



ENVIRONMENTAL LAW / ECONOMIC ANALYSIS

A Study of the Economic Values of the Surface Waters of New Hampshire

Phase I Report

**Preliminary Assessment of the Existing Literature, Data,
and Methodological Approaches to Estimating
the Economic Value of Surface Water**

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EXECUTIVE SUMMARY

The study on the economic values of the surface waters of New Hampshire has been divided into multiple phases. As described more fully in this report, Phase I includes a preliminary assessment of the existing literature, data, and methodological approaches to estimating the economic value of surface water. This assessment provides a roadmap for Phase II of the project, which will involve estimating a range of values for the total economic activity associated with surface water use in New Hampshire, and Phase III, which will assess the “net economic value”¹ of surface water and the potential economic impacts of changes in water clarity.

The Phase I assessment reveals that water-related studies address the value of economic activity as well as net economic value. These values come from multiple uses of surface water, both recreational and non-recreational, and from the aesthetic, spiritual, and cultural value that individuals derive from their experiences on or around these bodies of water or just knowing that they exist for current and future generations. These uses can be looked at from both qualitative and quantitative perspectives, as well as under static or impact assessment scenarios. (Refer to Section II and Table 1 of this report).

The Phase I assessment also reveals that several different approaches can be used to estimate the value of economic activity associated with surface water use. (Refer to Section III and Table 2). In broad terms, the value of recreational uses can be estimated either in the aggregate or for each separate use, while the valuation of non-recreational uses can only be accomplished using the use-by-use approach. The net economic value of surface water can often be captured through surveys of the public’s preferences and priorities for this natural resource. The availability of data required by these approaches to make a New Hampshire-specific estimate varies considerably. (Refer to Section IV and Table 2). Nonetheless, it appears that sufficient data is available for Phase II to estimate a *range* of values for the total economic activity associated with the State’s surface water, as discussed further below.

The findings from Phase I, taken as a whole, indicate that one viable approach for Phase II would be to estimate a range of economic values based on swimming, fishing, and boating (i.e., three separate recreational uses), as well as waterfront property owners and public drinking water supplies (i.e., two non-recreational uses). (Refer to Table 3). The range would be estimated under a static assessment scenario using readily available data as well as data collected through New Hampshire-specific primary research. This overall approach takes into account the findings of the other studies regarding the economic activity associated with a given use relative to the total economic activity value of all uses, the quality of data that can reasonably be obtained, and an appropriate first round of monetary estimates of value.

Many studies, including surveys in New Hampshire, have identified swimming, fishing, and boating as top recreational uses of surface water, and therefore important contributors to the

¹ The “net economic value” measures the difference between an individual’s total willingness to pay for the use or existence of something and the amount that the individual actually pays.

water's economic value. The Maine Study² found that direct annual expenditures for recreational uses of Maine's Great Ponds totaled \$1.09 billion. Of this, swimming contributed around 25 percent, fishing 14 percent, and boating more than 59 percent. (Waterfowl hunting contributed the remainder). The Maine Study estimated that the \$1.09 billion in direct recreational expenditures resulted in \$1.7 billion in total economic activity and \$208 million in net economic value per year. The Maine Study did not address other recreational uses, such as snowmobiling or sight-seeing, because it was not possible to isolate the role of lakes in these activities and seemed unlikely that the omissions would affect the magnitude of the economic estimates. The proposed Phase II New Hampshire Study would follow a similar rule of thumb relative to estimating the value of economic activity.

Similarly, with respect to non-recreational uses, public drinking water and waterfront properties are believed to be primary contributors to overall economic value. For example, the Maine Study found that direct annual expenditures for non-recreational uses totaled \$742 million, of which 43 percent was attributed to public drinking water and 47 percent to lakefront properties. (Private drinking water and youth camps contributed the remainder). The Maine Study estimated that this \$742 million in direct expenditures resulted in \$1.1 billion in total economic activity and \$6.5 billion in net economic value, which was largely driven by lakefront properties. It is recommended that a Phase II Study of economic activity not address other non-recreational uses beyond these two because of data constraints and the likelihood that the total estimates of economic activity would not increase significantly.

A Phase III Study would include an assessment of net economic value and impact assessment scenarios, and could include some of the other uses of surface water, as well. (Refer to Table 3). Primary research would be required to improve the quality and quantity of available data in these areas, and would be coordinated to the extent possible with the primary research for Phase II. A phase III Study would yield a more precise estimate of the economic value of New Hampshire's surface water rather than a range, which is all that is possible under a Phase II Study. These are the types of trade-offs that are inherent in the types of studies that can be conducted for New Hampshire's surface waters under different scopes-of-study and funding levels.

The proposed Phase II budget is a little more than \$28,000, including professional services, modeling software, and out-of-pocket expenses. (Refer to Table 4). Specifically, the Phase II tasks, coupled with the work conducted in Phase I of this project, will provide the New Hampshire Lakes Association and stakeholders groups with an estimated range of values for economic activity associated with the State's surface water that will help guide important public policies regarding these water bodies.

² Kevin Boyle, Jennifer Schuetz, and Jeffery Kahl, "Great Ponds Play an Integral Role in Maine's Economy," April 1997. We will refer to this study as "the Maine Study."

INTRODUCTION

Background

Gallagher, Callahan & Gartrell (“GCG”) was retained by The New Hampshire Lakes Association (“NHLA”) in November 2000 to prepare a study on the economic values of surface water in New Hampshire. Information about the economic contribution of New Hampshire's surface water to the State's economy will help guide decision-making regarding multiple, and sometimes competing, uses of these water bodies, so as to benefit the majority of the people over the long-run, with the overall health of the economy and the environment in mind.

Purpose of the Report

The study on the economic values of surface water in New Hampshire has been divided into several phases. Phase I provides a preliminary assessment of the existing literature, data, and methodological approaches to estimating the economic value of surface water. The purpose of Phase I is to provide a roadmap for Phases II and III of the project. Phase II will involve estimating a range of values for the total economic activity associated with surface water in New Hampshire, and Phase III will assess the “net economic value” of surface water³ and the potential economic impacts of changes in water clarity. The Phase I Report is intended to give the NHLA and other stakeholders a clear understanding of what a study of the economic value of New Hampshire surface waters can include under different funding levels, and a basis for reaching consensus on the study's scope and depth.

Specifically, Phase I includes the following:

- A review of existing studies that estimate economic value of surface waters;
- An assessment of various methodological approaches which could be used to estimate the economic value of surface waters in New Hampshire; and
- An evaluation of the status of available data.
- A proposed scope and budget for Phase II

³ The “net economic value” measures the difference between an individual's total willingness to pay for the use or existence of something and the amount that the individual actually pays.

