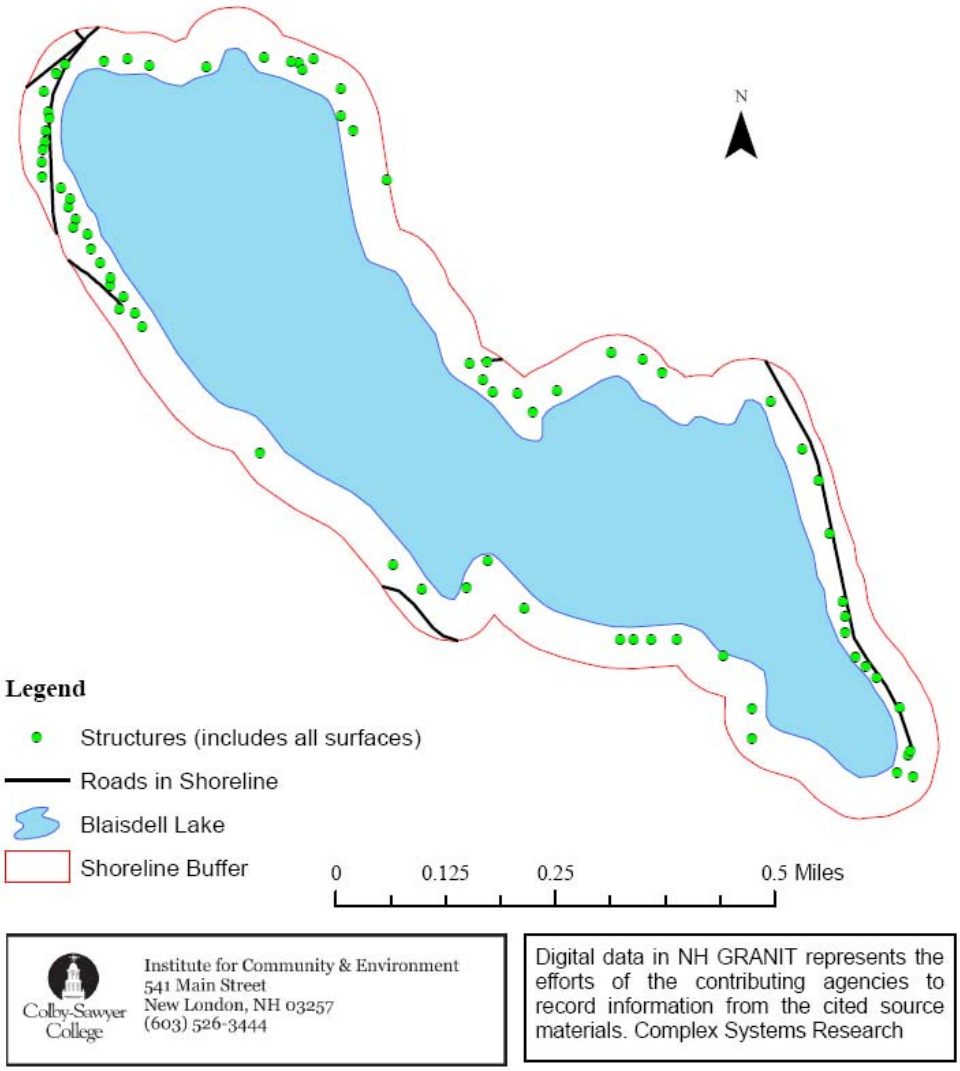
Assessment of Question: The only trouble the group had with his question was the weather and technology. Some of the roads in Blaisdell Lake shoreline are seasonal roads that do not get plowed during the winter. Although our group hiked in and still took the measurements of the houses, the points had to be estimated on the map.

Date Completed: April 2008

Investigator: Benjamin Taylor

Percent of Impervious Surface

Attribute 8: Question D



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Digital data in NH GRANIT represents the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research

Attribute 8: Shoreline Characteristics

Category:

Question E: Permanent or seasonal water dependent structures.

Directions: Using the "Shoreline Structure Survey" in Appendix C, 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.

Rationale: The density of water dependent structures is useful for assessing the waterbodies 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: Kayaked shoreline and used GPS units to mark places where shoreline structures existed.

Findings and Analysis: Findings indicate that there is an average of 4 – 6 structures for every 1,000 feet of shoreline. There are two places around the lake that have around 7 – 9 structures for every 1,000 feet of shoreline. These two places are on Camp Kemah Road and also on Route 114. Yet, there are also places around the lake that have no boathouses, docks or breakwaters. This is why the average of 4 – 6 structures was given.

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: Observational knowledge from Colby-Sawyer students and faculty.

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 8: Shoreland Characteristics

Category:

Question F: Shoreland Topography (Slope)

Directions: Using US Department of Agriculture Natural Resources Conservation Service (NRCS) County Soil Surveys in New Hampshire determine all shoreland areas (areas within 250 feet of the high water mark) with a slope >15%. If NRCS County Soil Surveys in New Hampshire are unavailable determine slope by drawing a straight line perpendicular to the contours of a USGS topographic map. For the most accuracy, begin and end the line on a contour, rather than between contours. Measure the length of the line drawn, using a ruler and the scale of the map, and convert that distance to feet. Determine the total elevation change along the drawn line by subtracting the elevation of the lowest contour used from the highest contour used. This is the elevation change. To calculate a percent slope, divide the elevation change by the distance of the drawn line, then multiply by 100. Ex: 100 ft. (highest elevation) – 40 ft. (lowest elevation) = 60 ft. elevation change. 60 ft/100 ft. (distance of drawn line) = 0.6 ft. 0.6 ft. x 100 = 60 percent slope.

Rationale: The topography and especially the slope of the shoreland area is an important natural characteristic that controls the rate and amount of stormwater that enters the lake or pond. 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: Referred to NH GRANIT. Used ArcMap GIS tools to calculate slope.

Findings and Analysis: Within the 250 buffer of the lake there is little amount of 16% or greater grade, but still falls in the 1 to 25 percentage of the buffer criteria.

Evaluation Criteria:
1) >75% of the shoreland area has a slope of 16% or greater
2) 51 – 75% of the shoreland area has a slope of 16% or greater
3) 26 – 50% of the shoreland area has a slope of 16% or greater
4) 1 – 25% of the shoreland area has a slope of 16% or greater
5) None of the shoreland has a slope of 16% or greater

Sources:

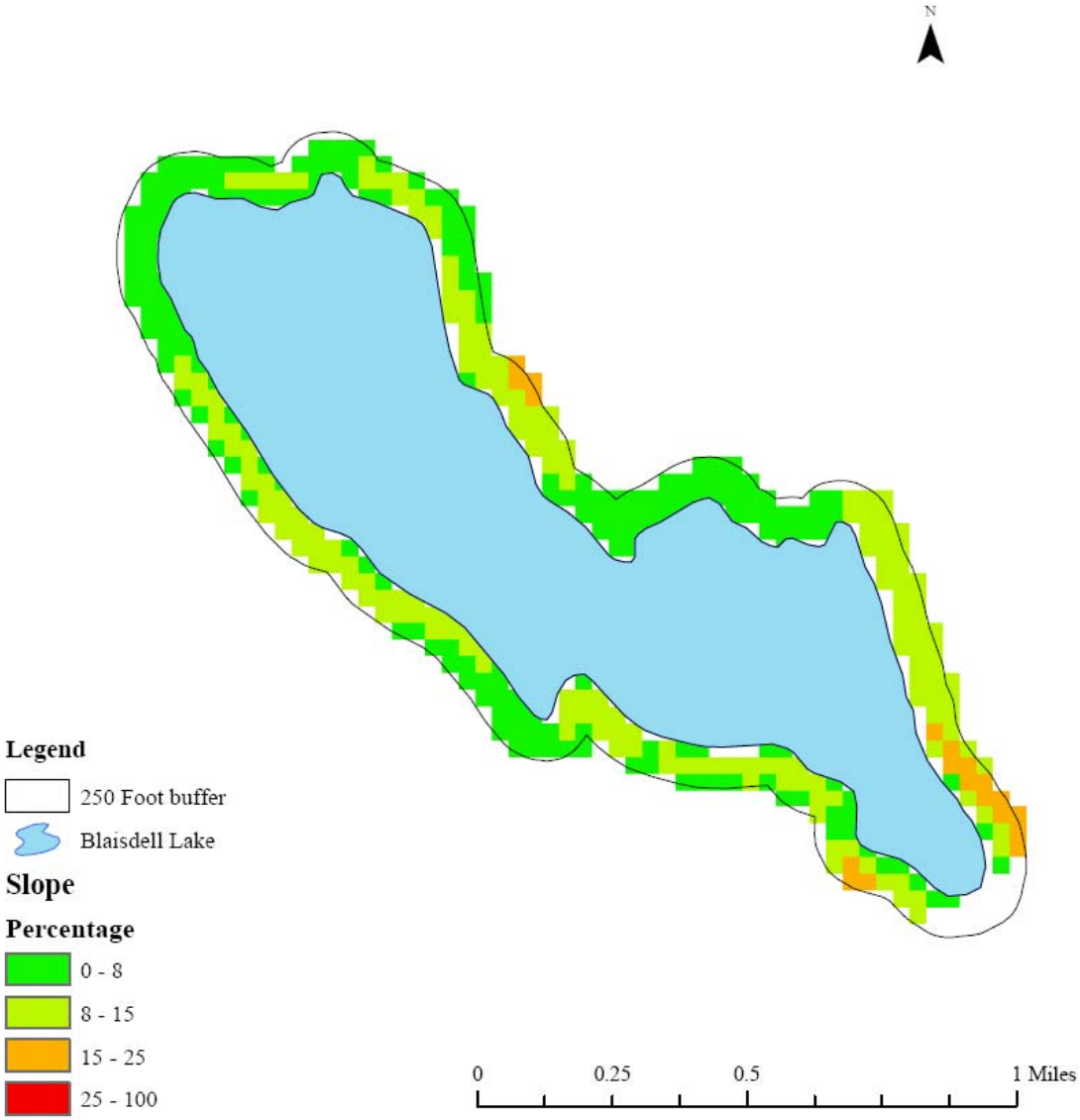
"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. <http://www.granit.sr.unh.edu/>

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Shoreland Topography
Attribute 8: Question F



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Attribute 8: Shoreland Characteristics

Category:

Question G: Shoreland Geology and Soils.

Directions: Consult the NRCS County Soil Surveys in New Hampshire and the NHDES Bedrock Geologic Maps to identify the percentages of bedrock and hydric-soils in the shoreland area (area within 250 feet of the high water mark).

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 a high percentage of the shoreland area has bedrock present at the surface, 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: Referred to NH GRANIT. Used ArcGIS to select hydricsoils. There was no bedrock indicated in this data layer within the shoreland. We calculated the acreage of those soils and the percent in the shoreland.

Findings and Analysis:
Bedrock: 0% of 250 foot shoreland buffer
Hydric soils: 8.96% of 250 foot shoreland buffer

Evaluation Criteria:	**Score:**
1) 0%; all shoreland soils are suitable for development	**1**
2) < 10%	**2**
3) 11 – 25%	**3**
4) 26 – 50%	**4**
5) >50%	**5**

Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. <http://www.granit.sr.unh.edu/>

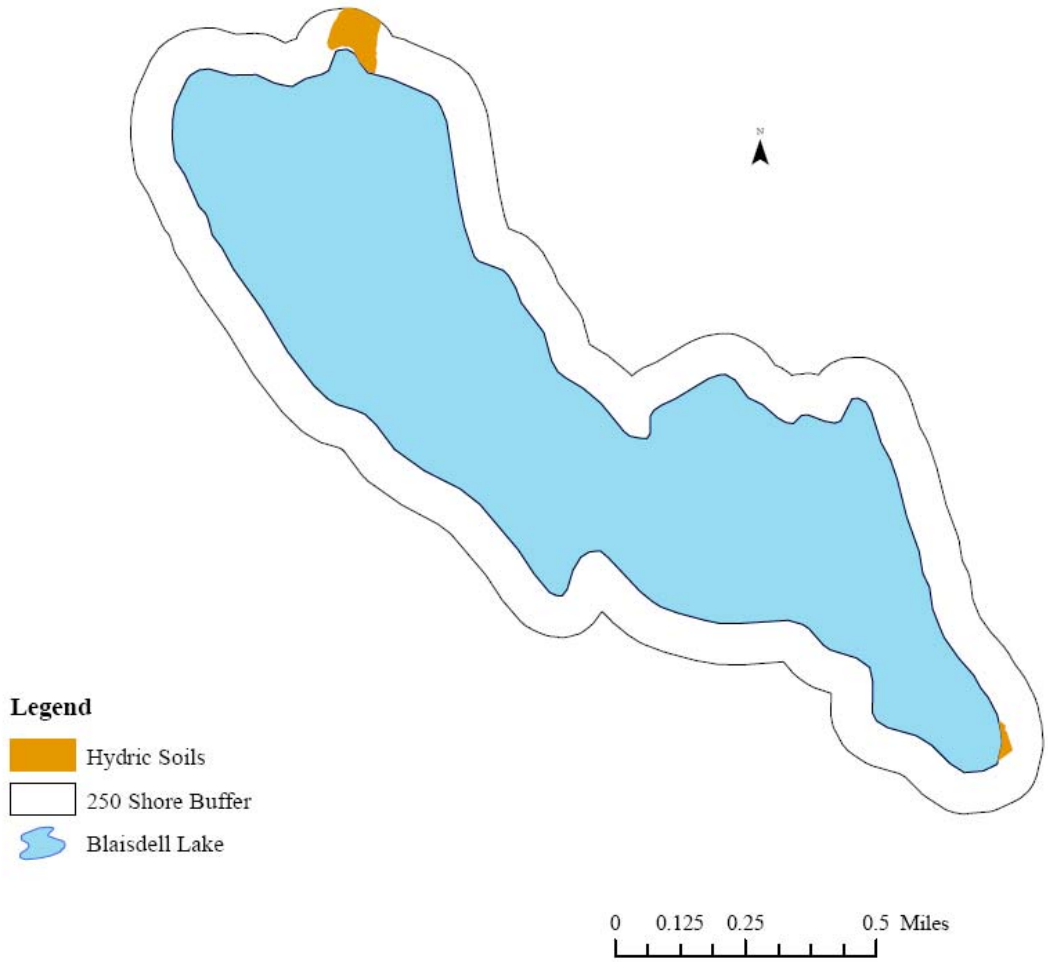
Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Shoreland Geology and Soils

Attribute 8: Question G



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Attribute 8: Shoreland Characteristics

Category: Susceptibility to Impairment

Question H: Local Land Use Regulatory Measures within the Shoreland

Directions: Review the regulatory measures for land use and development for each of the municipalities by visiting their website or their city/town hall within the shoreland area to determine if there are any ordinances designed to protect the natural waterbody characteristics.

Inadequate	*Adequate*	*Exceptional*
• No zoning • No site plan review regulations required •Only state or federal regulations apply	• At least 50' setback from stream/wetland • Specific erosion control provisions • Subsurface sewage regulations • Minimum lot sizes • Excavation regulations • Junkyard regulations • Use of best management practices required	• >50' setback from stream / wetland • Detailed erosion control plans • Buffer strip protection required • Subsurface sewage regulations (>125' from stream/wetland) • Minimum lot sizes by soil type •Wetland regulations • Aquifer regulations • Limited impervious surface • Innovative land use controls • Growth management strategy enacted • Hazardous waste and underground storage tank regulations • Overlay zones

Rational: 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: Consulted Town of Sutton 2005 *Master Plan*

Findings and Analysis: Blaisdell watershed falls within in one municipality.

