DRAFT

Proposal to the Ecosystem Objectives Work Group

c/o Paul Bertram
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 West Jackson Blvd.
Chicago, IL 60604

Amount Requested: $40,293

MEASUREMENT OF STEWARDSHIP INDICATORS IN THE LAKE ONTARIO ECOSYSTEM

Produced for the

Lake Ontario Responsible Stewardship Subcommittee

of the Bi-National Ecosystems Objectives Work Group

by

Barbara Knuth with assistance from Lester Milbrath, Janet Hatcher Roberts, Jennifer Rae, and members of the Stewardship Subcommittee

Principal Investigator:

Barbara A. Knuth, Cornell University

March 1993

MEASUREMENT OF STEWARDSHIP INDICATORS IN THE LAKE ONTARIO ECOSYSTEM

I. BACKGROUND

Ecosystem Objective for Stewardship

The Ecosystem Objectives Work Group developed a goal and objective related to Lake Ontario Stewardship. The goal is that "we as a society shall recognize our capacity to cause great changes in the ecosystem and we shall conduct our activities with responsible stewardship for the Lake Ontario basin." The stewardship objective is that "human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship." The goal and objective imply important indicators will include measures of (a) the extent to which members of society are aware of, and accept responsibility for, the ecosystem effects caused by human activities; (b) the type and extent of adoption of certain ethical environmental beliefs held by decision-makers (individuals and groups in government and non-government spheres); (c) human activities that may reflect stewardship; and (d) commitment to stewardship. We recognize that stewardship commitment may be different than actual behavior (human activities). That phenomenon is discussed below.

The ability of the Parties (governments) to meet the set of Lake Ontario ecosystem goals and objectives depends to a large degree on development of common understandings and partnerships between the Parties and the publics they serve. The proposed Stewardship Indicators Survey Project will assist the Parties in monitoring progress toward widespread stewardship ethics and behavior in the Basin, and progress toward partnerships and common understandings between Party representatives and the citizens of the Basin.

Without a citizenry that has adopted a responsible stewardship ethic, political, financial, and institutional support for programs implementing the Lake Ontario Toxics Management Plan and the Lake Ontario Lakewide Management Plan will not exist. It is critical that the Four Parties understand (and do not just assume they understand) the current environmental ethic of Basin citizens.

The Stewardship Indicators Survey will provide measurement of consequential, socially- and politically-relevant indicators. How these indicators change over time will be a powerful assessment of the success of efforts of the Four Parties to achieve ecosystem management in the Lake Ontario Basin. The Stewardship Indicators Survey will also assess the accuracy of perceptions held by the Four Parties about the environmental attitudes and behaviors of citizens in the Basin and about the attitudes and approaches of key leaders in various sectors. The goal of the Four Parties should be to achieve over time a match between their perceptions of citizen attitudes and behavior and actual attitudes and behavior. Without such an understanding, the Parties may be making policy that cannot be implemented for lack of support, or that may be weaker than would have been supported, or that may be in conflict with the citizens for whom they are supposed to be working.

This proposal contains four major sections. First, stewardship is defined and reasons for a survey measurement approach are discussed. Second, the four indicators to be developed and measured as part of this project are described in terms of content and meaning for agencies, and linkages to other proposed indicators of the EOWG

Stewardship Subcommittee are explained. Third, a budget and means of developing the measures for the four indicators is proposed. Fourth, a budget and detailed methods for conducting a survey to measure the baseline values for these indicators for the Lake Ontario Basin are included. Through this proposal, funding is sought to support the activities described in Section III only. Potential future activities described in Section IV, including a draft budget, are included to portray the full context of stewardship indicator development (Section III) and measurement (Section IV).

Defining Stewardship

What is stewardship? It is the moral obligation to care for something and undertaking the behavior necessary to provide the care. Behavior that accidentally supports something would not be thought of as stewardship unless the person undertaking the behavior felt obliged (responsible) to do the caring thing. Conversely, feeling the obligation to care but not doing anything to provide the care would not be thought of as responsible stewardship.