EXISTING STUDIES AND LITERATURE

The NHLA, stakeholder groups, and GCG identified approximately one hundred studies and reports as being potentially useful to a study of the economic value of New Hampshire's surface waters. (Refer to the complete bibliography). These resources addressed a host of environmental, economic, and water-use issues including tourism, recreation, commercial activities, property values, ecosystems, and quality of life. The review revealed three important pieces of information: 1) the kinds of uses that tend to be addressed in water-related studies, 2) the different methodological approaches that are available, and 3) the types and sources of data that were either relied upon in other studies or that could be relied upon in a New Hampshire study. The first of these is addressed below, while the second and third are addressed in the following sections of this report.

Uses Addressed in Water-related Studies

Water-related studies address the value of economic activity as well as net economic value. These values come from multiple uses of surface water, both recreational and non-recreational, and from the aesthetic, spiritual, and cultural value that individuals derive from their experiences on or around these bodies of water or just knowing that they exist for current and future generations. These uses can be looked at from both qualitative and quantitative perspectives, as well as under static assessment scenarios versus impact assessment scenarios. For example, one study may look at the number of people who boat and what their typical costs are (quantitative), while another study may look at how boaters rank crowding, safety, noise, etc. in order of importance (qualitative). Similarly, some studies may look at a snapshot in time (static assessment) while others may estimate the effects on water use or quality assuming certain changes occur (impact assessment).

Table 1 provides a list of the specific uses within the use categories and the assessment scenarios that were studied in one or more of the water-related studies reviewed by GCG and compares this list to the uses identified by New Hampshire stakeholders as important to the State's lakes, ponds and rivers. The column labeled "Maine Study" refers to the study entitled "Great Ponds Play An Integral Role in Maine's Economy" (1997),⁴ and has been distinguished from the other reports GCG reviewed because of its potentially high relevance to a New Hampshire study.

While most of the uses listed in Table 1 are self-explanatory, several deserve mention. First, recreational uses can be looked at in the aggregate or by individual use. As discussed further in the following sections of this report, one of the challenges of the use-by-use approach is obtaining accurate data that does not double count the economic activity generated when individuals participate in multiple recreational activities during a given period. Also, certain uses can be broken down into subcategories, depending on the availability of data. For example, fishing can be broken down into open water and ice fishing or freshwater and saltwater fishing.

⁴ Kevin Boyle, Jennifer Schuetz, and Jeffery Kahl, "Great Ponds Play an Integral Role in Maine's Economy," April 1997. We will refer to this study as "the Maine Study."

Finally, “net economic value” refers to the aesthetic, spiritual, and cultural value that individuals derive from their experiences on or around surface waters or just knowing that they exist for current and future generations. It is measured as the difference between an individual’s total willingness to pay for the use or existence of something and the amount that the individual actually pays.

APPROACHES TO ESTIMATING THE ECONOMIC VALUE OF SURFACE WATERS IN NEW HAMPSHIRE

The studies reviewed by GCG used several different approaches that could be used in estimating the economic value of surface waters in New Hampshire. The approaches can vary by both the category and type of use, as discussed further below and summarized in Table 2.

Recreational Uses – Aggregated

The value of economic activity associated with surface water recreational uses, in the aggregate, can be estimated using one of two general approaches. The first approach is based on data collected from businesses both directly and indirectly dependent on the provision of goods and services to recreational users of surface water. This was the approach taken, for example, in “Rivers, Recreation, and the Regional Economy: A Report on the Economic Importance of Water-Based Recreation on the Upper Connecticut River” (1996). The approach requires identification of the appropriate businesses, data on the total economic activity they generate, and a means of assessing how much of that activity is actually associated with surface-water recreational activities. This approach was rejected by the Maine Study because the authors believed that “more accurate data on expenditures associated with recreation uses of Great Ponds can be collected from customers rather than business owners” (Boyle, Kevin, Jennifer Schuetz, and Jeffrey Kahl, “Great Ponds Play an Integral Role in Maine’s Economy,” April 1997, p.5).

A second approach to estimating economic activity stemming from recreational uses, in the aggregate, is based on economic activity generated by travel and tourism specific to surface water, or at least specific to recreation in areas where surface waters exists and in seasons when these waters are likely to be used for recreation. This latter approach also requires some means of assessing how much of the recreational tourist activity is actually associated with the use of surface waters. The study entitled “The Economic Value of Weiss Lake” (1995) employed this approach by conducting on-site surveys of Weiss lake users and phone interviews with users and non-users. The survey gathered information used to estimate the number of people who visited the lake within the last year, the average number of times they visited, resident and tourist expenditures in related goods and services, regional multiplier effects from tourist expenditures, wages and jobs generated, and the consumer surplus from recreation.

There are several advantages associated with these aggregate approaches. Generally speaking, information about the economic activity of businesses (by category) and tourism is available. Data disaggregated by recreational use is not always readily available, and even when it is, adding it up can lead to double counting. For example, if someone spends a day both swimming and fishing, the money they spend on travel and food should only be counted once. However, if the separate data sources on swimming and fishing both include 100 percent of the travel and food, then double counting would occur as a result of aggregating this data. The Maine Study notes that its estimate of total recreational user days might be overstated for this reason. While overestimates due to double counting may be less of a problem under the aggregate approach,

over- and underestimates can occur if economic activity unrelated to the recreational use of surface waters is inadvertently included or excluded. For example, businesses may not always know when their sales are associated with surface water use, or users may buy items from businesses located anywhere and not necessarily identified as “water-dependent.”

Recreational Uses – Disaggregated

The value of surface water recreational uses can also be estimated for each separate use by looking at the economic activity generated from marginal expenditures (e.g., travel costs), fixed expenditures (e.g., equipment purchases), and participation levels for each use. Greater detail on each recreational use is provided below.

Swimming

Many of the water studies GCG reviewed estimated the value of swimming because it reportedly has one of the highest participation rates of any water-based recreational use, along with fishing and boating. To calculate the value of economic activity associated with swimming, studies tend to require at least two pieces of information: daily expenditures (marginal costs) per participant and the total number of user days (equal to the total number of participants times the average number of days of participation). The value of swimming may be estimated separately for state residents and non-residents, as it was for Maine.⁵ In addition, swimming’s *net* economic value can be estimated based on average daily net economic value per person, again as it was for Maine.

In the Maine Study, expenditures for resident and non-resident swimming were obtained from spending profiles developed by the U.S. Army Corps of Engineers at twelve Corps project sites across the country. While the daily expenditures for swimming in particular were not reported, they were reported for all non-boating activities for day and overnight users and were used as a proxy for swimming expenditures. Data on resident swimming days was available from the Maine Department of Conservation. Data on nonresident swimming days was not available, so the ratio of resident to non-resident visitors (seven to one) at ten inland beaches at Maine state parks was used to estimate non-resident swimming days.

Fishing

Fishing is another recreational use for which economic value is often estimated in water studies. As with the estimates for swimming, the value may be estimated separately for residents and non-residents of a given geographic area. Studies that estimate the economic activity associated with fishing tend to require at least three pieces of information: daily expenditures (marginal costs) per participant; daily equipment costs (fixed costs) per participant; and the total number of user days. In addition, an estimate of the average daily *net* economic value per person from fishing may be included.