- 75' setback from the high water mark of a wetland
- 150' setback from the boundary of a lake
- 2 acre lot size is required with 200'-250'frontage along a town road

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

Sources:

Chapter II- Current Land Use. Retrieved November 26, 2007, from 2005 Sutton Master Plan <http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/mp3.pdf>.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 8: Shoreland Characteristics

Category: Unique or Outstanding Value

Question H: Local Land Use Regulatory Measures within the Shoreland

Directions: Review the regulatory measures for land use and development for each of the municipalities by visiting their website or their city/town hall within the shoreland area to determine if there are any ordinances designed to protect the natural waterbody characteristics.

Inadequate	*Adequate*	*Exceptional*
• No zoning • No site plan review regulations required •Only state or federal regulations apply	• At least 50' setback from stream/wetland • Specific erosion control provisions • Subsurface sewage regulations • Minimum lot sizes • Excavation regulations • Junkyard regulations • Use of best management practices required	• >50' setback from stream / wetland • Detailed erosion control plans • Buffer strip protection required • Subsurface sewage regulations (>125' from stream/wetland) • Minimum lot sizes by soil type •Wetland regulations • Aquifer regulations • Limited impervious surface • Innovative land use controls • Growth management strategy enacted • Hazardous waste and underground storage tank regulations • Overlay zones

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: Consulted Town of Sutton 2005 *Master Plan.*

Findings and Analysis: Blaisdell watershed falls within in one municipality.

- 75' setback from the high water mark of a wetland
- 150' setback from the boundary of a lake
- 2 acre lot size is required with 200'-250'frontage along a town road

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

Sources:

Chapter II- Current Land Use. Retrieved November 26, 2007, from 2005 Sutton Master Plan <http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/mp3.pdf>.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 8: Shoreland Characteristics

Category:

Question I: Rate of Shoreland Development

Directions: Consult the NH Office of Energy and Planning's Current Estimates and Trends in New Hampshire's Housing Supply, town planners, town master plans, or regional planning commissions to obtain an estimate of the rate of development over the past ten years of the shoreland area (area within 250 feet of the high water mark). The estimate should be based upon the number of building permits per year. Please note: This question pertains to new development, not conversion, additions, improvements, etc. Only include new development in the tally.

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: In order to answer this question the team traveled to the Sutton Town Hall. There we were given development information for the town of Sutton from March 16th, 1998 up until October 18th, 2007. Unfortunately the information provided was only the development in the watershed and not in the 250 feet shoreland buffer .

Findings and Analysis: Findings indicate that the rate of development within the watershed is around twenty-two houses a year.

	House
3/16/1998	5
1999	17
2000	26
2001	17
2002	33
2003	33
2004	24
2005	19
2006	18
Up to 10/18/2007	11
Total	**203**

Evaluation Criteria:

1) >10 permits/year
2) 6 – 10 permits/year
3) 3 – 5 permits/year
4) 0 – 2 permits/year
5) None within the past 10 years

Sources:

Lynn King, personal communication, April 21, 2008

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 8: Shoreland Characteristics

Category:

Question J: Rate of Conversions

Directions: Consult the NH Office of Energy and Planning's Current Estimates and Trends in New Hampshire's Housing Supply, town planners, town master plans, or regional planning commissions to obtain an estimate of the rate of conversions, additions, improvements, etc. over the past ten years of the shoreland area (area within 250 feet of the high water mark). The estimate should be based upon the number of building permits per 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: In order to answer this question our team traveled to the Sutton Town Hall. There we were given information of development in Sutton from March 16th, 1998 to October 18th, 2007. Unfortunately the group could only get the conversion rate for the whole watershed. With this information the group was able to answer this question completely.

Findings and Analysis: Findings indicate that there were seventy total additions and one hundred and six total renovations from March 16th, 1998 to October 18th, 2007. This averages out approximately seven additions a year and around eleven renovations a year.

	Addition	Renovation
3/16/1998 and up	5	13
1999	7	15
2000	12	17
2001	2	6
2002	9	8
2003	7	9
2004	12	13
2005	7	18
2006	4	2
Up to 10/18/2007	5	5
Total	70	106

Evaluation Criteria:

1) >10 permits
2) 6 – 10 permits/year
3) 3 – 5 permits/year
4) 0 – 2 permits/year
5) None within the past 10 years

Sources:

Lynn King, personal communication, April 21, 2008

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 9: Watershed Characteristics

Category: Recreation

Question A: Watershed Development and Land Use

Directions: Using the NRCS County Soil Surveys in New Hampshire, aerial photos, local tax maps, and USGS topographic maps construct a map indicating the location and approximate amount of medium density residential, high density residential, commercial, industrial, institutional, and major roads in the immediate watershed area. Town planning departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: Identifying the percent of each land use type 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 lands available for future development or land use conversion.

Process Followed: Using ArcGIS we calculated the acreage in the Blaisdell watershed. We then traveled out to the field with our Global Positioning Systems (GPS) and took points at each structure. After obtaining this information we were then able to compare it to tax data and parcel data obtained earlier. Each parcel with a structure on it was called developed. We also used aerial photos in order to be more accurate.

Findings and Analysis: Findings indicate that there is no commercial, industrial, or institutional land in use right now in the watershed of Blaisdell Lake.

Findings indicate the following:

-Medium Density Residential: 7.41%
- High Density Residential: 32.21%
- Commercial: 0%
- Industrial: 0%
- Institutional: 0%

Total % Developed = 39.62%

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:

Gray, James (2007). Retrieved April 17, 2008, from Google Earth Web site: earth.google.com

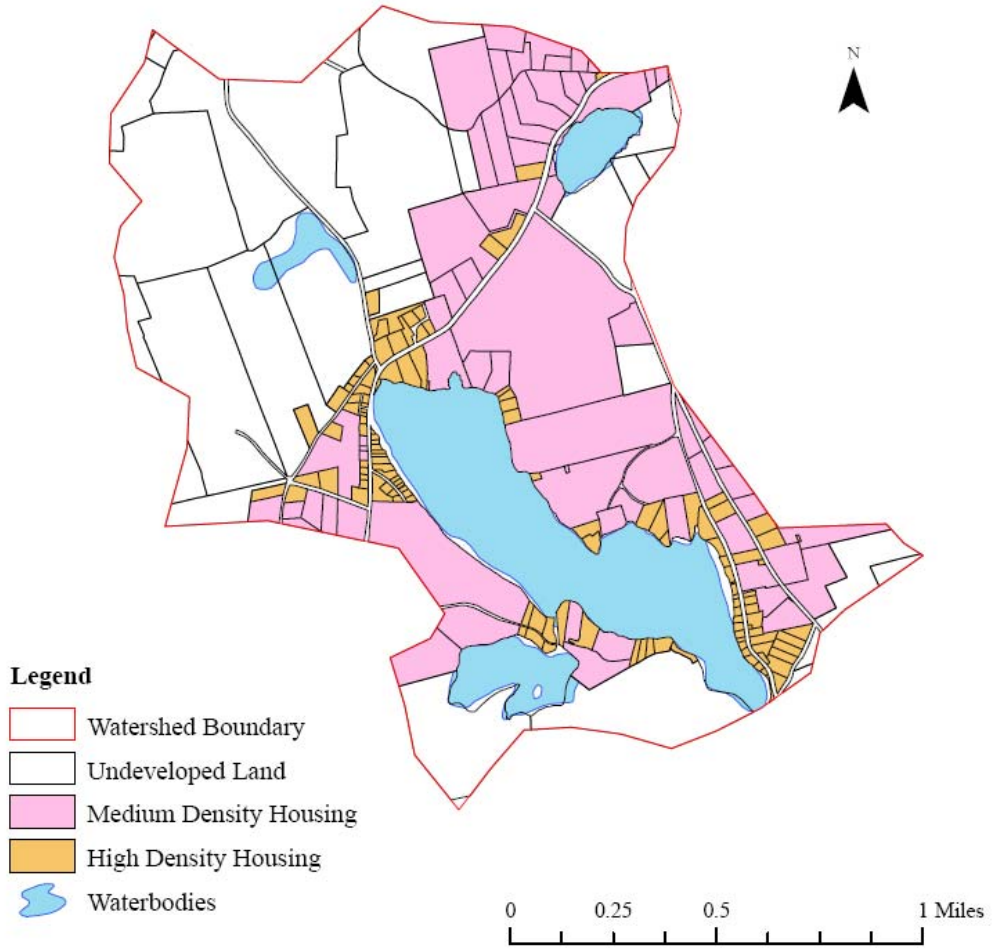
Assessment of Question: In this question "high density residential" describes houses that are less than two acres and have a structure on them. "Medium density residential" means that the house was over two acres and had a structure on it.

Date Completed: April 2008

Investigator: Benjamin Taylor

Development and Land Use

Attribute 9: Question A



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Attribute 9: Watershed Characteristics

Category: Susceptibility to Impairment

Question A: Watershed Development and Land Use

Directions: Using the NRCS County Soil Surveys in New Hampshire, aerial photos, local tax maps, and USGS topographic maps construct a map indicating the location and approximate amount of medium density residential, high density residential, commercial, industrial, institutional, and major roads in the immediate watershed area. Town planning departments, as well as regional planning commissions may be able to offer assistance in generating a map.

Rationale: Identifying the percent of each land use type 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 lands available for future development or land use conversion.

Process Followed: Using ArcGIS we calculated the acreage in the Blaisdell watershed. We then traveled out to the field with our Global Positioning Systems (GPS) and took points at each structure. After obtaining this information we were then able to compare this data to tax parcel data. Each parcel with a structure on it was called developed. We also used aerial photos in order to be more accurate.

Findings and Analysis: Findings indicate that there is no commercial, industrial, or institutional land in use right now in the watershed of Blaisdell Lake. Yet there is still undeveloped land and medium and high density residential housing.

Findings indicate the following:

-Medium Density Residential: 7.41%
- High Density Residential: 32.21%
- Commercial: 0%
- Industrial: 0%
- Institutional: 0%

Total % Developed = 39.62%

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:

Gray, James (2007). Retrieved April 17, 2008, from Google Earth Web site: earth.google.com

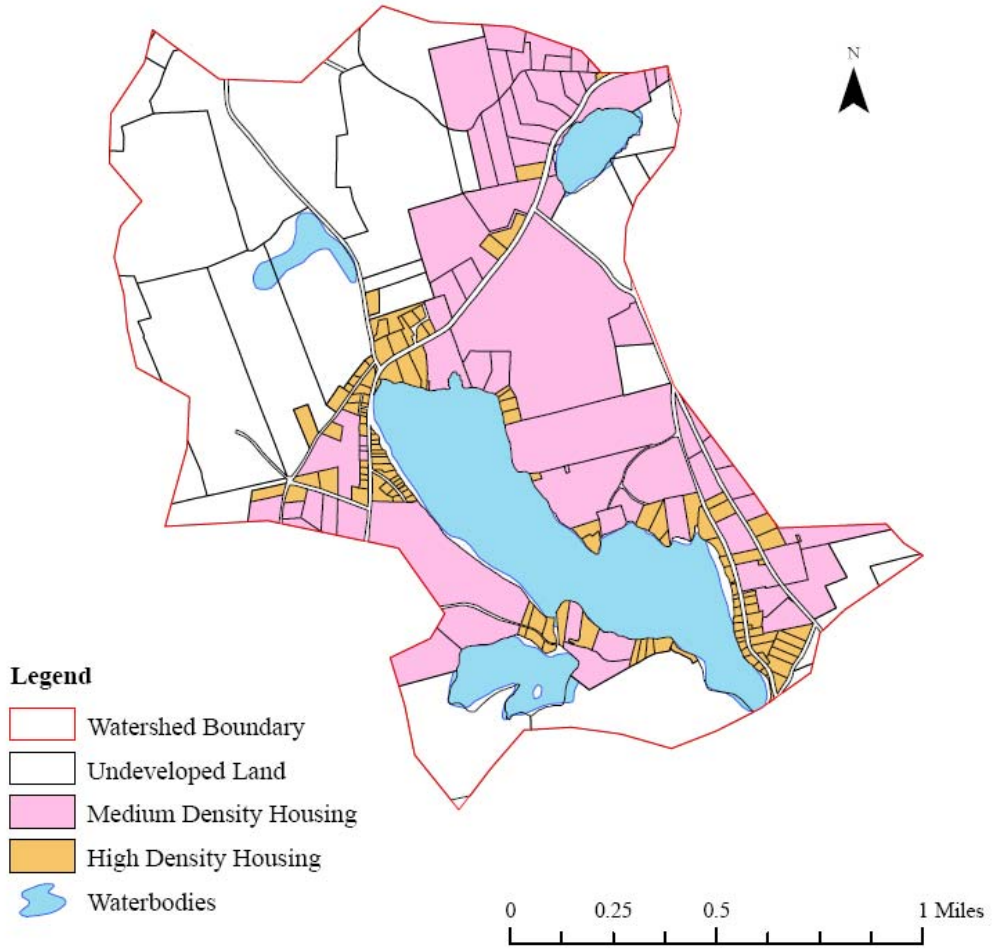
Assessment of Question: In this question "high density residential" describes houses that are less than two acres and have a structure on them. "Medium density residential" means that the house was over two acres and had a structure on it.

Date Completed: April 2008

Investigator: Benjamin Taylor

Development and Land Use

Attribute 9: Question A



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Attribute 9: Watershed Characteristics

Category:

Question B: Watershed Land Ownership.

Directions: By using local tax maps and NH GRANIT 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 town planning or assessing departments, as well as regional planning commissions may be able to offer assistance generating a watershed map.

Rational: 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 forestry 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 representing results can be found on the following page. Data retrieve from New Hampshire Granit was used in ArcGIS 9.1 geographic information systems program. Data concerning conserved land was used along with tax parcel information to construct a map showing conserved land within the watershed.

Findings and Analysis: 8.44 acres of conserved land were located within the watersheds 1088 acres.

Evaluation Criteria:

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

If (3), then what is the approximate percent f public and private land?

Public:	**.78%**
Private:	**99.2%**

* Public lands = government owned or maintained; conservation land; power company land.

Sources:

"GRANIT" Complex Systems Research Center: University of New Hampshire. 31 March 2008. http://granit.sr.unh.edu

Town of Suttons parcel data.

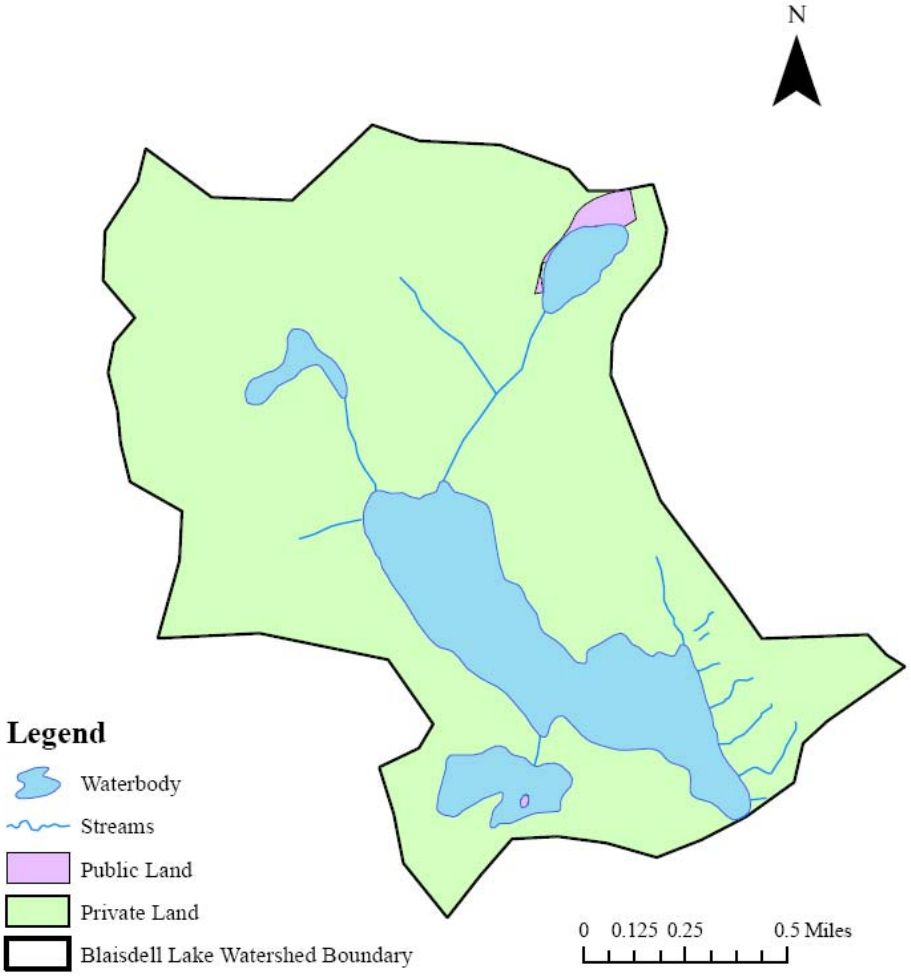
Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Amanda Lambert

Watershed Land Ownership

Attribute 9: Question B



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Attribute 9: Watershed Characteristics

Category: Outstanding and Unique Values

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

Directions: Using the information and maps from questions 9-A & 9-B as well as NH GRANIT identify all land that is protected from future development within **the immediate watershed** including state owned properties, town owned properties, private conservation organization properties, and conservation easements. Note ownership of the land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland usage 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: Referred to NH GRANIT.