Stewardship (or the lack of it) is a moral activity that only humans undertake. Humans are responsible for much of the degradation of the Lake Ontario ecosystem. Only they can remember the past and foresee the future and thus are equipped to imagine, plan, carry out, and evaluate stewardship activities. Other creatures devastate ecosystems at times (usually by reproducing at epidemic rates), but we never "blame" them, nor do we expect them to have the foresight or stewardship that would allow them to correct the damage they caused.

It is now obvious that humans have greatly degraded the Lake Ontario ecosystem and, if it is to be restored to higher integrity, humans must take responsibility for carrying out remedial action programs and for insuring that its ecosystem is maintained with high integrity far into the future.

How can stewardship be measured? The moral obligation part of the phenomenon is "in the head" and can only be inferred from verbal or nonverbal behavior observed by the researcher. Although researchers can observe nonverbal behavior that might be stewardship, it is still necessary to infer whether it is accidental or the result of purposeful care. If it is not purposeful care, it is not stewardship.

What is the best (most valid) basis for making inferences of stewardship? Researchers typically infer what is occurring "in the head" from seeing how persons respond to questions put to them by the researcher, or they observe nonverbal behavior believed to be relevant (e.g., expenditures, votes, programs, political action) and make inferences about the meaning of the behavior. Which evidence is best?

Evaluating Validity of Inferences

Inferences about the way people think, value, and behave are unavoidable. It is impossible to interact with other people or think about public policy without using such inferences. Regrettably, many people carry such inferences as background assumptions and do not raise them to consciousness for careful examination. It is sometimes said that everyone has an implicit theory of social change. Every decision about a contemplated political action, even the decision not to be active, is based in a person's operative theory of social change. A first step in our discourse, then, is to raise our implicit assumptions, our theories of social change, to full consciousness so they can be scrutinized for validity.

As we evaluate the validity of inferences, two general rules should be kept in mind. First, keep the inferences as short as possible; each additional step in the inference adds error. Second, beware of unspoken (and unanalyzed) assumptions that play a role in the inference; such assumptions must be analyzed for validity.

For example, it is often said that what people do is a better guide to what they think (believe, value) than what they say. Is it? This assumption may have some validity when applied to a candidate for public office who you believe is telling people what he thinks they wish him to say in order to win their votes. It may also be relevant for concepts or views that society highly proscribes or honors. For example, very few people today will readily declare, in private or public, that they are racist or anti-environmental. These barriers to being candid, however, are special circumstances that do not apply to many contexts in which people express their values and beliefs.

We can tease out a better understanding of validity of inferences by examining a case that is central for our concern. Most survey studies of environmental thinking report that a high percentage of people express deep and sustained concern about environmental problems, yet these same studies also report that most of these people take no overt action to improve the environment. How do we resolve this seeming contradiction? One possible interpretation is that people do not really mean what they say. Another is that people do mean what they say but an additional set of factors shape what they do. What could those additional factors be?

Action carries time, effort, and money costs that are far greater than expressing an opinion. These costs bring other values into consideration such as needing to rest to relieve fatigue, spending time with one's family, giving time to other causes, having other purposes for one's money, and so forth. A belief that one does not have the proper skills (typically verbal skills and appropriate information) is also a considerable barrier to action. Being at ease socially is nearly a prerequisite for political action. A person with concern may also believe that her government does not respond to her action; therefore, why waste energy, money, and time on something that will not result in change? Finally, occasions for action (a meeting, a public hearing, etc.) are episodic and often not very visible to the average person; people cannot take action if they do not cognize the possibility.

Given all these confounding influences on behavior, it is obvious that feeling concern is only one of the possible antecedent factors determining if, when, and how people act. It is much more straightforward to recognize that concern is one thing and behavior is another and that they are loosely linked. The antecedents of behavior constitute a very complex set that is seldom possible to thoroughly explore in a study.

Tracing back from observed non-verbal behavior (especially the lack of it) to infer concern (or lack of it) involves a complex chain of reasoning and indefensible assumptions. Asking people if they are concerned leads to a much more parsimonious and defensible inference of concern.