The Maine Study looked at open water and ice fishing. The authors obtained data on angler expenditures and angler days from surveys conducted by the University of Maine for the Maine

⁵ For each use looked at in the Maine Study, economic value was estimated separately for residents and non-residents. The benefits and challenges of this methodological approach are addressed later in this section.

Department of Inland Fisheries and Wildlife. Information was gathered from resident and non-resident fishing license holders.

Boating

Boating is yet another top recreational water use, and can be broken into subcategories for motorized and non-motorized boaters who are residents and non-residents. Estimating the value of boating requires data in the same categories as those mentioned above for fishing: daily expenditures (marginal costs) per participant; daily equipment costs (fixed costs) per participant; the total number of user days; and (optional) average daily net economic value per person.

In the Maine Study, expenditures for resident and non-resident boating were obtained from spending profiles developed by the U.S. Army Corps of Engineers at twelve Corps project sites across the country. Because the trip expenditures were not distinguished between motorized and non-motorized boating, the authors assumed they were the same for the two types of boating. Equipment expenditures for non-residents were estimated by multiplying resident equipment expenditures for boating by the ratio of non-resident to resident fishing equipment expenditures. Resident motor and non-motor boating days were obtained from the Maine Department of Conservation. To avoid double counting of people who both fish and boat, boating days were multiplied by an estimate of the percentage of non-angler boating days, estimated by the Department to be 33%. Nonresident motor and non-motor boating days were not reported, so the ratio of resident to non-resident visitors (seven to one) at ten inland beaches at Maine state parks was used to estimate non-resident boating days.

Waterfowl Hunting

Waterfowl hunting is a recreational use that was included infrequently in the water value studies reviewed by GCG. However, its value was included in the Maine Study, by resident and non-resident, using the standard data categories regarding marginal and fixed costs and total number of user days, as well as the optional category of net economic value. Under the Maine Study, waterfowl hunting contributed 0.6% of the total recreational use of lakes.

The Maine Study obtained resident waterfowl hunting days and expenditures from a 1988 survey of migratory waterfowl hunters who are residents of Maine. The authors assumed that a non-resident waterfowl hunter hunts the same number of days per year, on average, as a resident. Expenditures for non-residents were estimated by multiplying resident waterfowl hunting expenditures by the ratio of non-resident to resident open water fishing expenditures.

Wildlife Watching

Like the other recreational uses discussed above, wildlife watching as a primary activity can be included in water studies, although it was not included in the Maine Study for reasons the authors did not explicitly discuss.⁶ Its value could be included, by resident and non-resident, using the standard data categories regarding marginal and fixed costs and total number of user days, as well as the optional category of net economic value.

⁶ The authors did discuss the challenges of distinguishing sight-seeing from other recreational uses of lakes, and they may have considered wildlife watching to be similarly challenging.

Snowmobiling

Snowmobiling is probably a common recreational use of lakes during the winter months, although isolating the role of lakes in this activity appears to be quite difficult. None of the lakes-studies we reviewed attempted to include snowmobiling. If it were included in a study, the types of data required regarding expenditures and participation levels would be the same as those required for the other recreational uses already discussed above.

Walking and Hiking

Walking and hiking are also likely to be common recreational uses of lakes and rivers, but again isolating the role of surface water in these activities may be a challenge. The water-related studies GCG reviewed only attempted to ascertain how common an activity walking and hiking are through survey questions – none attempted to isolate their economic value from other recreational uses of the water. If they were to be included, the types of data required regarding expenditures and participation levels would be the same as those required for the other recreational uses already discussed above.

Camping

Camping is probably another common recreational use around lakes, ponds, rivers, and streams but again isolating the role of surface water in these activities may be a challenge. None of the lakes-studies we reviewed attempted to include camping.

Beaches

Beaches located near lakes, ponds, rivers, and streams are clearly used for sitting, picnicking, and other activities not already listed above. However, the challenge associated with isolating the use of beaches from other activities such as swimming or fishing appears to be great. Only one of the lakes-studies we reviewed attempted to include beaches as a distinct use, and this was in the context of separating “beach area use” from “lake surface use”.

Sight-Seeing

Sight-seeing, like walking and hiking, is likely to be a common recreational use of lakes and rivers, but isolating the role of surface water in this activity is difficult. The water-related studies GCG reviewed only attempted to ascertain how common an activity sight-seeing is through survey questions – none attempted to isolate its economic value from other recreational uses of the water. If sight-seeing were to be included, the types of data required regarding expenditures and participation levels would be the same as those required for the other recreational uses already discussed above.

Non-Recreational Uses

The value of non-recreational uses of surface waters can also be estimated for each separate use, just as recreational uses, by looking at the economic activity generated from marginal and fixed expenditures and number of users for each use. Greater detail on each non-recreational use is provided below.

Owners of Waterfront Property

Owners of waterfront property clearly place a value on being located near surface water. Some of this value is reflected in the property taxes they pay and the investments they make in their properties that are unique to their water-based location. These expenditures contribute to the economic activity within the state. Estimating these expenditures requires data on tax revenue associated with waterfront property, and investments and costs unique to waterfront properties. Estimates of *net* economic value could also be included, requiring an estimate of the number of user days of waterfront properties, net of all recreation days. The Maine Study found that the largest single source of “great pond” usage in Maine is associated with waterfront property ownership, and that ninety-five percent of the total estimated *net* economic value accrues to these owners.

To compute annual property taxes, the Maine Study estimated developable waterfront on great ponds by taking geographic information about the total length of frontage and assuming that 90 percent of it was developable, based on correspondence with Maine’s Department of Environmental Protection. A study on surface water quality and property values provided the Maine Study with the average price-per-foot of frontage and the percent of lake-front properties owned by residences. The Maine Study relied on a separate source for an estimate of lakefront property owners’ average expenditures on maintenance and improvements, not including boating and drinking water expenditures, that would not have occurred if the property were not on a lake. To estimate the number of property owners paying these incremental costs, the Maine Study again referred to the property value study, which provided the average lot frontage in feet and the percent of lots that have seasonal or year-round residences.

Public Drinking Water Supplies

Some public water utilities draw drinking water from lakes, ponds, and rivers. These entities serve residential and commercial accounts, and some of them are regulated by state public utilities commissions (“PUCs”). Estimating the direct economic value of surface water use to customers served by water districts requires data regarding each utility’s annual operating revenue, which reflects the amount that was paid by all of its customers through their bills. If the utility is regulated, information about its revenue is filed annually with the PUC. If the utility is not regulated, information regarding its rates and customer base would need to be obtained either from the company or from surveys of its customers and then used to estimate customers’ total annual expenditures.

Private Drinking Water Supplies

Some private residences also draw drinking water from lakes, ponds, and rivers. Estimating expenditures for private drinking water supplies requires an estimate of the number of residences drawing potable water from these sources and an annual average cost to replace and maintain their private water systems.