Findings and Analysis: Blaisdell Lake has a small piece of land in Conservation on the shore of Russell Pond, which is owned by the Town of Sutton, and the island on Billings Pond is also conserved land, which is owned by the State of New Hampshire.

Evaluation Criteria:	**Score:**
1) 0%	**1**
2) 1-10%	**2**
3) 11-25%	**3**
4) 26-50%	**4**
5) >50%	**5**

Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. http://www.granit.sr.unh.edu/

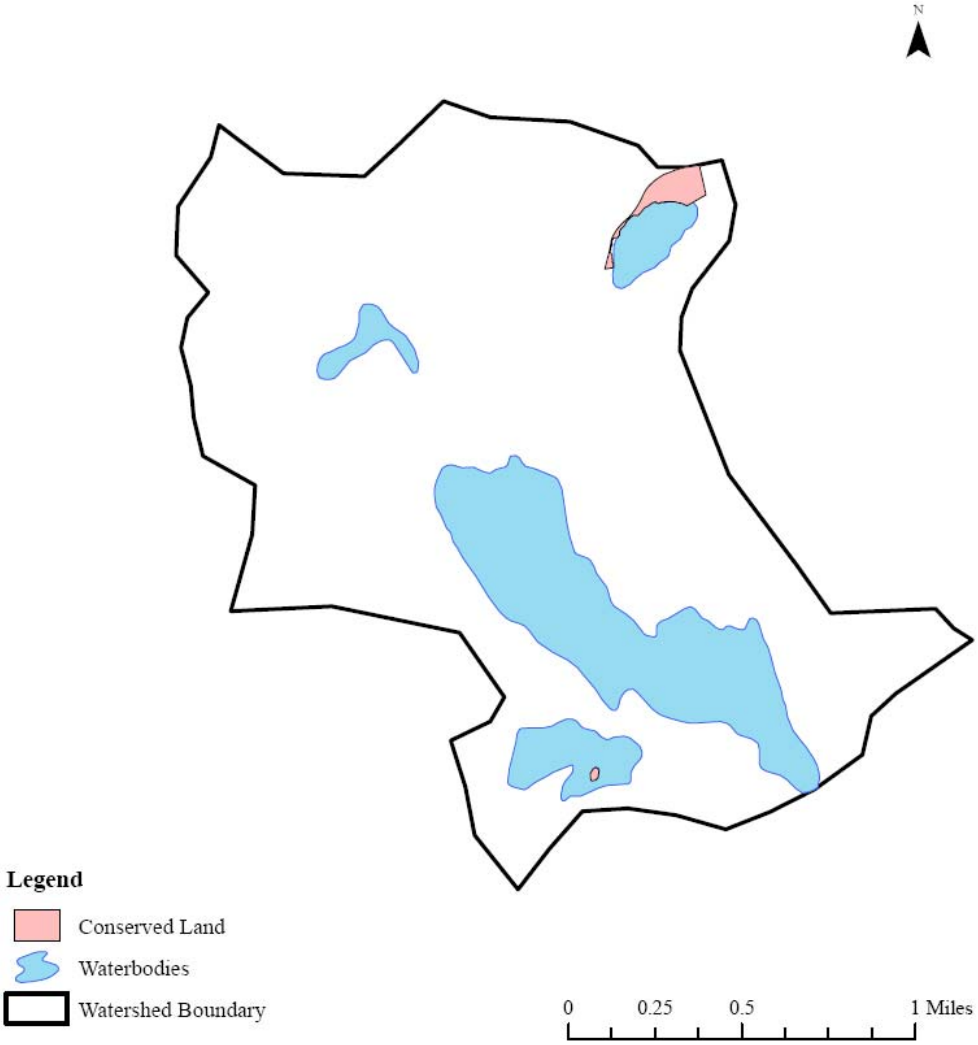
Forsham, Betsy. Interview, 18 April 2008.

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Watershed Conserved Land
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 the information and maps from questions 9-A & 9-B as well as NH GRANIT identify all land that is protected from future development within **the immediate watershed** including state owned properties, town owned properties, private conservation organization properties, and conservation easements. Note ownership of the land.

Rationale: Identifying the percentage of land protected from future development will provide guidance for monitoring changes in shoreland usage 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: Referred to NH GRANIT and the Town of Sutton tax maps.

Findings and Analysis: Blaisdell Lake has a small piece of land in Conservation on the shore of Russell Pond, which is owned by the Town of Sutton. The island on Billings Pond is also conservation land, which is owned by the State of New Hampshire.

Evaluation Criteria:	**Score:**
1) 0%	**5**
2) 1-10%	**4**
3) 11-25%	**3**
4) 26-50%	**2**
5) >50%	**1**

Sources:

"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. http://www.granit.sr.unh.edu/

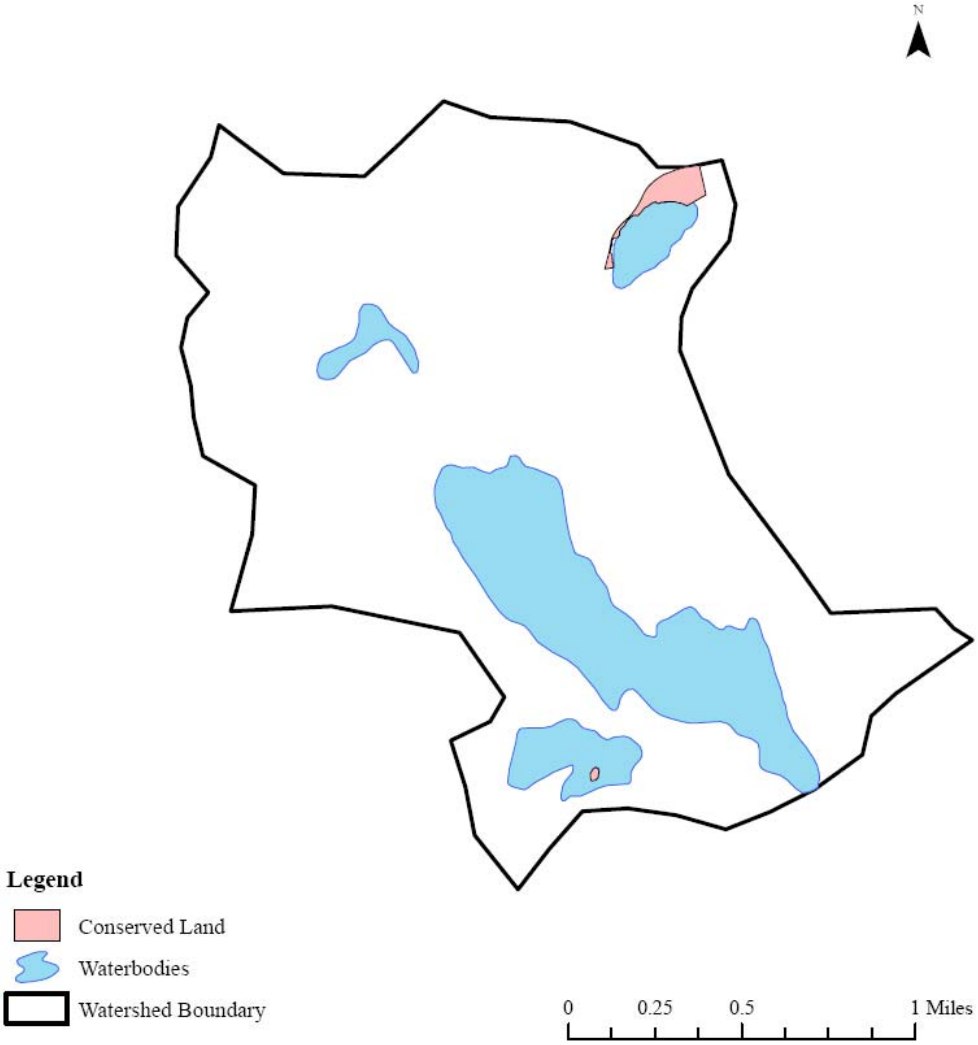
Forsham, Betsy. Interview, 18 April 2008.

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Watershed Conserved Land
Attribute 9: Question C



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Attribute 9: Watershed Characteristics

Category:

Question D: Percent of Impervious Surface within the Watershed

Directions: Using the information and maps from questions 9-A, 9-B, and 9-C calculate the land use for high density residential, medium density residential, commercial, industrial, institutional, and major roads. Do not include any unbuildable areas of land. Multiple each land use category by its impervious cover coefficient: medium density residential = 0.278, high density residential = 0.444, commercial = 0.722, industrial = 0.534, and institutional = 0.344. Add up the impervious area for each land use and major roads. Divide by the subwatershed area and multiply by 100.

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 within the shoreland boundaries.

Process Followed: In order to answer this question the group used two other previous lake inventories to compare their impervious surface coverage.

Findings and Analysis: Finding indicates that there less then five percent impervious surface coverage in the watershed.

Evaluation Criteria:

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

Sources:

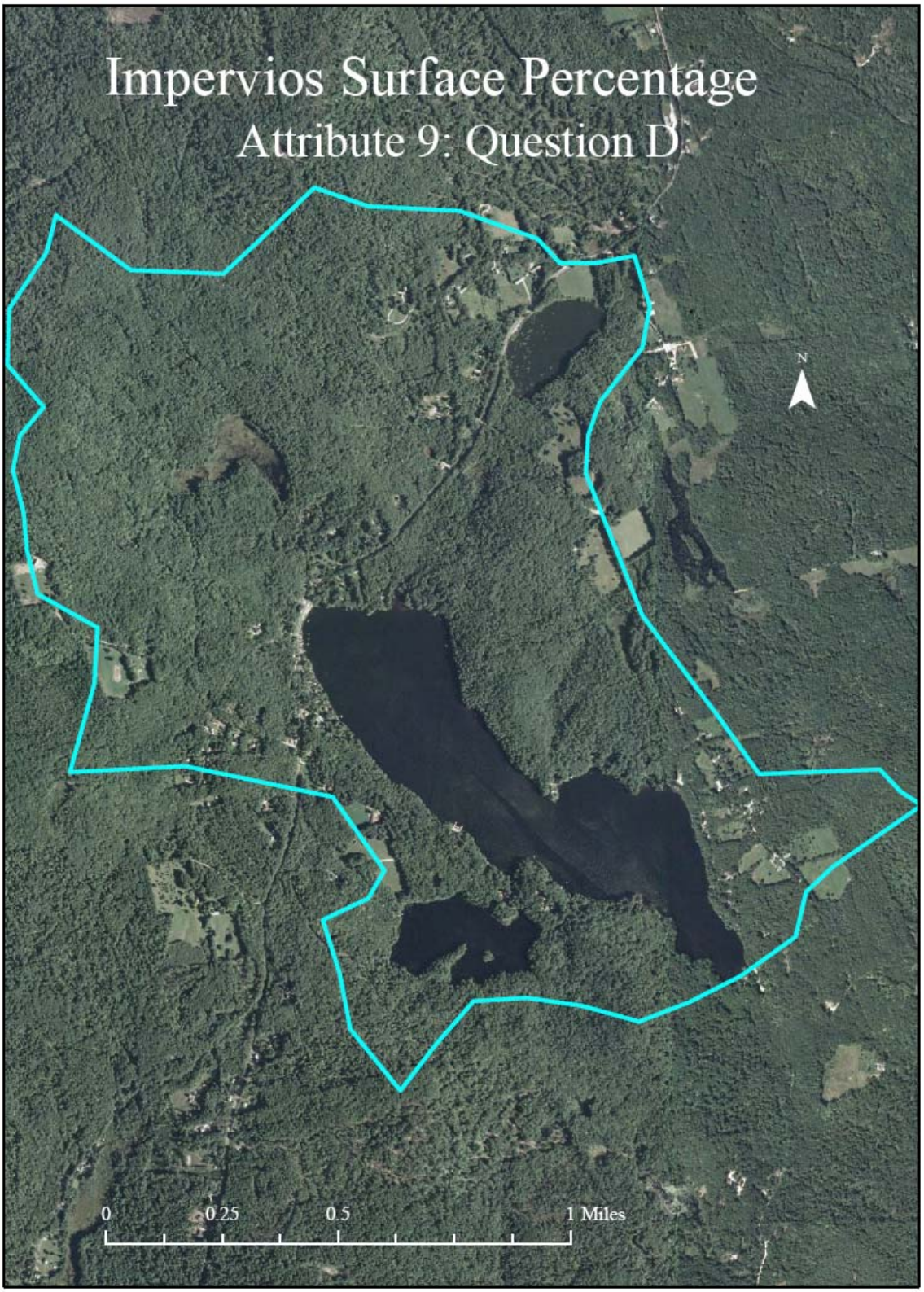
CES Community Based Research Team of 2005-2006, *Our Water Our Lake*

CES Community Based Research Team of 2003-2004, *Lake Sunapee Watershed Portfolio*

Assessment of Question: Due to technical difficulties in the field, the group was not able to answer the question exactly. The map shown indicates where the houses in the watershed are located.

Date Completed: April 2008

Investigator: Benjamin Taylor


Impervios Surface Percentage
Attribute 9: Question D
N
0
0.25
0.5
1 Miles

Attribute 9: Watershed Characteristics

Category:

Question E: Land Use Adjacent to Perennial Streams.

Directions: Using USGS topographic maps identify perennial streams that drain into the lake. Use an aerial photo to delineate the stream and determine the locations and amounts of forested, wetland, active agricultural, clear/open, and urban land use types within 250 feet on each side of the streams that ***drain into*** the waterbody. Town planning, as well as regional planning commissions may be able to offer assistance in generating a map.