A similar critique can be made of inferences about value when only economic behavior is observed (e.g., inferring the value of a park from people's expenditures to get there). Many people have recently sent money to a campaign to preserve the Arctic National Wildlife Refuge in Alaska where the U.S. DOE would like to drill for oil; surely most of them have no intention of ever going there. Should we infer that those who gave money highly valued the refuge and that it was their main motive? Should we infer that those who did not give money to fight DOE have no value for the refuge?

As another example, fighting for the preservation of the ozone layer is a struggle for a public good. Should we infer that those who do not join the struggle have no value for having an ozone layer? A much more defensible way to measure value is to simply ask people if they value something and to indicate the strength of their value. When values are clearly in conflict, it is possible to ask people to trade them off and thereby obtain an indication as to how values compare in strength.

If survey studies provide insightful information for inferring what is going on in people's heads, why is there so much resistance to them? For example, one frequently hears politicians or reporters saying that they really do not trust polls. Persons who disparage polls, however, cannot avoid making some assumptions about how people think, value, and behave if they are trying to understand or to influence political activity and public policy. Therefore, they are leaving unsaid, and probably unexamined, the assumptions that they use for making their inferences. They are using even shakier evidence for inferences than the evidence they could draw from polling data. We suspect people disparage polls because they have not examined their own hidden assumptions that guide their personal interpretation of the way the world works.

II. Stewardship Indicators: Concepts and Operationalization

Information needs for successful Lake Ontario ecosystem management that can be met through this project include: identification of factors that motivate stewardship; identification and measurement of actions that reflect stewardship; assessment of intentions to take stewardship actions; and assessment of barriers that prevent stewardship. Perceived barriers are important to identify, so we can interpret why stewardship intentions are not always carried out (and to counter arguments that "people do not care"), and offer suggestions as to how barriers to stewardship might be removed or lessened.

The four stewardship indicators are, therefore: **(1) stewardship motivators; (2) stewardship intentions; (3) stewardship behavior; and (4) stewardship barriers.** Each of these indicators will be measured on a **1 to 10 point scale**. Techniques must be developed, however, to be able to measure each of these indicators meaningfully on such a scale, as described below in Section III. The "acceptable endpoints" on these scales will be approaching a value of 10 for indicators of stewardship motivators, intentions, and behavior, and approaching a value of 0 for the barriers indicator. Separate values will be reported for three groups (described in detail in Section IV): citizens, key leaders, and government.

The stewardship motivators indicator will be derived from several measures relating to normative values and beliefs, perceived responsibilities to future generations, personal concern, and perceptions about ecosystem relationships. The stewardship intentions indicator will be derived from several measures relating to what people seek and are willing to do to fulfill their stewardship responsibilities. The stewardship behavior indicator will be derived from several measures relating to what people are doing (and how often) to fulfill their stewardship responsibilities. The stewardship barriers indicator will be derived from several measures relating to why personal behaviors do not equal intentions. When measurement of these indicators is actually conducted, analsyis of sociodemographic influences on each indicator will be included.

Meaning for Agencies. The stewardship objective is that "human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship." In an April, 1992 memo, J. O'Connor noted that "stewardship

indicators can be expected to evoke action through clarifying unacceptable disparities between where we are and where we want to be, thereby prompting change in both public policy and actions of the entire Basin community." In order to work towards the stewardship objective, we therefore need to have indicators of **human activities** (stewardship behavior), **environmental ethics** (stewardship motivators), and **commitment to responsible stewardship** (stewardship intentions). If any of these indicators are less than the acceptable endpoint, **barriers** must be identified that stand in the way of attaining these objectives (stewardship barriers). Research and theory on human behavior indicates that behavior is linked fundamentally to intentions, motivators, and barriers. If agencies seek to influence behavior, they need to understand what causes Lake Ontario stewardship behavior, identify which of these forces they can influence, and then take actions to influence behavior (directly) or its related elements.