To estimate the number of lake residences drawing potable water from the lakes, the Maine Study relied on a study of surface water quality and property values and a survey of lake property owners. The study that Maine relied on found the average lot frontage (in feet), the percent of lots that had seasonal or year-round residences, and the percent of lake-front properties owned by residences, thus allowing resident expenditures to be distinguished from

those of nonresidents. The survey, conducted by the University of Maine, found the percent of lake residences drawing drinking water from the lakes. The average annual expenditure on replacement and maintenance per residence was taken from a separate study conducted by the University of Maine in 1996.

Agricultural, Commercial and Industrial

Some agricultural, commercial and industrial firms use surface waters in their production processes. The Maine Study did not address these users, and explained that agricultural irrigation was omitted because lakes were not determined to be a significant source of irrigation in Maine. If these uses were included in a study, an approach similar to that used for either public or private drinking water supplies could be used. Specifically, information would be needed on the number of users and the average amount they use per year. In addition, information on their annual average water-related costs could either come from an estimate of the average cost to replace and maintain their water systems or from a statewide average water utility rate for commercial and industrial customers.

Youth Camps

Many children attend youth camps that are located on bodies of surface water. Their families spend money not only on camp “tuition,” but also on trips to drop the children off, pick them up, and visit them. All of these expenditures generate economic activity. To estimate youth camp expenditures, data is needed on the number of camp attendees at camps near surface water, the total number of visitors for these attendees, the cost of tuition, and the in-state expenditures of the youth camp visitors.

The Maine Study relied upon a 1995 study conducted for the Maine Youth Camping Association for data regarding youth attendance, total visitors, revenue from youth attendance, and daily expenditures reported for visitors. The authors of the Maine Study assumed that *all* youth camps in Maine are located on lakes and that all of the economic activity associated with these camps can be attributed to their lakes. The authors noted that visitors are essentially tourists, but apparently did not attempt to mitigate against the possibility of double counting the visitor expenditures if such expenditures were already included in other recreational activities.

Net Economic Value

Most of the studies reviewed by GCG that attempt to capture the aesthetic, spiritual, and/or cultural value that individuals derive from their experiences on or around surface waters, or the value of just knowing that they exist for current and future generations, tend to utilize surveys to assess people’s preferences, priorities, and willingness to pay. For example, a study entitled “The Economic Value of Weiss Lake” (1995) interviewed lake users and non-users to query, among other things: their perceptions of water quality, their willingness to pay for water quality improvements, reasons why non-users do not visit the lake, and the values that non-users place on the option to use the lake (“option value”) and knowing that the lake exists (“existence value”). Another study entitled “The White River Valuation Study: A Report on the Value of Maintaining Natural River Flows on Vermont’s White River” (1998) surveyed local and non-

local households to assess, among other things, their willingness to pay for the protection of natural river flows for recreation and other purposes.

Surveys of these types have inherent challenges, such as self-selection in the sample of interviewees and inconsistencies between reported and actual behavior. Nonetheless, well-designed surveys can be informative and useful.

Impact Assessment Scenarios

The economic impact that may occur due to a given change in surface water usage can be assessed in a number of ways, as indicated by some of the studies GCG reviewed. One approach is to conduct a survey, such as that done for “Recreational Boating in Ohio: An Economic Impact Study” (1999), in which boat owners were asked to indicate how their number of trips would likely change in response to specified percentage changes in expenses.

Another approach is to use detailed modeling to obtain an estimated change in participation or valuation that may result from a change of environmental characteristics. This approach was used, for example, in “The Influence of Water Clarity on Marginal Prices for Residential Lake Front Property in New Hampshire” (2000), in which an hedonic analysis was conducted. Essentially, analyses were performed to determine the influence of lakefront homes’ structural characteristics, locational characteristics, and water clarity (based on secchi disk measurements) on their selling prices. The estimated increase/decrease in valuation can then be used to estimate a change in economic activity. Alternatively, a less sophisticated approach would be to assume (rather than estimate) a specific increase or decrease in participation or valuation as a possible result from a change in the environment, and use that assumption to estimate a change in economic activity. For example, one could estimate the economic impact if participation in all water-based recreational uses fell by 5 percent, a decrease that one might assume could occur if water pollution and waterfront development both rose.

Additional considerations

Distinguishing Residents from Non-Residents

As mentioned earlier, the Maine Study distinguished between residents and non-residents because the authors wanted to identify “new money” coming into the state, which they assumed would come only from non-residents. They presumed that if residents had not spent money on lake uses in Maine, they would have spent it on something else in Maine, and therefore that residents’ expenditures on lake uses would not represent a *net* addition to the economy. Others may disagree, in part noting that New Hampshire residents choose between spending their recreation and vacation dollars in New Hampshire versus other states.

Another reason to consider distinguishing between residents and non-residents is that their travel costs (e.g., transportation, food, and lodging) can be different when they travel to participate in water-based recreation. However, differences in travel costs can be captured to a great extent

because the data is often broken down between day-trips and overnight trips, which may in some cases be a more useful distinction.

STATUS OF THE DATA

Some of the studies reviewed by GCG include data that could be used in estimating the economic value of surface waters in New Hampshire. The availability of data varies by category and type of use, as discussed further below and summarized in Table 2.

Recreational Uses – Aggregated

The Institute of New Hampshire Studies (“INHS”) at Plymouth State College generates quarterly and annual reports on tourism statistics and travel economics on behalf of the New Hampshire Division of Travel and Tourism Development. These reports include data by season and/or region on New Hampshire traveler days, average expenditures per visitor day (day trips and overnight trips), average expenditures by activity category (e.g., “recreation”), indirect effects of these expenditures, jobs created, and rooms and meals tax revenues. The INHS also publishes visitor surveys that include the percentage of travelers who indicate having participated in one or more activities listed on the questionnaire. The listed activities include outdoor recreation, sight-seeing, beaches (lakes, oceans), state parks and national forests, and hiking. However, this information is only broken down by season but not by region, is not specific to surface water recreation and does not provide detailed participation rates. In order to use this data in a New Hampshire study, an assumption would need to be made about how much of this tourist activity is actually associated with the recreational use of surface waters.

Recreational Uses – Disaggregated

Swimming

To help meet the informational requirements for a state-specific study, New Hampshire could use expenditure data from the United States Army Corps of Engineers’ report in the same manner as Maine did. However, the applicability of the data to a New Hampshire study may be limited for at least two reasons. First, none of the twelve Corps project sites that were surveyed are in New England (the nearest is in Raystown, PA), and therefore the expenditure profiles may not be representative for the region in general or New Hampshire in particular. Second, the survey was conducted during the summers of 1989 and 1990, and adjusting the expenditure data for more than a decade’s worth of inflation may result in expenditure estimates that are significantly different from actual current expenditures. Another source for expenditure data could be the New Hampshire Division of Parks and Recreation, which maintains revenue figures for state parks where swimming is an option. While many of the parks offer multiple activities, swimming is the only recreational option at four of the parks, and swimming and picnicking are the only options at three others. Statewide data on swimming days at lakes, ponds, and rivers in New Hampshire does not appear to be available. However, data on participation *rates* for swimming is reported in surveys conducted by the New Hampshire Fish and Game in 1998 and the Squam Lakes Association in 2000, and the Division has attendance figures for the state parks.