Rational: The perennial streams 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 nonpoint 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 establishing other streams by means of GPS were applied to ArcGIS. All streams that drain directly into Blaisdell 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:	13.39%
Forested:	84.95%
Wetlands:	1.6%
Clear/Open:	.05%
Total % developed:	**13.39%**

Evaluation Criteria:

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

Sources:

"GRANIT" Complex Systems Research Center: University of New Hampshire. 31 March 2008. http://granit.sr.unh.edu

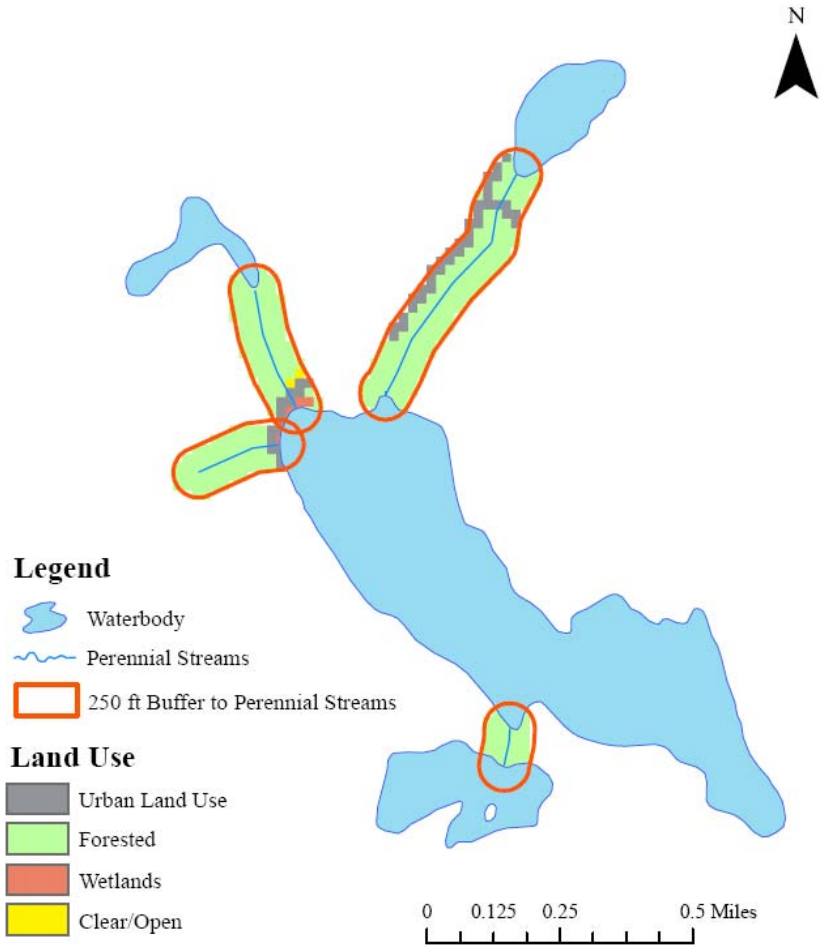
Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Amanda Lambert

Land Use Adjacent to Perennial Streams

Attribute 9: Question E



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Attribute 9: Watershed Characteristics

Category:

Question F: Watershed Topography (Slope)

Directions: Using a NRCS County Soil Surveys in New Hampshire determine all areas within **the immediate watershed** with a slope >15%. If a NRCS County Soil Surveys in New Hampshire is available determine slope by drawing a straight line perpendicular to the contours of a USGS topographic map. For the most accuracy, begin and end the line on a contour, rather than between contours. Measure the length of the line drawn, using a ruler and the scale of the map, and convert that distance to feet. Determine the total elevation change along the drawn line by subtracting the elevation of the lowest contour used from the highest contour used. This is the elevation change. To calculate a percent slope, divide the elevation change by the distance of the drawn line, then multiply by 100.

Rationale: The topography, especially the slope of the immediate shoreland, is an important natural characteristic that controls the rate and amount of stormwater that enters the lake or pond. A steeply sloped watershed (slope >15%) will convey stormwater more quickly to nearby tributaries than a watershed with a relatively flat landscape.

Process Followed: Referred to NH GRANIT. Used ArcMap GIS tools to calculate slope.

Findings and Analysis: The Blaisdell Lake watershed has between 1 and 25 percent of it's land in the 16% slope or greater zone.

Evaluation Criteria:
1) >75% of the watershed area has a slope of 16% or greater
2) 51 – 75% of the watershed area has a slope of 16% or greater
3) 26 – 50% of the watershed area has a slope of 16% or greater
4) 1 – 25% of the watershed area has a slope of 16% or greater
5) None of the watershed has a slope of 16% or greater

Sources:

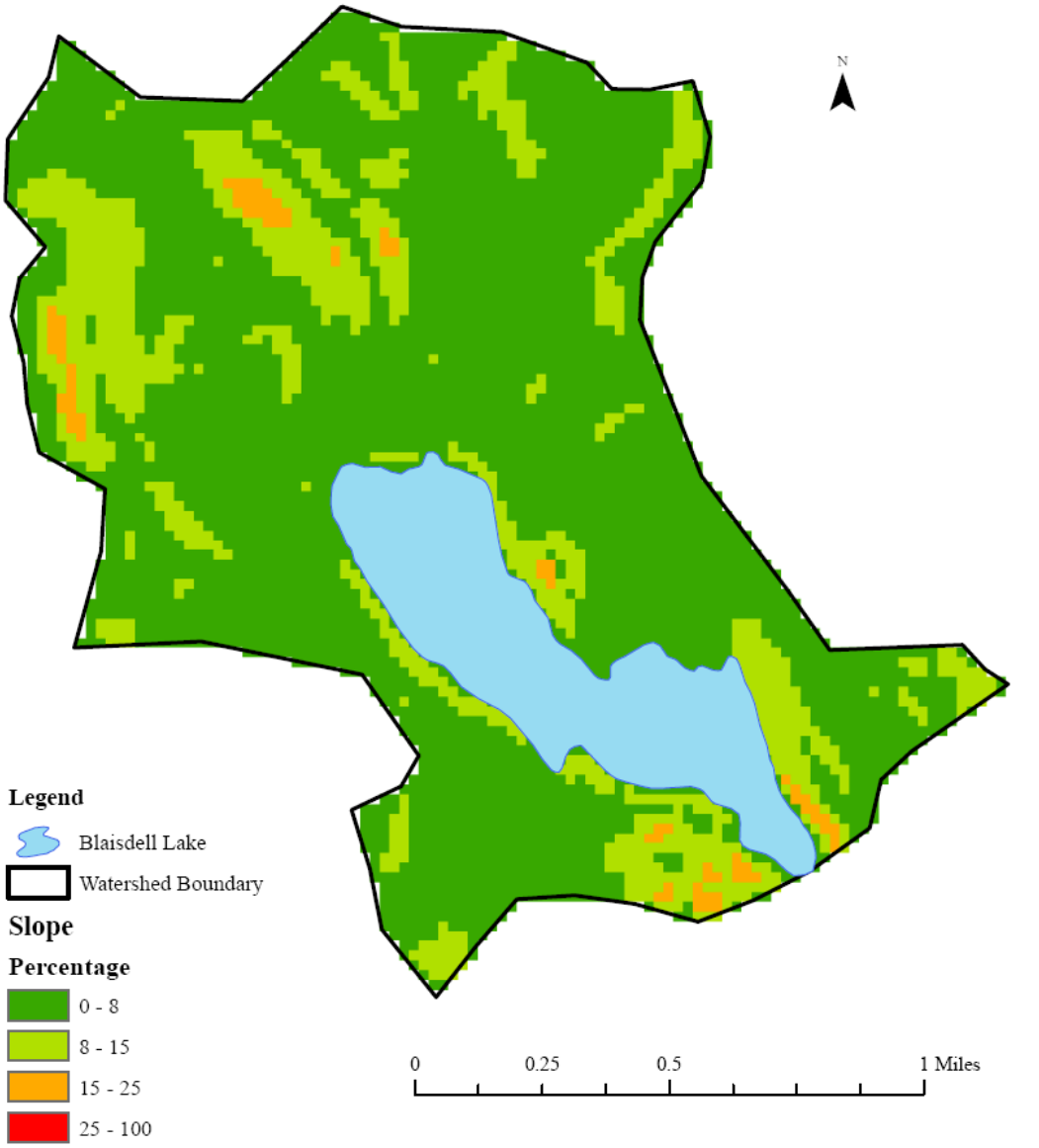
"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 February 2008. <http://www.granit.sr.unh.edu/>

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Watershed Topography
Attribute 9: Question F



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Attribute 9: Watershed Characteristics

Category:

Question G: Watershed Geology and Soils

Directions: Consult the NRCS County Soil Surveys in New Hampshire and the NHDES Bedrock Geologic Maps to identify the percentages of bedrock and hydric soils within **the immediate watershed**.

Rationale: The geology and soils of the watershed are important characteristics to inventory because they dictate what type and where development can and should occur. For example, if a high percentage of the watershed has bedrock present at the surface, 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: Referred to NH GRANIT maps of hydric soils and bedrock. Used NRCS, statewide important soils data, to determine which soils were where.

Findings and Analysis:
Bedrock in watershed: 0%
Hydric soils in watershed: 7.1%

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

Sources:
"GRANIT." Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space. University of New Hampshire. 7 March 2008. <http://www.granit.sr.unh.edu/>

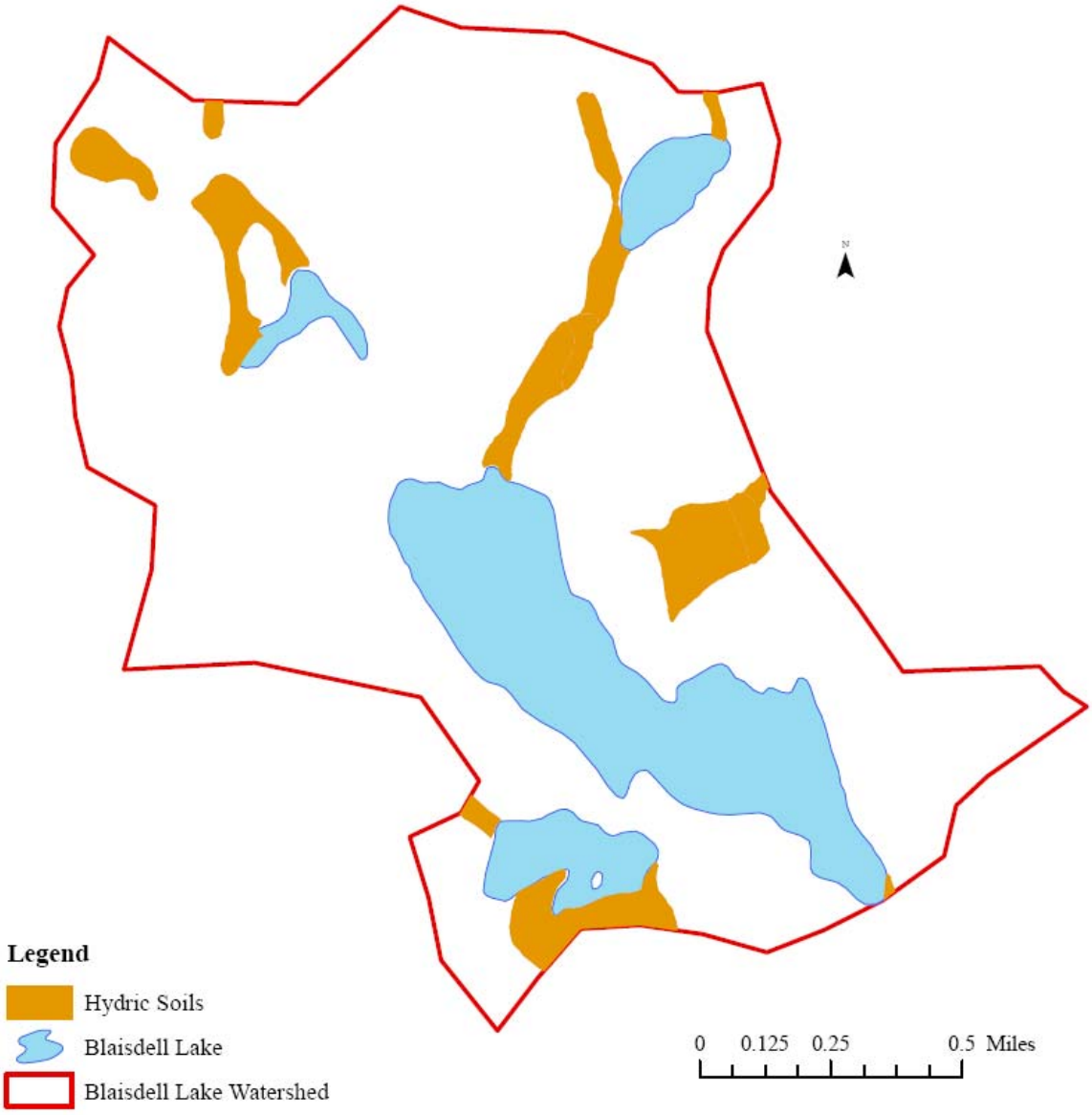
Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Sarah Champagne

Shoreland 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 within the watershed

Directions: Contact each of the municipalities immediately surrounding the watershed by visiting their website or city/town hall or consult with the regional planning commission 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 municipality within the watershed in order to assess the adequacy of the surface water protection measures.

Inadequate	*Adequate*	*Exceptional*
• No zoning	• At least 50' setback from stream/wetland	• >50' setback from stream / wetland
• No site plan review regulations required	• Specific erosion control provisions	• Detailed erosion control plans
•Only state or federal regulations apply	• Subsurface sewage regulations	• Buffer strip protection required
	• Minimum lot sizes	• Subsurface sewage regulations (>125' from stream/wetland)
	• Excavation regulations	• Minimum lot sizes by soil type
	• Junkyard regulations	•Wetland regulations
	• Use of best management practices required	• Aquifer regulations
		• Limited impervious surface
		• Innovative land use controls
		• Growth management strategy enacted
		• Hazardous waste and underground storage tank regulations
		• Overlay zones

Rational: 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 sound watershed development and use. Also, reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures 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: Consulted Town of Sutton 2005 *Master Plan.*

Findings and Analysis: Blaisdell watershed falls within in one municipality.

- 75' setback from the high water mark of a wetland
- 150' setback from the boundary of a lake
- 2 acre lot size is required with 200'-250'frontage along a town road

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)	1
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 watershed has exceptional land use regulations that exceed state standards	5

Sources:

Chapter II- Current Land Use. Retrieved November 26, 2007, from 2005 Sutton Master Plan <http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/mp3.pdf>.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 9: Watershed Characteristics

Category: Susceptible to Impairment

Question H: Local land use regulatory measures within the watershed

Directions: Contact each of the municipalities immediately surrounding the watershed by visiting their website or city/town hall or consult with the regional planning commission 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 municipality within the watershed in order to assess the adequacy of the surface water protection measures.

Inadequate	*Adequate*	*Exceptional*
• No zoning	• At least 50' setback from stream/wetland	• >50' setback from stream / wetland
• No site plan review regulations required	• Specific erosion control provisions	• Detailed erosion control plans
•Only state or federal regulations apply	• Subsurface sewage regulations	• Buffer strip protection required
	• Minimum lot sizes	• Subsurface sewage regulations (>125' from stream/wetland)
	• Excavation regulations	• Minimum lot sizes by soil type
	• Junkyard regulations	•Wetland regulations
	• Use of best management practices required	• Aquifer regulations
		• Limited impervious surface
		• Innovative land use controls
		• Growth management strategy enacted
		• Hazardous waste and underground storage tank regulations
		• Overlay zones

Rational: 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 sound watershed development and use. Also, reviewing town land use and development ordinances will hopefully increase local awareness of, and compliance with, the measures 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: Consulted Town of Sutton 2005 *Master Plan.*

Findings and Analysis: Blaisdell watershed falls within in one municipality.
75' setback from the high water mark of a wetland
150' setback from the boundary of a lake
2 acre lot size is required with 200'-250'frontage along a town road

Evaluation Criteria:	**Score:**
4) One or more municipalities within the watershed has inadequate local land use regulations (i.e. only state and federal regulations apply)	5
5) All municipalities within the watershed have adequate local land use regulations (i.e. town ordinances comply with minimum state standards)	3
6) One or more municipalities within the watershed has exceptional land use regulations that exceed state standards	1

Sources:

(2005). Chapter II- Current Land Use. Retrieved November 26, 2007, from 2005 Sutton Master Plan <http://www.sutton-nh.gov/Public_Documents/SuttonNH_Planning/mp3.pdf>.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Amanda Lambert

Attribute 9: Watershed Characteristics

Category:

Question I: Drainage Network.