Bertram and Reynoldson (1992) noted that ecosystem objectives "should be incorporated not only into agency programs but into public expectations." Thus, it becomes critical for public policymakers at all levels (not just the 4 Parties) and for key citizen leaders and teachers to have an understanding of the stewardship intentions, motivators, barriers, and resulting behaviors of the Lake Ontario citizenry. Without such an understanding by the 4 Parties, agencies will be ineffective working with and responding to the needs of the citizenry with which they seek to develop partnerships. Without such an understanding by other government and citizen leaders, it will be difficult for the 4 Parties to enlist the assistance that will be needed to foster long-term stewardship by the Basin's citizenry. As described in Section IV, a component of the measurement phase will include identifying disparities between public perceptions and key leader beliefs about public perceptions. Disparities between these two elements would demonstrate the need for improved understanding and partnerships (that will enable more effective collaboration) between the Parties and the public.

Bertram and Reynoldson (1992) noted that the entire EOWG guiding principle demands that "no activity of our present society will impair the use and enjoyment of Lake Ontario by future generations." How will this be possible to ensure if the 4 Parties do not work toward understanding and fostering desirable stewardship intentions and behaviors among the citizens of the Basin (our "present society")?

Bertram and Reynoldson (1992) concluded their article by stating that "because the critical role of public participation has been recognized and is being used during the development of both the ecosystem objectives and the environmental management plans, public support for these programs and expectations for achieving the ecosystem objectives <u>should</u> (emphasis added) remain high." It is naive for the 4 Parties to assume that simply because they are using what they consider to be adequate public participation that public support in fact is or will remain high. A rigorous assessment and continual monitoring of public support and stewardship is needed to identify if the 4 Parties need to make changes in their policies and actions.

Relationship to Other Stewardship Indicators. The EOWG Stewardship Subcommittee began with a set of 18 potential indicators and is now discussing a subset of those for final adoption. The four indicators proposed here encompass or complement several of the other indicators being discussed for adoption as described below. Several of the other subcommittee indicators are subsets of the four indicators described in this proposal, and some can be measured as part of the survey project described in Sections III and IV (Figure 1).

Figure 1. Matrix of proposed stewardship indicators and measurement techniques. (BK)= Barbara Knuth indicator as outlined in proposal; (C) = committee indicator. Prepared by M. Gadova and L. New.

Indicators	*Measurement other than Knuth Questionnaire*	*Knuth Questionnaire*
Motivators (BK)		X
Intentions (BK)		X
Behavior (BK)		X
* Effective interactions with public, government, industry (C)	Atlantic States Legal Foundation's (ASLF) assessment of attendance and FOIL requests	X
* Corporate Volunteerism (C)	Number of volunteer programs ◄---sub survey--	---------- X
* Environmental Volunteerism (C)	Sally Lerner's survey ◄-----sub survey----------	---------- X
* Other sub-indicators (C)		X
* Other sub-indicators (BK)		X
Barriers (BK)		X
TRI Data (C)	ASLF's assessment of permits	
Toxicant Loss (C)	Toxicant loss analysis	

(1) Effectiveness of Interactions Among the Public, Industry, and Governments -- This proposed subcommittee indicator falls within the "Stewardship Behavior" indicator in this proposal. As discussed by the subcommittee, Atlantic States Legal Foundation would have primary responsibility for developing the measurement for this indicator under terms of the Foundation's "Lake Ontario Ecosystem Stewardship Project" Grant Agreement with U.S.E.P.A. Region II(and possibly implementing the measurement activity), but complementary concepts would be included in the development of the measurement for the Stewardship Behavior indicator in this proposal (Figure 1).

(2) Corporate Volunteerism -- This proposed subcommittee indicator falls within the "Stewardship Behavior" indicator in this proposal. In addition to the number of volunteer programs proposed as a measurement during subcommittee discussions, a subsurvey in this project focusing on "key leaders" (described in Section IV) could measure extent of and types of specific involvement (Figure 1).

(3) Environmental Volunteerism by the Public -- This proposed subcommittee indicator falls within the "Stewardship Behavior" indicator in this proposal. In addition to the inventory work proposed by S. Lerner, a subsurvey of volunteer groups could be included in this project to help understand the meaning behind any fluctuations in numbers of volunteers (Figure 1).

(4) Toxics Inventory (TRI data) -- This proposed subcommittee indicator is not related to the proposed project (Figure 1).

(5) Toxicant Loss from Manufactured Products -- This proposed subcommittee indicator is not related to the proposed project (Figure 1).