Fishing

Data regarding angler days for *open water* and *ice* fishing is available for New Hampshire from the “New Hampshire Freshwater Angler Survey” (1996). Data is broken down between residents and nonresidents, as well as by region of the State and type of water fished (e.g., brooks, ponds, rivers, and lakes). However, the survey does not provide expenditure data. Adequate data on *freshwater* fishing (broken down by “lakes, ponds and reservoirs” and “rivers and streams”) is also available. The “1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation” and “The 1996 Economic Impact of Sport Fishing in the United States” provide state-specific data on participation, expenditures, and economic impacts for both residents and non-residents who fish in New Hampshire. These sources should provide sufficient data for inclusion of freshwater fishing in a New Hampshire surface water study; however, it will need to be inflated to estimate current year values.

Boating

A New Hampshire study could use expenditure data from the United States Army Corps of Engineers’ report in the same manner as Maine did, although the same caveats as those mentioned above for “swimming” would apply. In addition, the National Marine Manufacturers’ Association has “Estimated state distribution of 1999 boat, motor, trailer and accessory purchases,” but it does not provide average purchases per participant, nor does it distinguish between freshwater and saltwater boating. A third option is the New Hampshire Division of Parks and Recreation’s revenue figures for state parks where boating is an option.

Statewide data on boating *days* in New Hampshire in 1989 is available from the “Compendium of Sportfishing Statistics” (1996). The data includes information about inboard and outboard motor boaters, boaters’ state of residence, and the percent of motor boaters who fish. Data on participation *rates* for boating is reported in surveys conducted by the New Hampshire Fish and Game in 1998 and the Squam Lakes Association in 2000. Furthermore, the New Hampshire Division of Parks and Recreation maintains attendance figures for state parks where boating is an option. In addition, the Squam Lakes Association has 2000 survey data regarding: 1) static and active boat counts broken out by canoes and kayaks, sailboats, motor boats under 25 horse power, and motor boats above 25 horse power, and 2) boat rental statistics on quantity, rental income, average daily rental costs, and estimated user days. The Association also estimated out-of-state boat usage for New Hampshire using an extrapolation of data collected at Squam Lake. Finally, boat registration data for 2000 is available from the New Hampshire Division of Motor Vehicles. The Division will accept and evaluate requests to sort this data by, for example, type of boat or the owner’s residence status, if the database includes the relevant information. Some estimates would have to be developed to estimate whether boats registered in New Hampshire are typically used in fresh or saltwater.

Waterfowl Hunting

While comparable data to that used in the Maine Study does not appear to be available for *waterfowl* hunting in New Hampshire, adequate data on *migratory bird* hunting (defined as bandtailed pigeons, coots, ducks, doves, gallinules, geese, rails, and woodcocks) is available. The “1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation” provides state-specific data on participation and expenditures for both residents and non-residents who hunt migratory birds in New Hampshire. This source should provide sufficient data for inclusion

of bird hunting in a New Hampshire surface water study. However, this would likely overestimate *waterfowl* hunting because not all migratory birds are waterfowl.

Wildlife Watching

A New Hampshire study could use data from the “1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation” and the “1996 National and State Economic Impacts of Wildlife Watching,” which provide information on participation, expenditures, and economic impacts for both residents and non-residents who participate in wildlife watching in New Hampshire. However, the national study does not identify wildlife watching that occurs exclusively around surface waters, and therefore some assumptions would need to be developed about the number of participants at these particular types of sites compared to the total number of participants at all types of sites.

Snowmobiling

A New Hampshire study entitled “Assessment of Snowmobiling in New Hampshire 1996 - Summary and Recommendations” (1996) includes data on participation, direct expenditures, and economic impacts (e.g., jobs, taxes) for New Hampshire residents and nonresidents by region within the state. However, the study does not provide specific data on snowmobiler days at lakes, ponds, rivers, and streams, and thus an assumption would need to be developed about the number of participants at these particular sites.

Walking and Hiking

New Hampshire specific data that would be needed to conduct an economic analysis on waterside walking and hiking appears to be limited. The New Hampshire Division of Parks and Recreation maintains revenue and attendance figures for state parks where walking trails are available. Data on participation *rates* for hiking is reported in surveys conducted by the New Hampshire Fish and Game in 1998, the Squam Lakes Association in 2000, and the Institute for New Hampshire Studies at Plymouth State College in 2000, although the data is not limited to walking and hiking near surface water. Average daily expenditures for walkers and hikers could be assumed to equal the average for all New Hampshire tourists based on data from INHS, which does not include expenditures associated with special hiking equipment. Expenditure estimates for equipment could be developed from other sources.

Camping

Readily available data on camping in New Hampshire does exist but does not specifically identify camping at lakes, ponds, rivers, and streams. A 2000 survey conducted by the INHS reports, by season, the percent of visitors who indicated using campgrounds for overnight accommodations, the average number of nights they camped, the average cost per overnight travel party, and the average size of overnight travel parties. In order to use this data in a New Hampshire study, an assumption would need to be developed about the number of participants at surface water sites. In addition to INHS data, the New Hampshire Division of Parks and Recreation maintains revenue and attendance figures for state parks where camping is allowed. Data on participation *rates* for camping is reported in the Squam Lakes Association’s 2000 survey. It is unclear whether or not the New Hampshire Campground Owners’ Association has publicly available attendance figures and expenditure levels or aggregate revenue figures.

Beaches

New Hampshire-specific data on the use of beaches associated with surface water and distinct from other recreational uses appears to be limited. Again, the New Hampshire Division of Parks and Recreation maintains revenue and attendance figures for state parks where swimming is an option and presumably, then, where beaches are located. In addition, a 2000 survey conducted by the INHS reports the percent of visitors who indicated participating in “beach (lake, ocean)” activities during their trip to New Hampshire.

Non-Recreational Uses

Owners of Waterfront Property

In terms of relevant data available for a New Hampshire study, we believe the Department of Environmental Services can provide an estimate of total feet of frontage on lakes, ponds, rivers, and streams statewide. If the developable portion of this frontage can be estimated and then readily allocated to each community, then community property tax rates could be used. If the estimated developable frontage can not be readily allocated to each community, then an average tax rate would need to be used.

The Maine Study obtained the average price per foot of lake frontage from a study on surface water quality and property values. A similar study has been conducted for New Hampshire called “The Influence of Water Clarity on Marginal Prices for Residential Lake Front Property in New Hampshire” (2000) and its supporting documentation may include a New Hampshire-specific average price per foot of frontage. If not, New Hampshire could adopt the finding that the Maine Study used. Another relevant source of information might be the evaluation of shorefront property values for each of five towns on Squam Lakes that was conducted by the Squam Lakes Association, which used data from town reports and town offices. A New Hampshire study could conduct a similar evaluation for other major bodies of surface water and extrapolate the findings to all surface water in the State.