Directions: Use the Strahler (1957) modified Horton (1945) method and the NH GRANIT to classify each stream segmen within the immediate watershed. A stream with no tributaries is a first order stream. A stream segment downstream of the confluence of two first order streams is a second order stream. Thus, a next order stream only forms at the confluence of two streams of the same order.

Rational: This question will provide 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 water to and from the waterbody, respectively.

Process Followed: Map representing the results can be found on the following page. Contacted NHDES to help identify order of streams. Intermittent streams are shown on the map, but do not play a role in the delineation of rank for any stream.

Findings and Analysis: All streams have no tributaries (first order).

Evaluation Criteria:

Stream or river with the highest order ranking draining into the waterbody:

Names: Russell, Brown, 114 Culvert, Billings.
Order: 1st

Highest order rank or stream or river:

1) 1st
2) 2nd
3) 3rd
4) 4th
5) 5th or higher

Sources:

New Hampshire Department of Environmental Services, Water Bureau. – March 2008

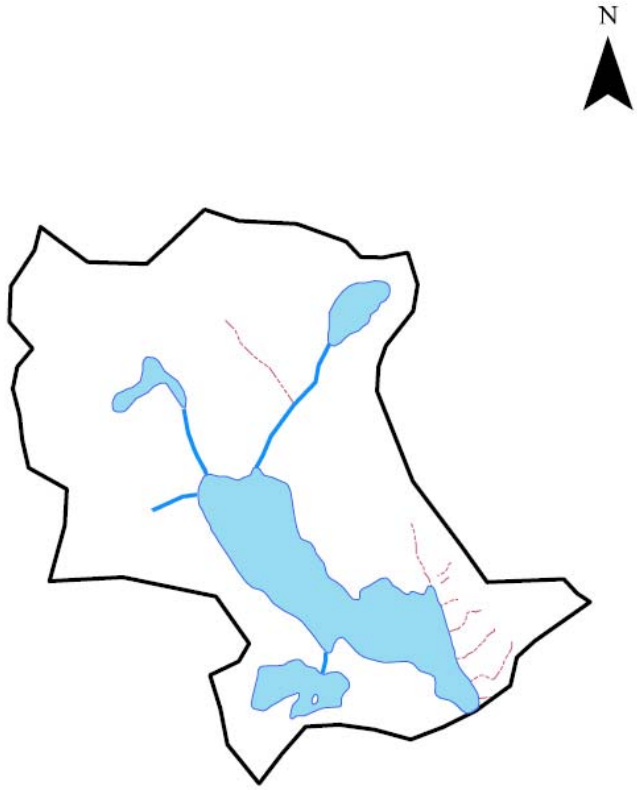
Assessment of Question: The question is adequate as stated.

Date Completed: March 2008

Investigator: Amanda Lambert

Drainage Network

Attribute 9: Question I



Legend

- Waterbody
- First Order Streams
- Intermittent Streams
- Blaisdell Lake Watershed Boundary

0 0.25 0.5 1 Miles

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Attribute 9: Watershed Characteristics

Category:

Question J: Rate of Watershed Development

Directions: Consult the NH Office of Energy and Planning's Current Estimates and Trends in New Hampshire's Housing Supply to obtain an estimate of the rate of development over the past ten years within the immediate watershed area (area within 250 feet of the high water mark). The estimate should be based upon the number of building permits per year. This question pertains to new development, not conversion, additions, improvements, etc. Only include new development in the tally.

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:

Findings and Analysis: Findings indicate the following:

From	House
3/16/1998	5
1999	17
2000	26
2001	17
2002	33
2003	33
2004	24
2005	19
2006	18
Up to 10/18/2007	11
Total	203

Evaluation Criteria:
1) > 25 permits/year
2) 16 – 25 permits/year
3) 7 – 15 permits/year
4) 0 – 6 permits/year
5) None within the past 10 years

Sources:

Lynn King, personal communication, April 21, 2008

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 10: Visual/Aesthetic Characteristics

Category: Outstanding and Unique Value

Question A: Scenic or Natural Features Visible from Waterbody

Directions: Record the name(s) and location(s) and photographs of any significant scenic or natural features of interest that can be viewed from the waterbody by conducting a site visit and using NH GRANIT.

Rationale: The presence of significant scenic or natural features will increase the popularity and natural beauty of the lake or pond.

Process Followed: Conducted several site visits in order to determine several scenic features from Blaisdell Lake.

Findings and Analysis: Findings indicate that there were several scenic or natural features visible from Blaisdell Lake. Some of these include:

- Mount Sunapee
- Billings Pond
- Blaisdell Beach

Evaluation Criteria:	**Score:**
1) None	5
2) At least 1	4
3) At least 2	3
4)At least 3	2
5)> 3	1

Sources:

Observational knowledge from local residents and Colby-Sawyer students and faculty

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 10: Visual/Aesthetic Characteristics

Category:

Question B: Scenic Viewing Opportunities of the Waterbody

Directions: 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.

Rationale: Using a USGS topographic map of your waterbody, mark the scenic locations from which the lake or pond can be viewed (e.g., roadway pullovers, public parks, access sites, and public beaches) by the general public. Visit each location, take photos, 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).

Process Followed: Talked to local residents in order to find scenic viewing points of Blaisdell.

Findings and Analysis: Found that there are several good viewing areas of the lake that allow for most of the lake to be viewed from. The places that were found are:

- Looking from the beach
- Looking from the house next to the dam
- Looking from the top of Blaisdell Hill Rd.

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

Sources:
Observational knowledge from local residents and Colby-Sawyer students and faculty

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

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: Used residential knowledge to locate good locations for observations, then visited those points to analyze the question.

- Looking from the beach
- Looking from the house next to the dam
- Looking from the top of Blaisdell Hill Rd.

Findings and Analysis: Findings show that there were no sounds two of the viewing points. Yet, when looking from the beach, there are sounds of traffic from Route 114.

Evaluation Criteria:

1) High; unnatural sounds predominate (i.e. constant traffic, industrial, construction)

2) Moderate; some unnatural sounds audible (i.e. occasional nearby traffic, diffuse constant traffic noise, distant industrial noise)

3) Low; natural sounds predominate (i.e. birds, wildlife, winds)

Sources:

Observational knowledge from local residents.

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

Attribute 10: Visual/Aesthetic 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, and take photos. In different colors shade in 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.

Process Followed: Conducted several site visits in order to estimate the percentage of land use visible from Blaisdell Lake.

Findings and Analysis: Findings indicate that the dominant land use visible from Blaisdell Lake was split up into two different categories.

- Undeveloped Land (around 70%)
- High Density Residential Land (around 30%)

Evaluation Criteria:

1) Commercial or urban development dominates visible landscape
2) Densely clustered residential development and occasional commercial land uses dominates visible landscape
3) Residential and/or commercial development present and 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:

Observational knowledge from local residents and Colby-Sawyer students

Assessment of Question: The question is adequate as stated.

Date Completed: April 2008

Investigator: Benjamin Taylor

Attribute 10: Visual/Aesthetic Characteristics

Category:

Question E: Odors Present on Waterbody or at Viewing Areas

Directions: Gauge the type, 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: Identified viewing areas from local knowledge, then traveled to the viewing areas to analyze the question.

- Looking from the beach
- Looking from the house next to the dam
- Looking from the top of Blaisdell Hill Rd.

Findings and Analysis: Findings indicate that the only smell noticeable was the smell of sulfur which was near the intermittent stream, which was not a viewing area of the lake.

Evaluation Criteria:

1) Unnatural odors distinct and continuously present at more than one location
2) Unnatural odors distinct and continuously present at only one location
3) Unnatural odors intermittent dependent on production source(s) and wind direction at more than one location
4) Unnatural odors intermittent dependent on production source(s) and wind direction at only one location
5) Only natural odors detectable at all location(s)

Sources:
Observational knowledge from students and faculty of Colby-Sawyer College

Assessment of Question: The question is adequate as stated.

Date Completed: November 2007

Investigator: Benjamin Taylor

CHAPTER 2

Conductivity Chapter

Introduction:

Conductivity levels of Blaisdell Lake have been monitored for many years. Between 1990 and 1991 the average conductivity for Blaisdell Lake was 55.16µS/cm. When the AP Biology students were available we tested locations all over the lake and found that the average conductivity level was 49.7µS/cm. One location had a significantly higher conductivity level reading at 88µS/cm, which was the Russell Pond inlet. Russell Pond has had a long history for having elevated conductivity levels. We hypothesized that road salt may be a factor as to why the conductivity is so high. In addition to road salt influence, we looked at the influence of development as a human impact we could isolate for this study. Our focus has been studying the conductivity in the watershed. Conductivity is defined as "a measure of the ability of water to pass and electrical current" (EPA, 2007). In water this is possible through the level of dissolved ions. High conductivity levels in a water system are a concern in water bodies because aquatic plants will have to put more energy into osmosis rather than into photosynthesis which leads to a lower oxygen supply. With higher conductivity less tolerant invertebrates start to dissipate from the water which decreases the food supply. In other words the aquatic plants spent more energy filtering the water than creating their food supply and intolerant invertebrates in the water started to die.

Literature Review:

In watershed management it is important to understand what factors affect the health of a lake. Conductivity is a water quality parameter that is being monitored more closely than in the past. Conductivity in water bodies is becoming a growing concern because of the statistically significant increases throughout the state.

The more dissolved ions you have in water, the higher the conductivity. Ions are a part of everything in life. Ions are in chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron, and aluminum; most of which you can find in water and are measured in microsiemens per centimeter (µs/cm).

When it rains water lands on the surface of the earth, and because water is the universal solvent, the rain water will dissolve some of the ions on the ground (Boyd, 2000). This is how conductivity in increased. Although we can see changes in the level of conductivity, we don't always know what is making it change. There are so many dissolved inorganics that can alter conductivity in water that it's hard to pinpoint a source.

Dissolved ions work like a teabag. When you put a teabag in water, the ions seep out into the water. In the case of the teabag you can see the dispersion happen. In most cases it does not work that way in the watershed. Ions will dissolve into water

but you won't be able to see them. This is why conductivity is measured by the ability to pass an electrical current. Too high a concentration of dissolved ions in a water body can affect the overall health.

In a recent study (Tabatabaie, 2007) scientists grew plants that were given water with different levels of conductance to see if there was affect on plant growth. Raising the conductivity level reduced the chlorophyll index. In another study (Hall, 2005) scientist tested invertebrate changes with different water quality levels. Conductivity was one of the three main water quality parameters listed and scientists found that at higher levels tolerant taxa survived at a higher rate as intolerant taxa levels decreased dramatically. This shows that the benthic community is being shaped by the quality of the water.

In September 2007 a group of AP Biology students from Massachusetts came up to Blaisdell Lake to help collect and analyze data. The AP students found that the beach area had less aquatic vegetation than the surrounding grassy shore areas. The lack of aquatic vegetation in this area may be due to boat traffic, recreation traffic, chemical impacts such as conductivity, or sand washing into the water. Conductivity normally occurs in nature but can also be influenced by human behavior.

> "Sources of elevated and increasing conductivity are typically due to human activity such as road salting, faulty septic systems, and urban/agricultural runoff. New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which may also contribute to increasing conductivity" (NHDES, Special topics article 2004, 2004).

New Hampshire State average conductivity readings are **56.8 µS/cm** (NHDES, 1999). According to NHDES Observations and Recommendations, readings above **100 µS/cm** can be viewed as having *human influence* on a water body.

Even though conductivity is a natural occurrence, the way that humans change the geology in a watershed we often increase the conductivity levels in a water body. For instance, the slope of a hillside will affect the velocity of the water coming off of it and can erode away particles into the water. More impervious surface will not allow for water to be filtered through land but rather run along the surface with increased conductivity, picking up nutrients alongside the road and carried down the watershed. When human activity increases the levels of conductivity in a water body, everything about the lake is affected. Certain ion levels are needed to support life and productivity. If there is sudden increase the life in the water would have a shock and survival rates would drop (Spellman, 1998).

In the winter months, road salt is one of the biggest contributors to conductivity. The New Hampshire Department of Transportation's (DOT) winter maintenance goal is to have bare and dry pavements on state roads at the earliest realistic time following the end of a storm. When temperatures are above 20°F DOT applies 250-300 pounds of salt per lane-mile and sand where it is needed. Temperatures below 20°F DOT uses

combinations of salt, sand, calcium chloride, based on the road conditions (NHDES, Special topics article 2004, 2004). That is a lot of salt that can potentially end up in a water body. One of the good things about the length of this project was our ability to add winter water testing to the Blaisdell Lake data set.

Methods:

Testing Locations:

Because of previous data collected from The Blaisdell Lake Protective Association, we knew that conductivity was high for the inlet to Blaisdell Lake from Russell Pond. From this information we decided to test six locations that run from Russell Pond to the inlet of Blaisdell Lake. These sites were: from the beach at Russell Pond, the outlet of Russell Pond, above and below Johnson Hill Road, above a set of driveways, and below which is the inlet to Blaisdell Lake. These sites were selected to see if roads were influencing conductivity the further down water traveled. After sampling for a few weeks we noticed a stream that came off of a hillside (across 114) and ran into Russell stream. We decided to test this new location to see if the conductivity was consistent with that of the original sites. We found that the conductivity of this new stream was significantly lower than that of the Russell stream. Because of the differences we extended our study to all inlets/streams that run into Blaisdell Lake. Our hypothesis was that road salt and high development might be causing increases in conductivity. The additional locations, in most cases, were above and below roads and in areas of high development and low development to test our variables. We had a total of thirteen sample locations for the study. During the spring we started to notice more streams emerging as a result of snowmelt. We tested this water (six more locations) to see the effects of snowpack melt. These were not all of the streams that emerged but they were easily accessible and had the same criteria as our other selected sites (above and below road and in areas of high and low development).

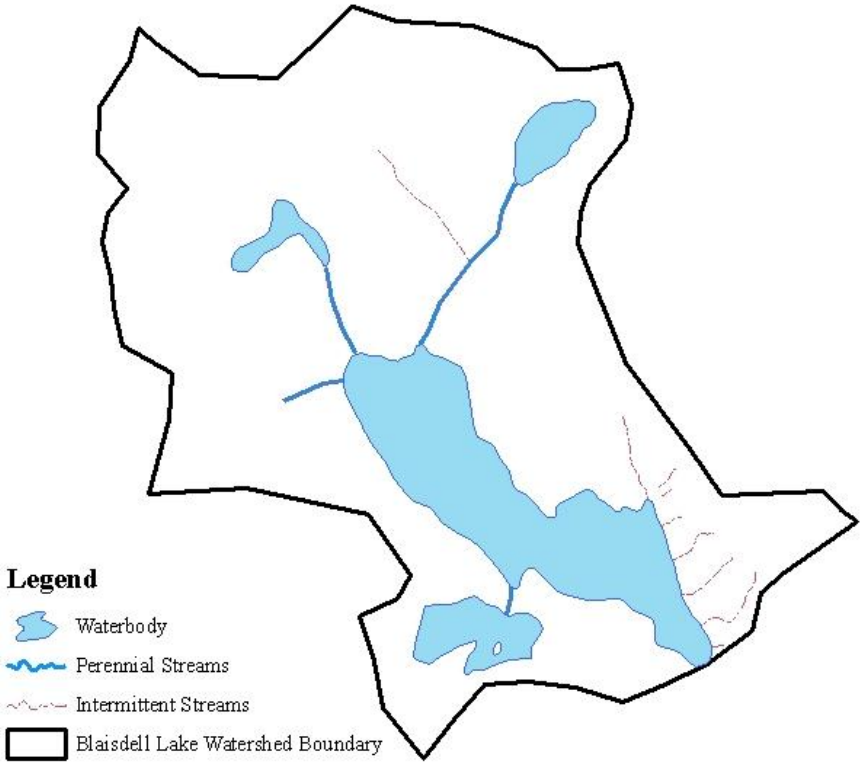
Sampling Procedure:

In order to accurately obtain a conductivity sample, the state of New Hampshire requires a specific sampling and testing procedure. The procedure helps ensure accuracy statewide so that all samples taken are comparable to one another.