GCG is not aware of any New Hampshire-specific estimate of the average expenditure of waterfront property owners on maintenance and improvements that are unique to waterfront properties and does not include boating and drinking water expenditures which will be picked up elsewhere. The findings used in the Main Study would probably need to be used in a New Hampshire study.

Public Drinking Water Supplies

The Maine Study obtained estimates for operating revenues of water districts from annual reports filed with the state regulators. Comparable revenue data is available from New Hampshire regulators, although only 40 water utilities are regulated in the State. According to data from the New Hampshire Department of Environmental Services, there are between 125 and 135 water systems that serve residential populations over 500 (most of these “large” systems are reportedly municipal systems). The New Hampshire Department of Environmental Services indicates that they serve approximately 65 percent of the State’s overall population but represent less than 10 percent of the total number of public water systems. The New Hampshire Department of Environmental Services’ data also indicates that there are between 555 and 575 community public water systems (reportedly serving mobile home parks, housing developments, and

institutions) and between 1,525 and 1,600 non-community water systems (reportedly serving schools, workplaces, campgrounds, and lodging and dining establishments). In short, because there are so many of them, the operating revenues of the 40 regulated water utilities would likely need to be extrapolated to all water utilities. The extrapolation will require an estimate of the portion of all water utility customers in the State that are served by the 40 regulated utilities, as well as other calculations to estimate total expenditures by residential and commercial customers of public water systems statewide.

The New Hampshire Department of Environmental Services does have survey data on water rates for customers of large water systems and small community water systems. The New Hampshire Department of Environmental Services also has data on public water supplies using surface water sources and on the number of people served by large surface water treatment plants. It appears, however, that no rate data is available for water systems that are cooperatively-owned or that serve apartments and mobile home parks. In addition, it appears that no data is available on how many customers are served by these smaller water systems. Thus, there may not be enough data on the rates, the number of customers, and the average customer usage to estimate total expenditures by residential and commercial customers of public water systems in New Hampshire using the New Hampshire Department of Environmental Services surveys, but rather using some combination of data from regulated utilities filed at the New Hampshire Public Utilities Commission, extrapolation, and some additional surveys.

Private Drinking Water Supplies

At this time, it appears that the necessary data to estimate the value of private drinking water for a New Hampshire surface water study is scarce. However, New Hampshire could utilize the assumptions and findings that the Maine Study used to make its calculations relative to private drinking water supplies.

Agricultural, Commercial and Industrial

Data collected by the New Hampshire Department of Environmental Services under its “Water User Registration and Reporting Program” contains data on the number of large users in New Hampshire (more than 20,000 gallons per day averaged over a 7-day period), their use purpose (e.g., agriculture, commercial, industrial), and annual usage. For each user in the database, the type of withdrawal and return source (e.g., lakes, ponds) is specified. Thus, the data regarding the number and types of users, as well as their annual usage, appears to be good. It is unclear, however, what the average annual water-related costs are for each type and size of user. As a proxy, the average regulated water rate for commercial and industrial customers could be used.

Youth Camps

No data on youth group camp attendance and expenditures is readily available. The New Hampshire Camp Directors Association is forwarding some data which GCG will assess. It is unclear at this time what types of data this organization might have. It is possible that a New Hampshire study could couple some of this information with some of the assumptions and findings that the Maine Study used to make its calculations

Distinguishing Residents from Non-Residents

The data required to distinguish between residents and non-residents in a New Hampshire study is fairly limited for most of the recreational and non-recreational uses discussed above. However, statewide survey data on visitors' states of residence are contained in the annual New Hampshire Visitor Surveys prepared by Plymouth State College's Institute of New Hampshire Studies for the New Hampshire Division of Travel & Tourism Development and could indicate how to allocate recreational water uses between residents and non-residents. INHS' Fiscal Year 1998 Travel Economics Report estimates that 22% of visitor days and 14% of the recreational spending in New Hampshire were by its residents.

Net Economic Value

Limited survey data exists on the preferences, priorities and willingness to pay of New Hampshire residents and businesses relative to the State's surface water. For example, the New Hampshire Fish and Game Department's "New Hampshire Public Access Needs Assessment Statewide Summary Report" (1998) examined residents' attitudes and perceptions about issues, concerns, priorities, and problems surrounding public access to lakes, ponds, and rivers. In addition, the study "Rivers, Recreation, and the Regional Economy: A Report on the Economic Importance of Water-Based Recreation on the Upper Connecticut River" (1996) investigated the relationship between environmental quality and economic health through a mailed survey of "direct" and "indirect" "water-dependent" New Hampshire businesses that provide goods and services on the Upper Connecticut River related to water-based recreation.

Furthermore, in June 2000, the UNH Center for Business and Economic Research conducted an opinion survey of New Hampshire business owners and executives on behalf of the New Hampshire Association of Realtors. Fifty percent of respondents said that the most attractive feature of doing business in New Hampshire is the State's "quality of life," and 15 percent of the entire sample specifically mentioned the mountains, lakes, scenic beauty, environmental quality, etc. as the State's top attraction. While there is general agreement in the literature reviewed by GCG that "quality of life" factors are important in business location decisions, there is little consensus as to what the key factors are or what precise role they play in business location. Estimating the impact of the quality of surface water on business location and expansion decisions in New Hampshire would require more extensive research and probably some primary data development.

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TABLE 2
DATA NEEDS AND EXISTING DATA BY USE AND SCENARIO

	Data Needs	Status of Existing Data
<p>USE - Economic Activity Recreation Aggregated all visitors / all uses</p>	<ul style="list-style-type: none"> • direct and indirect spending by visitors on surface water recreation and trip-related expenditures <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • direct and indirect surface water-dependent businesses providing goods and services to recreational users 	<ul style="list-style-type: none"> • Data on NH traveler days, direct expenditures (average per visitor day and by category, e.g. recreation), indirect effects, jobs, and taxes by season and/or region from "Fiscal Year 1998 Travel Economics Report," prepared by the Institute for New Hampshire Studies, Plymouth State College, June 1999. • Traveler activities reported (% indicating "yes") by season but <u>not</u> by region from "New Hampshire Visitor Surveys 1999/2000," prepared by the Institute for New Hampshire Studies, Plymouth State College, June 2000. • Missing travel and tourism data specific to surface water recreation - NH Division of Parks and Recreation has revenue and attendance figures for state parks on lakes, ponds, and rivers.