Samples must be collected in a polyethylene or glass bottles
The sample has to be a minimum of 100ml
After collection the sample must be refrigerated.
Testing should take place within 48hours of the sample collection time
Samples must be warmed between 20 and 25°C before testing (NHDES, 2005)

In order for our samples to have the best accuracy, sample duplicates were taken at each location. This allowed us to average the samples in the area increasing our confidence in the results. The testing equipment is calibrated before running the samples. After every ten water samples the calibration is rechecked to ensure precision.
Figure 1 shows the watershed area that we were testing.

Figure 1:



*Note that these are not all the intermittent streams but only the ones used in our analysis.

Figure 2 shows the watershed broken up into subwatersheds. Subwatersheds show how the area of the watershed that drains a stream. For example Billings pond and stream (in the green subwatershed) collects water from everywhere in the green outlined area and feeds it into Blaisdell Lake. We did this because if there was a stream with high conductivity we could look at its separate subwatershed and ask what is going on in this subwatershed. We also wanted to do this to determine which subwatersheds had high levels of development to test our hypothesis that higher development leads to higher conductivity.

Figure 2:

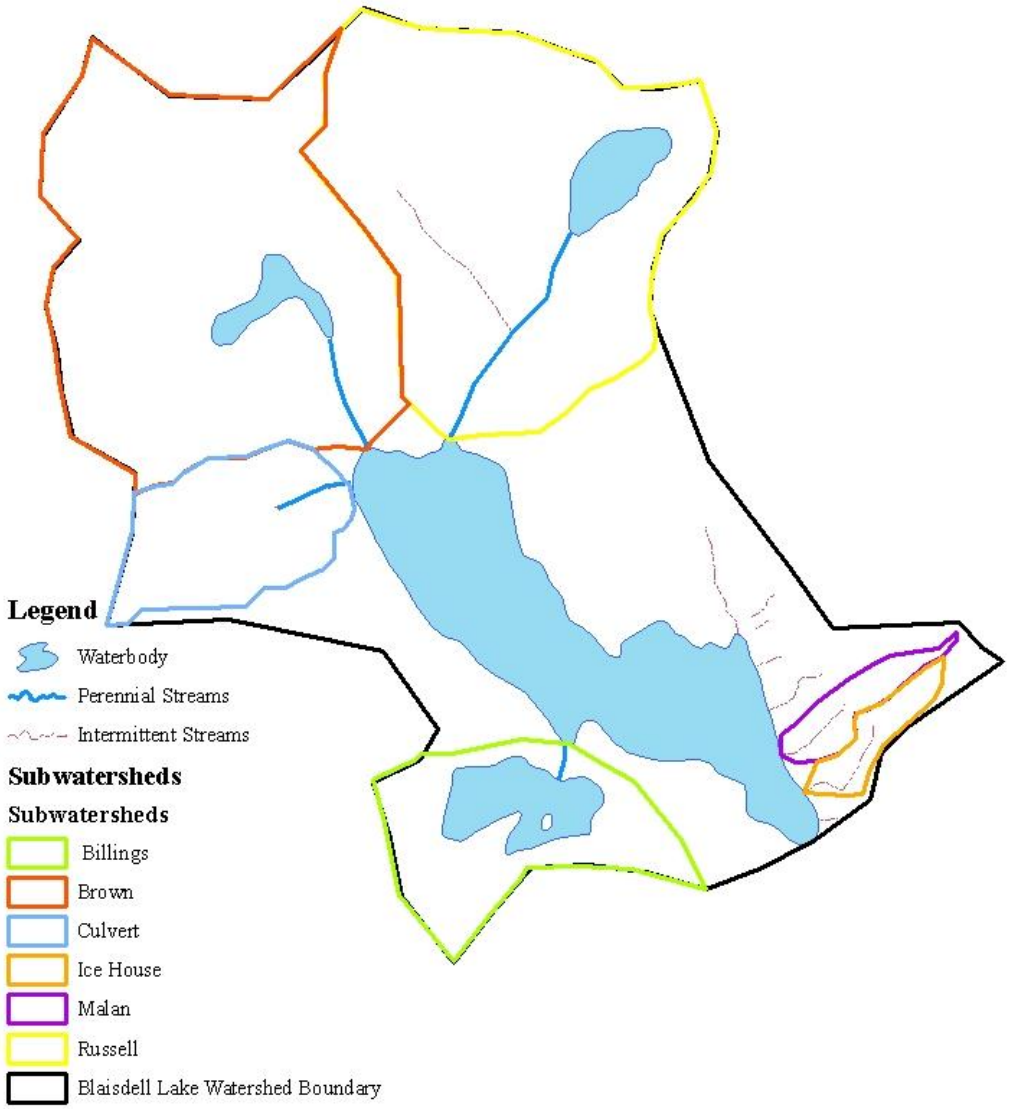

Legend
Waterbody
Perennial Streams
Intermittent Streams
Subwatersheds
Subwatersheds
Billings
Brown
Culvert
Ice House
Malan
Russell
Blaisdell Lake Watershed Boundary

Figure 3:

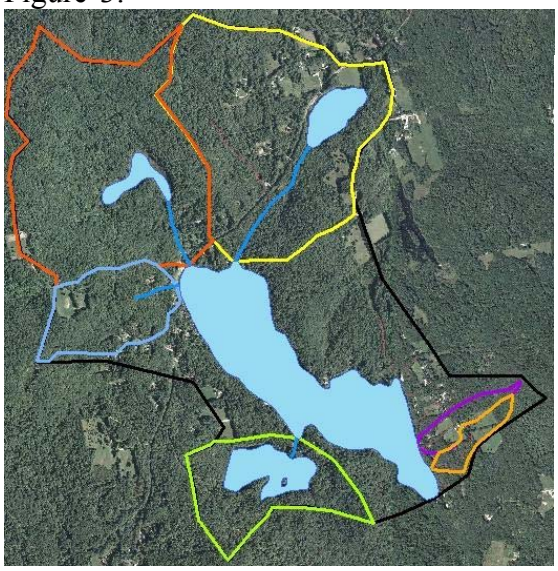
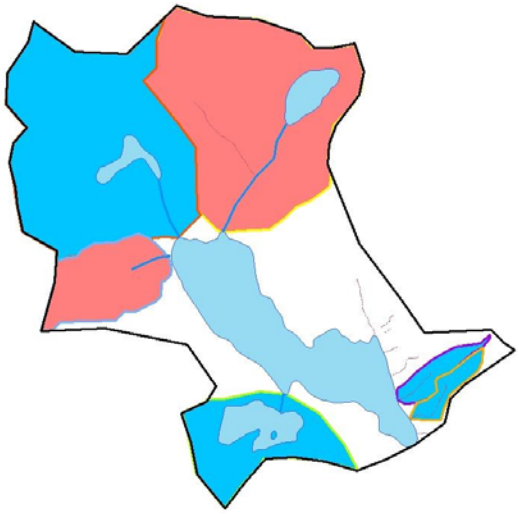


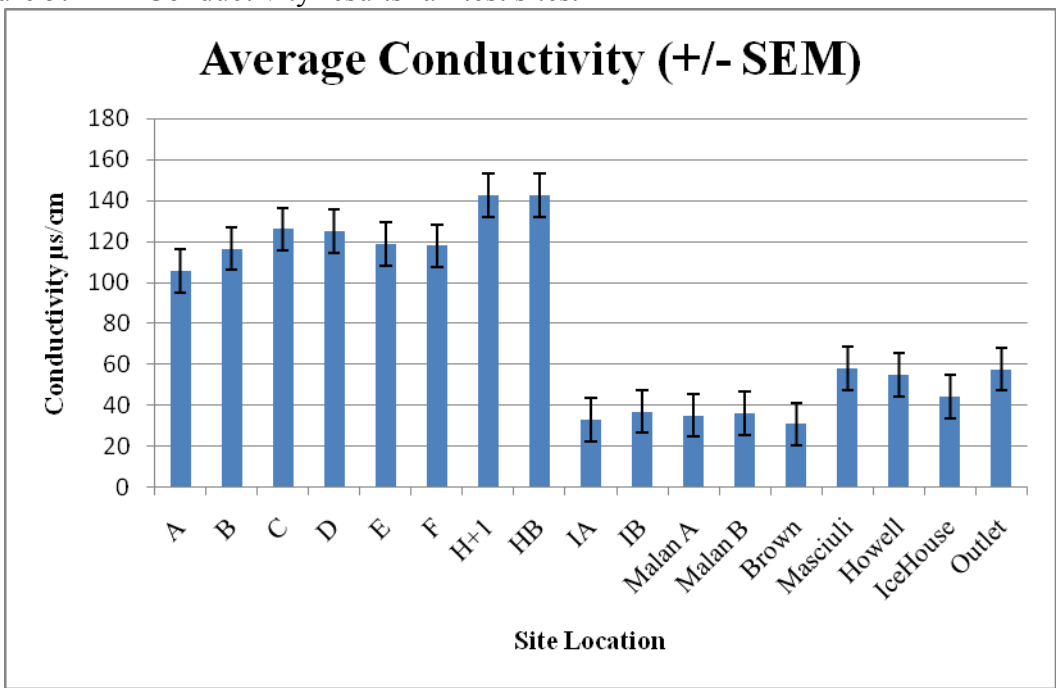
Figure 4:



We overlaid the subwatershed layer onto an aerial photo layer (Figure 3) to see what the land cover for the subwatersheds looked like. From this we were able to determine areas of high and low development. Figure 4 shows which areas were assigned as areas of low development (in blue) and areas of high development (in pink).
We collected samples once every two weeks from September to December and then we changed our sampling to once a week from January to April. We made this change to capture more data.

Results:

Figure 5: Conductivity results- all test sites.



The state average for conductivity is 56.8. Readings above **100 µs/cm** can be viewed as having *human influence* on a water body (NHDES, Observations and Recommendations, 2000).

Figure 5 shows the average conductivity for 17 testing locations. SEM on the graph stands for the Standard Error of the Mean. SEM helps show the amount of variance around each point where the data could fall. It shows between points if the numbers are statistically different. Figure 5 helps illustrate where the levels of high conductivity are coming from. Site A-F is the Russell stream which has high conductivity (100 µS/cm and above). The other spot with high conductivity is the H group located on 114 near the beach. HB (below the road) and H+1 (side culvert) show conductivity levels above 120µS/cm.

This starts to tell a story about conductivity in the Blaisdell watershed. Russell has something going on with it that makes it have consistently high conductivity. We believe that it has something to do with the ponds subwatershed because it's not picking up any additional conductivity along the way. Location H, on the other hand, shows that above the road there is not much conductivity, but the side culvert (which captures road runoff from Route 114) and below the road where the water flows into the lake has very high conductance indicating that the road is having an effect on the levels of conductivity. More chemical analysis is needed to determine the exact source of ions in the water. It might be road salt but it could also be the result of impervious surface, construction, septic tanks, or past land use around Russell Pond.

Because it's harder to pinpoint a source of the consistently high levels we took a sample to the New Hampshire Department of Environmental Services (NHDES) to test the actual dissolved ion sources. Our results are shown in Table 1.

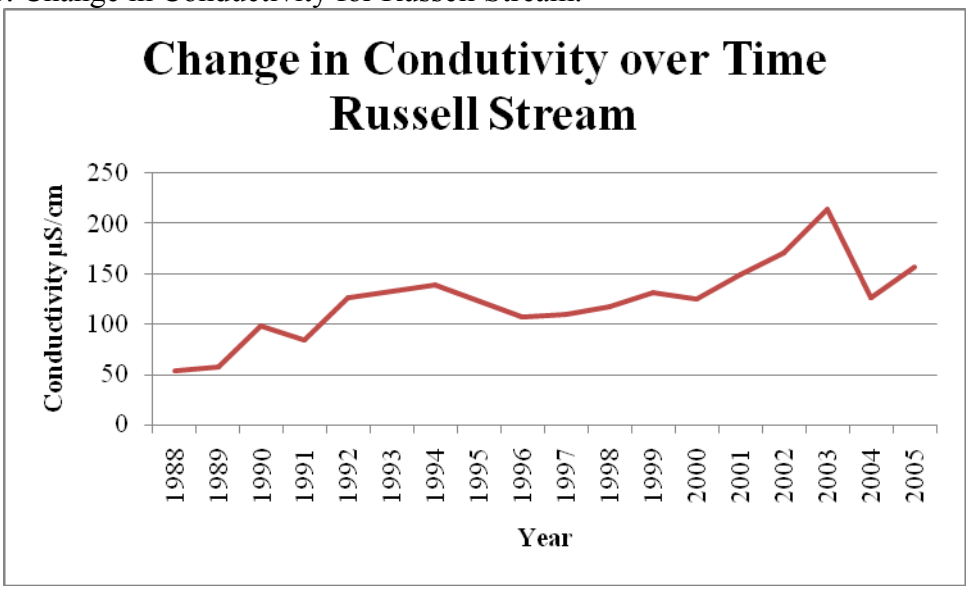
Table 1:

Parameter	Minimum	Maximum	Median	Russell Pond
Magnesium	0.05	5.38	0.69	0.807
Calcium	<1	33	2.6	5.69
Potassium	<0.4	4.4	0.5	1.03
Chloride	<2	198	4	18
Sodium	<1	108	3.1	15.3

Table 1 shows that all the parameters fell within maximum limits, but they were all high levels compared to the state average shown in the median column. Because they fall within normal limits it is impossible to pinpoint a specific source. What we can see from this is that there is a slight elevation from state average.

We know that conductivity in Russell Pond and Russell stream are high. We wanted to know if over time there was a pattern. We went through previous data from 1988 to 2005 to se what average level conductivity readings were occurring (shown in Figure 6). Conductivity has increased over time from 53µS/cm to at one point 214µS/cm. Now the reading have decreased slightly but it will still be important to keep an eye on this location.

Figure 6: Change in Conductivity for Russell Stream.



To test our hypothesis for what is raising conductivity we looked above and below roads.

Figure 7: Conductivity above and below roads.

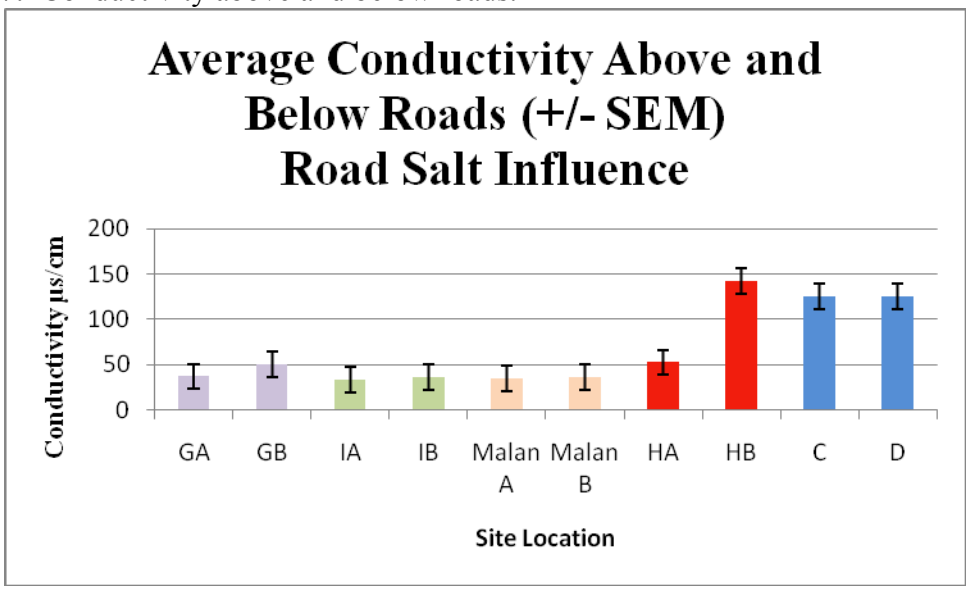
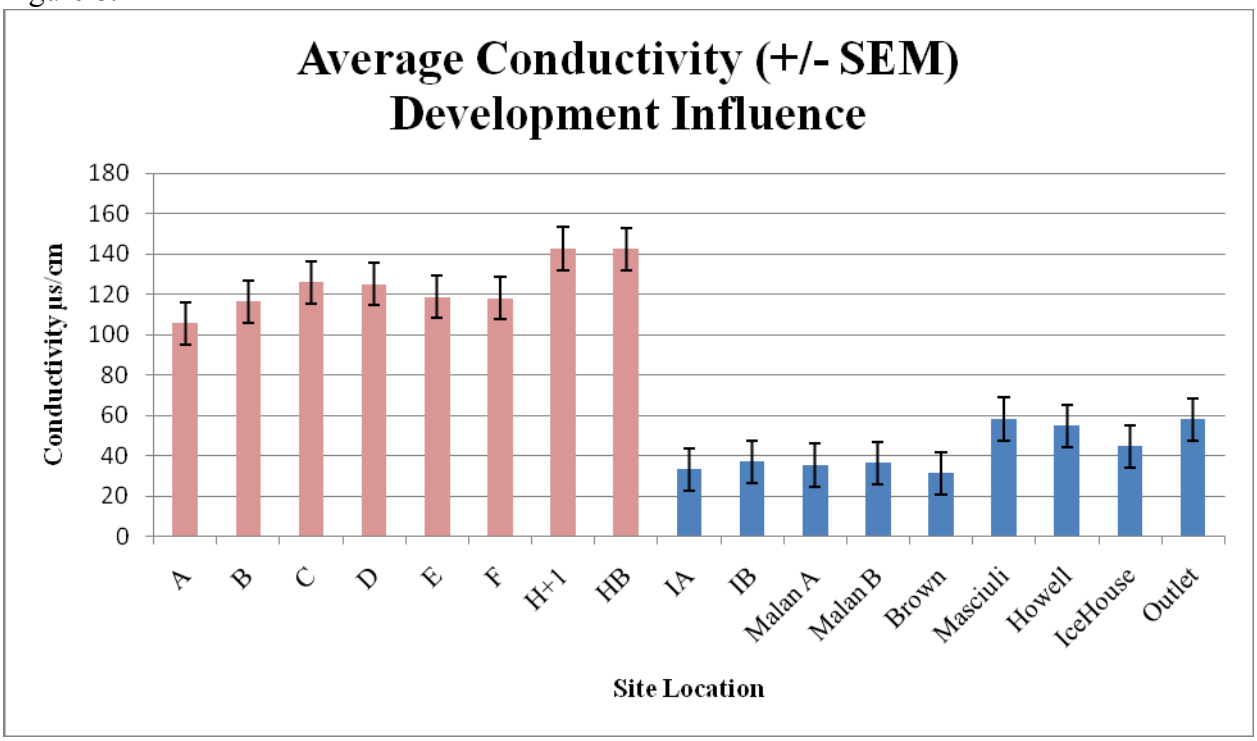


Figure 7 demonstrates the conductivity readings above and below roads. The matching colors identify individual streams and the A designates above while the B designates below. Sites C and D are above and below Johnson Hill Road in that order. Most points show that although conductivity might appear to be higher below a road but the room for error shows that they are close enough to the same conductivity level that we cannot call them different. We didn't see differences above and below roads, except in location H. Location H (directly off of Route 114) does show road influence on conductivity. Locations C and D are part of the Russell already identified as having high conductivity.

Because we see a change in conductivity above and below the road at location H we could make the assumptions that high conductivity is influenced by the road. Because location H is located on the beach areas where Route 114 there is no buffer area for whatever is on the road to filter through. We believe that the proximity to the lake and the low-no buffer area is the cause for this heightened conductance.

The other parameter we tested for was influence from high and low development. Figure 4 shows high and low development areas. Figure 8 illustrates the level of conductivity in areas of high development (in red) and levels of conductivity in areas of low development (in blue). In Figure 4 the subwatersheds are broken up into high and low development areas and the water from each was tested to see if development had an effect on conductivity levels. The area of high development shows all readings to be over 100µs/cm. The low development area shows readings of statistically lower than that of the areas with high development. Therefore we believe that development does increase the levels of conductivity in the water.

Figure 8:



Flow

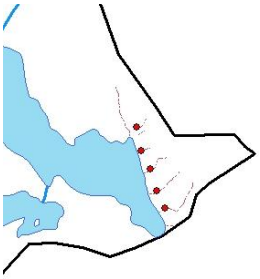
Introduction:

We were curious to know how water was coming from intermittent streams to help us understand overall how much water flows into to the lake during the spring melt season. This is important because all kinds of matter gets trapped in snow over the winter months. Whatever happened to be in the air at the time, road salt or sand gets plowed into snowbanks, and other influences from the ground are all trapped. When the melt occurs all of these elements are released into the water.

Methods:

We measured 6 intermittent streams along Camp Kemah Road (seen in Figure 9). We chose these intermittent streams beause they were easily accessible an had similar characteristic to the perennial streams we were testing.

Figure 9: Flow test sites.



In order to measure flow levels of the selected streams we used the bucket method. We held a bucket below each culvert to collect the water flowing out and timed how long it took the bucket to fill. From this we could determine how many liters were flowing per second. We also collected temperature data for the melt season.

Figure 10:

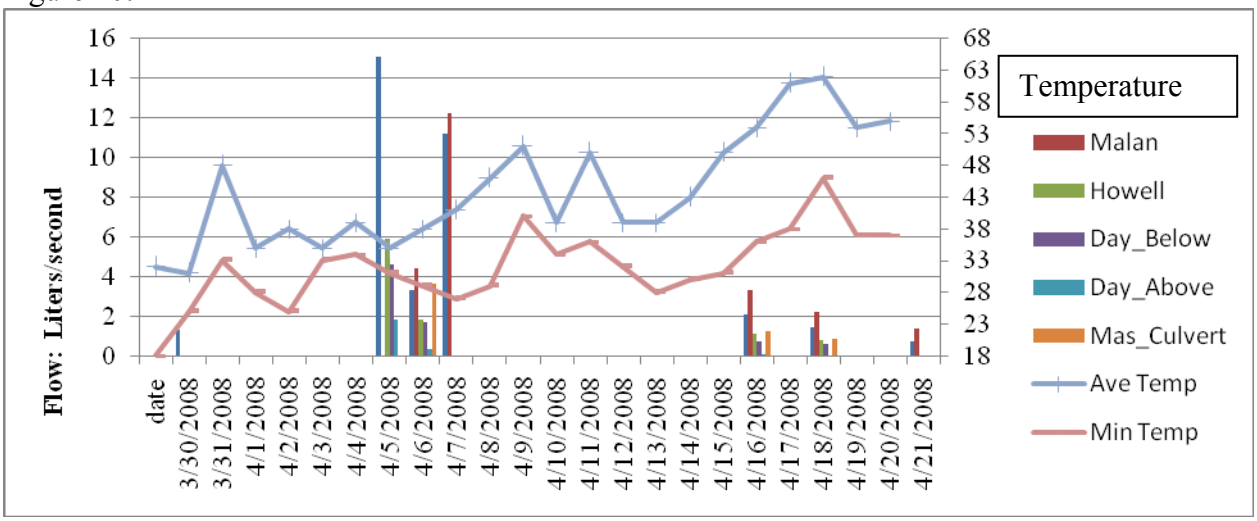


Figure 10 by Dr. Leon Malan.

Figure 10 shows the minium and the average temperature for each day and also the flow of each stream (note that some flow data is missing). We estimated the flow over the course of the three week melt event. We observed that the peak flow day was around the 10th of April. The flow value for the peak flow day was so large, we were unable to meause it with our buckets because they filled too quickly. We made some assumptions in order to determine flow. We assumed that flow increased steadily until it hit its peak day and then steadily decreased until the end of the melt season. We created a curve based on the Ice House data. We also assumed that each stream would flow in the same variation to one another. In order to be conservative about our data we reduced the curve by 10%. We calculated the difference in each stream and fit them to the Ice House curve. The results are seen in Figure 11.

Figure 11: Daily Flow data 3/30/08 - 04/21/08.

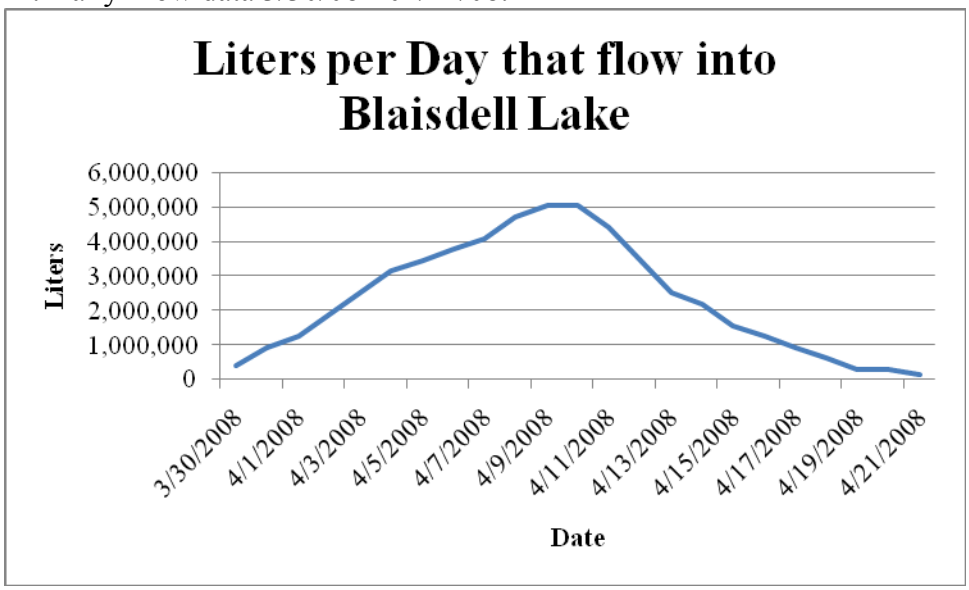
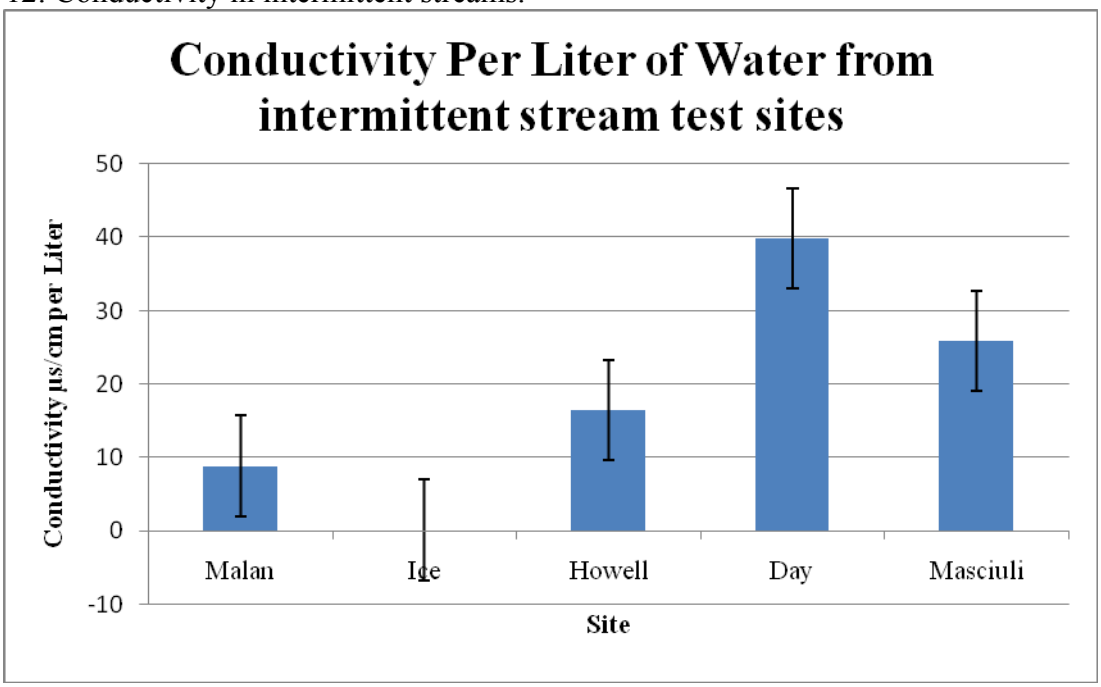


Figure 11 shows the liters per day that flowed into the lake from just the intermittent streams on Camp Kemah Road. At its peak, 5,000,000 liters flowed into the lake. Over the three week season enough water flowed in to raise the lake 3 inches, if there was no outflow.

Figure 12: Conductivity in intermittent streams.



We compared the average flow rate with the average conductivity of each location (shown in Figure 12).

This shows the conductivity level per liter of water that flows into the lake. Site Ice House had such low conductivity per liter that it did not show up on the graph. Site Day cottage shows for every liter of water the average conductivity is 40µs/s. Figure 12 shows the quality of the water and Figure 11 shows how much is flowing in. Site Howell, Day cottage, and Masciuli all have the road influence from water the flows across the land and then into their separate culverts. Site Malan and Ice House have little to no road influence because they flow directly off the hill and into a culvert under the road. The conductivity for the sites with road influence does show higher conductivity layers than the areas without this influence. Considering the average conductivity for the area, the melt contributed water that is the same quality as an average undeveloped perennial stream.

Discussion:

We have located two main areas with high conductivity. Russell and Site H. Russell had no specific source to its high conductivity and it may be naturally occurring or be a hold-over from past environmental neglect. Because both areas are located in high development areas we assume that higher development causes higher conductivity levels in water.

We have also seen road salt effects that boost conductivity in locations where the road is closest to the lake. Site H helps us to see this clearly as it captures the differences between above the road and below it.

Suggestions:

Our suggestions for the Blaisdell Lake Protective Association:
Suggest best management options to property owners.

Help property owners help reduce their impact on the water by developing an educational program that may include:

- Creating vegetative buffers to filter and reduce the amount of storm water runoff.
- Using cleaners without phosphorus.
- Pumping septic tanks regularly.
- Replacing or upgrading a failing leach field immediately.
- Encourage aquatic plant growth at location H to help, create an artificial wetland, or some other buffering method so that water will filter or settle out before entering the lake.
- Discuss alternatives to road salt use near lakes and there tributaries with the town road agent or State Department of Transportation agent.

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CHAPTER 3

Impervious Surface

Introduction

An impervious surface is any area where natural ground has been changed to a non-porous surface. Some examples of these surfaces would be rooftops, driveways, streets, and sheds. Even a gravel road, while not being completely impervious, would fall under this category. Many people don't give much thought to how their homes and driveways might affect a waterbody, but perhaps they should.