	Data Needs	Status of Existing Data
Disaggregated swimming	<ul style="list-style-type: none"> • avg. daily expenditures (marginal costs) • total user days 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data - US Army Corps of Engineers could be used as a source; NH Division of Parks and Recreation has revenue figures for state parks on lakes, rivers, and ponds with swimming. • Limited participation data (% indicating "yes") and visitor frequency rates for NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998; for NH state parks on lakes, rivers, and ponds with swimming from NH Division of Parks and Recreation; and for Squam Lakes from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000." • Missing user days at lakes - NH Division of Parks and Recreation has attendance figures for state parks on lakes, rivers, and ponds. • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle at al., April 1997.
fishing - open water and ice OR	<ul style="list-style-type: none"> • avg. daily expenditures (marginal costs) • avg. daily equipment costs (fixed costs) • total user days 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data in NH • User day data from NH Fish & Game's Freshwater Angler Survey, 1996. • Limited participation data (% indicating "yes") and visitor frequency rates for NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998; for NH by season but not region for "outdoor recreation" from "New Hampshire Visitor Surveys 1999/2000," prepared by the Institute for NH Studies, Plymouth State College, June 2000; and for Squam Lakes from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000." • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle at al., April 1997.
fishing - freshwater (vs. saltwater)	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Adequate NH data from the "1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation" and related reports, e.g., "The 1996 Economic Impact of Sport Fishing in the United States."

	Data Needs	Status of Existing Data
boating - motorized and non-motorized	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data - US Army Corps of Engineers could be used as a source; NH Division of Parks and Recreation has revenue figures for state parks on lakes, ponds, and rivers with boating; and National Marine Manufacturers Association has "Estimated state distribution of 1999 boat, motor, trailer and accessory purchases." • Static and active boat count data (canoes/kayaks, sailboats, motor) for Squam Lakes, boat rentals for Squam Lakes, NH registered and non-registered boats, and out-of-state registered and non-registered boats using NH waters from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000." • User days, participation data (% indicating "yes") and visitor frequency rates for NH residents and nonresidents from the "Compendium of Sportfishing Statistics" (1996); NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998; for NH by season but not by region for "outdoor recreation" from "New Hampshire Visitor Surveys 1999/2000," prepared by INHS, June 2000; Lakes from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000." • Missing user days on surface water • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle at al., April 1997.
hunting - waterfowl <p style="text-align: center;">OR</p>	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data for NH • Limited participation data (% indicating "yes") and visitor frequency rates for NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998. • Missing user days near surface water • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle at al., April 1997.
hunting - big and small game, migratory bird, other	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Adequate NH data from the "1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation." • Missing user days near surface water

	Data Needs	Status of Existing Data
wildlife watching	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Adequate NH data from the "1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation" and related reports, e.g., the "1996 National and State Economic Impacts of Wildlife Watching." • Missing user days near surface water
snowmobiling	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Data on participation, direct expenditures, indirect effects, jobs, and taxes for NH residents and nonresidents by region from "Assessment of Snowmobiling in New Hampshire 1996 - Summary and Recommendations," Robert Robertson, August 1996. • Missing user days near surface water
walking/hiking	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data for NH - NH Division of Parks and Recreation has revenue figures for state parks on lakes, ponds, and rivers with hiking • Limited participation data (% indicating "yes") and visitor frequency rates for NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998; for NH by season but not by region for "hiking" from "New Hampshire Visitor Surveys 1999/2000," prepared by the Institute for New Hampshire Studies, Plymouth State College, June 2000; and for Squam Lakes from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000." • Missing user days near surface water - NH Division of Parks and Recreation has attendance figures for state parks on lakes, ponds, and rivers with hiking.

	Data Needs	Status of Existing Data
camping	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Avg. lodging/campground expenditure data for NH by season but not by region for overnight travel parties from annual NH Visitor Surveys prepared by INHS, June 2000; NH Division of Parks and Recreation has revenue figures for state parks on lakes, rivers, and ponds with camping; NH Campground Owners' Association may have data. • Limited participation data (% indicating "yes") for NH, including avg. # of nights by season but not by region for "accommodations used" from NH Visitor Surveys prepared by INHS; and for Squam Lakes from "Squam Lakes Association Strategic Plan - Annual Results and Survey, January 2000. • Missing user days at lakes - NH Division of Parks and Recreation has attendance figures for state parks on lakes, rivers, and ponds with camping.
beaches (e.g., sitting, picnicking)	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data for NH - NH Division of Parks and Recreation has revenue figures for state parks on lakes, pond, and rivers • Limited participation data (% indicating "yes") for NH by season but not by region for "beaches (lake, ocean)" from "New Hampshire Visitor Surveys 1999/2000," prepared by the Institute for New Hampshire Studies, Plymouth State College, June 2000. • Missing user days at lakes - NH Division of Parks and Recreation has attendance figures for state parks on lakes, ponds, and rivers.

	Data Needs	Status of Existing Data
sight-seeing	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • Missing avg. daily expenditure data for NH - NH Division of Parks and Recreation has revenue figures for state parks on lakes, pond, and rivers • Limited participation data (% indicating "yes") for NH by season but not by region for "sight-seeing" from "New Hampshire Visitor Surveys 1999/2000," prepared by the Institute for New Hampshire Studies, Plymouth State College, June 2000. • Missing user days at lakes - NH Division of Parks and Recreation has attendance figures for state parks on lakes, ponds, and rivers.

	Data Needs	Status of Existing Data
<p>USE <u>Non-Recreation</u> lakefront property owners (e.g., taxes)</p>	<ul style="list-style-type: none"> • avg. annual lakefront property tax revenue per community (avg. tax rate for each community * avg. feet of frontage for each community * avg. price per foot) • avg. annual investments & costs unique to lake properties 	<ul style="list-style-type: none"> • Data for five towns on the Squam Lakes regarding total value of assessed shorefront, number of shorefront taxable lots, average value, average shorefront footage per tax lot, average value per shortfront footage, and total taxes from shorefront lots from "Evaluation of Shorefront Property Values by Town, Squam Lakes, New Hampshire" Squam Lakes Association, March 2001. • Missing tax data for other surface waterfront properties - towns' annual reports, public assessment records and transaction records may be a source. • Missing data on avg. annual investments & costs unique to NH lake properties • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle et al., April 1997.

	Data Needs	Status of Existing Data
public drinking water supplies	<ul style="list-style-type: none"> • annual operating revenues of public water utilities that use lakes as water sources and are regulated by the Public Utilities Commission <p>OR</p> <ul style="list-style-type: none"> • average cost per user * number of users of public water utilities that use lakes as water sources 	<ul style="list-style-type: none"> • Water utility revenue and number of customers available from the NH Public Utilities Commission, which regulates 40 water utilities <p>OR</p> <ul style="list-style-type: none"> • Average annual water rates from "1998 Water Rate Survey, Large Water Systems [serving 500+ people]," NH Department of Environmental Services, Environmental Fact Sheet WD-WSEB-16-5, 1999 and "1996 Water Rate Summary: Very Small Public Community Water Systems," NH Department of Environmental Services, Environmental Fact Sheet WD-WSEB-16-6, 1999. • List of "NH Public Water Systems Serving over 500 People" (including population served) and number of systems of community and non-community (transient and non-transient) public water systems in 1999 from NH Department of Environmental Services, Environmental Fact Sheet WD-WSEB-16-3, 1999. • List of surface water supplies (e.g., lakes) used for sources of public drinking water in 1999 from NH Department of Environmental Services, Fact Sheet WD-WSEB-13-3, 1999. • List of large surface water treatment plants, town and population served in 1999 from NH Department of Environmental Services, Fact Sheet WD-WSEB-13-2, 1999.
private drinking water supplies	<ul style="list-style-type: none"> • avg. annual expenditures (marginal costs) • avg. annual equipment costs (fixed costs) • total users (percent of seasonal and year-round lakefront residences) 	<ul style="list-style-type: none"> • Missing data on number of users in NH - ME survey data indicate that 52% of lake residences draw drinking water from lakes • Missing cost data for users in NH - ME assumes \$4 per year for small users • Adequate ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle et al., April 1997.

	Data Needs	Status of Existing Data
agricultural (e.g., irrigation)	<ul style="list-style-type: none"> • avg. annual expenditures (marginal costs) • avg. annual equipment costs (fixed costs) • total users 	<ul style="list-style-type: none"> • Data on number of large users in NH (20,000+ gallons per day averaged over a 7-day period), use purpose (e.g., agriculture, commercial, industrial), and annual usage by type of withdrawal/return source (e.g., lakes, ponds) based on the Water User Registration and Reporting Program, NH Dept. of Environmental Services • Missing cost data for "large users" in NH
commercial (e.g., special events, filming)	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • see above
industrial (e.g., manufacturing, shipping)	<ul style="list-style-type: none"> • see above 	<ul style="list-style-type: none"> • see above
youth camps on lakes (attendance and related visits)	<ul style="list-style-type: none"> • number of camps located on lakes • total number of youths and visitors per camp • camp tuition • avg. expenditure per visitor 	<ul style="list-style-type: none"> • No readily available data for NH identified to date - awaiting information from the NH Camp Directors / NH SentinelSource. • ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle et al., April 1997.
USE - New Economic Value		
aesthetic/spiritual/cultural	<ul style="list-style-type: none"> • willingness to pay 	<ul style="list-style-type: none"> • No readily available data for NH • ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle et al., April 1997.
crowding / safety / noise		<ul style="list-style-type: none"> • Survey data on % of NH residents who have stopped using an area and reasons why, and ranking of water-area characteristics and problems, from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998.
existence / bequest / altruism		<ul style="list-style-type: none"> • Survey data for VT from "The White River Valuation Study: A Report on the Value of Maintaining Natural River Flows on Vermont's White River," The National Wildlife Federation's Northeast Natural Resource Center, January 1998.
quality of life / economic growth / business location		<ul style="list-style-type: none"> • Survey data for NH from NH Association of Realtors' Opinion Survey of businesses, June 2000 - 50% of respondents identified "quality of life," with specific mention of lakes, scenic beauty, environmental quality, etc.

	Data Needs	Status of Existing Data
SCENARIO		
Static Assessment Scenarios		
Impact Assessment Scenarios		
changes in water quality / clarity	<ul style="list-style-type: none"> correlate changes in water clarity to changes in property values, willingness to pay, etc. 	<ul style="list-style-type: none"> Limited impact data on NH property-values from "An Hedonic Analysis of the Effects of Lake Water Clarity on New Hampshire Lakefront Properties," and "The Influence of Water Clarity on Marginal Prices for Residential Lakefront Property in New Hampshire," Gibbs et al, May / June 2000. ME data from "Great Ponds Play an Integral Role in Maine's Economy," Boyle et al., April 1997.
alternative land development patterns	<ul style="list-style-type: none"> correlate changes in water clarity, tax revenues, public expenditures, and economic spin-off effects under different development scenarios. 	<ul style="list-style-type: none"> Limited impact data for NH from "An Economic and Environmental Evaluation of Alternative Land Development Around New Hampshire Lakes," Andrews et al., March 1978.
increases in participation rates / crowding	<ul style="list-style-type: none"> correlate changes in participation rates to changes in water clarity, noise, etc. 	<ul style="list-style-type: none"> Data on NH residents from "New Hampshire Public Access Needs Assessment Statewide Summary Report," NH Fish and Game, October 1998.

**TABLE 3
USES AND SCENARIOS TO INCLUDE IN A PHASE II STUDY AND A PHYSE III STUDY**

	Phase II (no primary research)	Phase III (primary research)
USE - Economic Activity		
Recreation		
Aggregated		
all visitors / all uses		
Disaggregated		
swimming		
fishing - open water and ice OR		
fishing - freshwater (vs. saltwater)		
boating - motorized and non-motorized		
hunting - waterfowl OR		
hunting - big and small game, migratory bird, other		
wildlife watching		
snowmobiling		
walking/hiking		
camping		
beaches (e.g., sitting, picnicking)		
sight-seeing		
Non-Recreation		
lakefront property owners (e.g., taxes)		
public drinking water supplies		
private drinking water supplies		
agricultural (e.g., irrigation)		
commercial (e.g., special events, filming)		
industrial (e.g., manufacturing, shipping)		
youth camps on lakes (attendance and related visits)		
USE - Net Economic Value		
Aesthetic/Spiritual/Cultural		
net economic value		
crowding / safety / noise		
existence / bequest / altruism		
quality of life / economic growth / business location		
SCENARIO		
Static Assessment Scenarios		
Impact Assessment Scenarios		
changes in water quality / clarity		
alternative land development patterns		
increases in participation rates / crowding		

Table 4
Phase II - Estimation of the Economic Value of Surface Water in New Hampshire
Estimated Timeline and Budget

GCG Staff	Discounted Hourly Rates
Lisa Shapiro, Ph.D.	\$140
Heidi Kroll	\$90
Susan Paschell	\$70
Eric Anderson	\$45

	Estimated Completion Date*	Estimated Budget
Phase II Tasks		
Task A - Gather, Analyze and Calibrate Data on Swimming, Fishing and Boating		
• Primary research	September 2002	\$2,870
• Secondary research	September 2002	\$4,130
Task B - Gather, Analyze and Calibrate Data on Waterfront Properties		
• Primary research	September 2002	\$2,870
• Secondary research	September 2002	\$3,160
Task C - Gather, Analyze and Calibrate Data on Public Water Utilities		
• Primary research	September 2002	\$2,870
• Secondary research	September 2002	\$3,160
Task D - Run the Implan Model	October 2002	\$3,580
Task E - Draft, Present and Finalize Phase II Report	<u>November 2002</u>	<u>\$4,210</u>
Total Professional Services		\$26,850
Phase II Expenses		
Modeling software		\$725
<u>Other out-of-pocket expenses</u> (CAPPED)		<u>\$600</u>
Total Expenses		\$1,325
Total Phase II Budget**		\$28,175

* Assumes that Phase II starts in November 2001.

** Does not include production costs, NHLA overhead, or other in-kind support from stakeholder groups. Task budgets may be adjusted one to the other, but in no case can the total budget exceed the price limitation.