As population increases, development increases because more homes and roads are built. In Sutton, there has been a 241.3% increase in number of housing units from 1970 to 2000. (*Sutton Town Master Plan* 2005)

Impervious surface coverage is a very important factor to consider when assessing a watershed. "As natural landscape is paved over, a chain of events is initiated that typically ends in degraded water resources" (Chester, 2, 1996). In terms easier to understand, as the percentage of impervious surface increases, water quality decreases.

Problems

When rain falls onto a pervious surface, it is absorbed by the soil. Once the land can not absorb any more it travels downhill to the nearest body of water. When rain falls on an impervious surface, it doesn't absorb the water, but rather it picks up speed while traveling to the nearest waterbody. This increase in speed causes erosion on the landscape that delivers nutrients and other sediments into the waterbody. Sediments like fertilizer and manure have nutrients and nitrogen to help plants grow. Although these nutrients help lawns grow well, in a waterbody they help algae and different aquatic plants grow. If too many aquatic plants start growing in a waterbody, it will soon be over-populated leading to an oxygen deficiency that can wipe out the other species in the waterbody.

Calculations

One of our tasks was to calculate the percent of impervious surface in the shoreline and watershed of Blaisdell Lake. In order to calculate the impervious surface percentage for the shoreline our team traveled into the field. We carefully estimated the length and width of each road, driveway, house, and other structures in the shoreline. At each house a waypoint was taken on a Global Positioning System (GPS) in order to check this against the tax parcel data to be sure we hadn't missed any structures. From our estimates we calculated the amount of impervious surface in the 250 foot shoreline as 2.2%.

In order to answer the question that addresses impervious surface percentage in the watershed, the group researched past years lake inventories. We compared those watersheds to the Blaisdell Lake watershed and we are confident in estimating the amount of impervious surface in the Blaisdell Lake watershed as less then five percent. For reference purposes, the Pleasant Lake watershed had 3.48% impervious surface in 2006, and the Lake Sunapee watershed had 5.78% impervious surface in 2004.

Should the Blaisdell Lake Protective Association be Concerned?

During our research we found several studies conducted that determined the 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 (Brabec, 499, 2002). Although Blaisdell watershed is considered protected, as population and development increase in Sutton, this could change.

Suggestions

The group came up with several suggestions to protect the quality of the water from the effects of impervious surface:

- Employ best management practices for new construction and renovation especially when that involves disturbing the soil and creating new impervious surface. This is crucial in the shoreland because studies of other waterbodies show a trend of increasing shoreland development over time.
- Existing roads should not be widened.
- Study whether existing roads should be paved or gravel. This study did not address the effect of sedimentation from gravel roads compared to effects of impervious pavement.
- Consider conserving ridgelines and other high places in the watershed. There is evidence in Sutton's Master Plan that residents support conservation: "The protection, conservation, and enhancement of the natural environment are important to the residents of Sutton" (*Sutton Town Master Plan* 2005). Protecting land that will protect the water quality of Blaisdell Lake might be a good place to focus conservation efforts.

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CHAPTER 4

Conservation Priorities in the Blaisdell Lake Watershed, Sutton NH

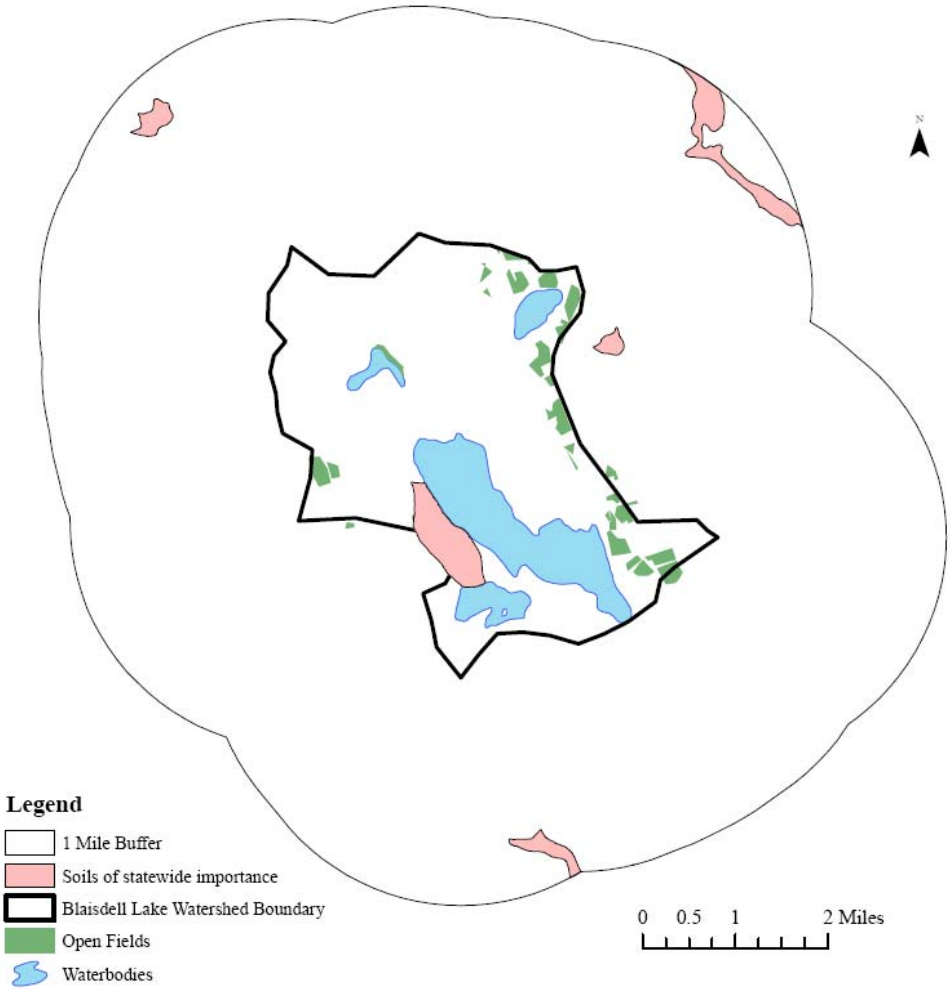
Land conservation and water quality are directly related. The more land that is protected from development the better the water quality will be in any given area. Development and high impervious surface percentages can cause erosion, sedimentation, and conductivity which will effect water quality. The Blaisdell Lake watershed has very little conserved land currently. There is a parcel of conserved land along the shore of Russell Pond and a parcel covering the island on Billings Pond. Conserving land in Sutton would maintain its rural character, excellent water quality, and extensive wildlife habitat. We met with Betsy Forsham, the Town of Sutton's Conservation Commission Chair and she told us that the Town of Sutton follows the conservation priorities set forth by The Forest Society, in its NH Everlasting Initiative, which is the same document the ASLPT (Ausbon Sergeant Land Preservation Trust) uses to focus its conservation efforts. This document was used in the 2005-2006 Community-Based Research Project done by Colby Sawyer Students, "Identifying Conservation Priorities in the Kearsarge/Sunapee Region".

The Town of Sutton, through their Conservation Commission, highlights specific areas to meet their conservation priorities. The NH Everlasting Initiative is focused on the entire state of New Hampshire and identifies 5 criteria for conservation: working farms, working forests, ecologically important resources, drinking water resources and scenic/historic resources. The areas of conservation interest that the Town of Sutton has identified as important differ slightly from the NH Everlasting Initiative. The components that differ are: the addition of wetlands to their conservation criteria and not having a specific focus on working forests.

Combining the characteristics of the watershed, the NH Everlasting priorities, and the interests of the Town of Sutton, we decided to use the criteria of unfragmented lands, open fields and important soils, scenic and historic places, wildlife habitats, steep slopes, ridgelines, wetlands and aquifers. There are no aquifers or historic places (says the NHDES and the NH State Register for Historic Places), and there is a cemetery that is important to the Town of Sutton, that is included in the scenic resource layer. The watershed is surrounded by steep slopes and ridgelines, providing scenic resources. We created a separate map for each criteria and then overlaid them to show where the most of these criteria occur. The overlapping areas are the highest priorities for conservation given they include more criteria than nonoverlapping areas.

On successive pages we show the steps used and results for each criteria.

Working Farms in the Blaisdell Lake Watershed



We selected prime agricultural soils and soils of statewide importance identified by the Natural Resources Conservation Service to identify areas that are potential working farms. In addition, we digitized existing open fields as agricultural land. We recognize that conserving working farms is important to towns, however, they can have a detrimental effect on water quality when fertilizers and pesticides are used.

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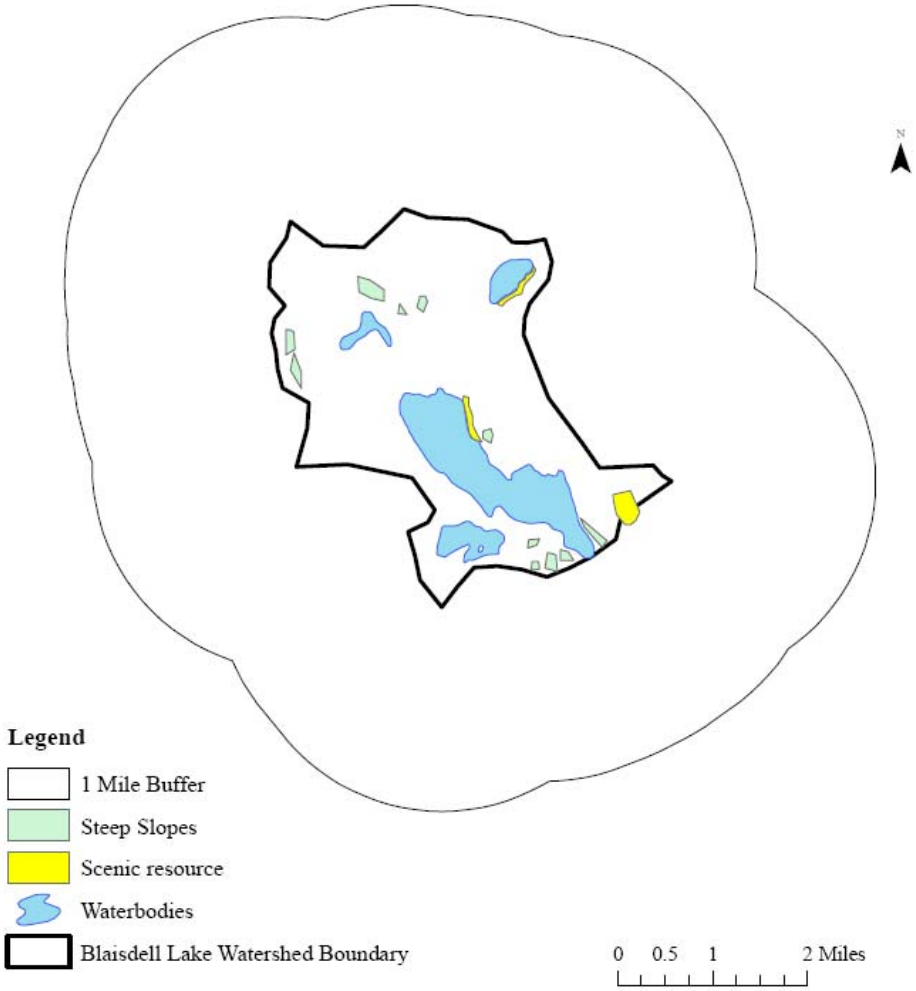
Scenic Resources in the Blaisdell Lake Watershed



Conserving scenic resources allow the rural character of the watershed to remain. This aesthetic characteristic is important to residents living in the watershed, and the quality of the water in Blaisdell Lake. This is because the scenic places in this watershed are high on ridgelines and on steep slopes keeping them undisturbed will prevent erosion, maintaining water quality. In addition to ridgeline, we digitized scenic places identified in the Town of Sutton's Master Plan.

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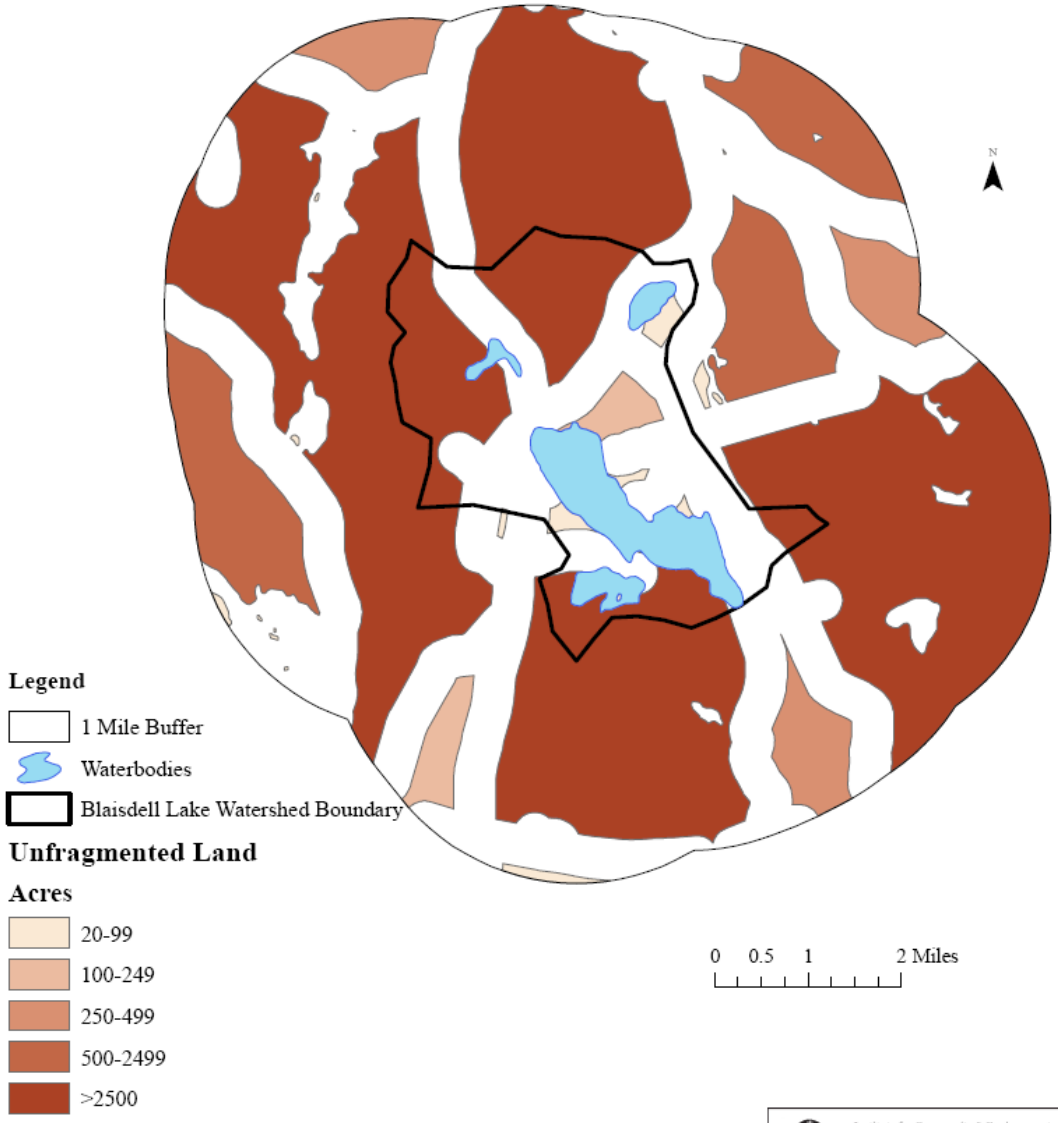
Unfragmented Land in the Blaisdell Lake Watershed



Conserving unfragmented land allows for the protection of working forests, wildlife habitat, and often links conserved lands. Keeping these large blocks of land undeveloped is beneficial to water quality, ecology and is a scenic resource. We selected unfragmented land greater than 100 acres as criteria for the co-occurrence analysis.

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Co-Occurrence of Conservation Priorities