Components of Proposed Stewardship Indicators

Each of the four stewardship indicators proposed for this project (motivators, intentions, behavior, barriers) would be quantified based on an aggregation of specific sub-indicator measurements, as outlined below. The quantitative endpoints of most of the specific subindicators will be either the percent of the population responding positively to a certain concept, or a mean score for the entire population or a specific subpopulation. An example of a "percent" endpoint is the percent of the population of the Lake Ontario Basin that believes Lake Ontario is important or very important for their future welfare (see Milbrath, 1984). An example of a "mean score" endpoint is the mean score (on a scale of 1 to 7) for a question such as "What is your responsibility to improve the quality of the Lake Ontario region?", with 1 = no responsibility and 7 = very great responsibility (see Milbrath, 1984). Reference values may not exist for many of the subindicators, but target values could be identified for each (e.g., 0% or 100% depending on the item; mean score above scale midpoint, or above the third quarter, etc.). Agreement on appropriate target values should be reached through discussion between representatives of the Four Parties. Specific subindicators would be combined into an overall indicator, with corresponding changes in the interpretation of endpoints (e.g., Dunlap and Van Liere, 1978). Development of the complete list of subindicators that would be measured to derive the four major indicators will take time and discussion and will be done as part of the project to be funded (Section III).

(1) Stewardship Motivators. Subindicators include (a) values and normative beliefs placed on personal and family health, ecosytem health, and natural vs. artificial systems; (b) perceived responsibilities to be stewards; (c) perceived responsibilities to future generations; (d) potential benefits from the Lake Ontario ecosystem; (e) knowledge and perceptions about the quality of the environment and the current condition of Lake Ontario and the ecosystem, uses of Lake Ontario, and risks and problems associated with Lake Ontario; (f) personal concern that something be done to restore the Lake; (g) relative importance of restoring environmental quality compared to other concerns including economic well-being; (h) perception about the relationship of the Lake Ontario ecosystem quality to stewardship behavior, and the relationship of global biospheric problems to Lake Ontario; and (i) information sources used to learn about Lake Ontario. For this indicator, it will be desirable to analyze progress toward the target by subpopulations (e.g., persons age 35 or under).

Example subindicators:

1. Extent to which people believe they are an integral part of the Lake Ontario ecosystem, rather than apart from it, measured on a 7-point scale. Target value will be determined (e.g., mean scale score of 7).

2. Extent to which people hold the view of the dominant social paradigm (Dunlap and Van Liere, 1978) that society depends upon unfettered environmental exploitation, measured on a 4-point scale with 12 separate items for a total possible score of 12 (holding this view) to 48 (opposing this view). Target value will be determined (e.g., mean composite scale score of 48).

3. Extent to which people score correctly on knowledge questions related to the types and potential negative effects (e.g., on human health, on wildlife) of anthropogenic chemicals in the Lake Ontario ecosystem (e.g., Connelly et al., 1992)

(2) Stewardship Intentions. Subindicators include (a) what people would like to do to fulfill their stewardship responsibilities; and (b) people's willingness to devote money, time, political support, and share jurisdictional authority for improving and managing the Lake Ontario ecosystem.

Example subindicators:

1. Extent to which people are willing to stop buying products that are especially harmful environmentally (e.g., Maloney et al., 1975). Target value to be determined.

2. Extent to which people are willing to pay a "pollution tax" to aid environmental remediation activities or limit future pollution (e.g., Maloney et al., 1975). Target value to be determined.

3. Extent to which people are willing to participate in beach cleanups. Target value to be determined.

(3) Stewardship Behavior. Subindicators include analysis of (a) what people are doing to fulfill their stewardship responsibilities; and (b) how often they are taking these actions. Topics may include consumption levels, waste disposal, land use activities, and ways in which people use the Lake. Other subindicators include those

noted above related to proposed subcommittee indicators (effective interactions, corporate volunteerism, and environmental volunteerism).

Example subindicators:

1. Extent to which people purchase given products specifically because they have a lower-polluting effect (e.g., Maloney et al., 1975). Target value to be determined.

2. Level of care in disposal of hazardous materials (e.g., used motor oil, antifreeze, pesticides). Target value to be determined.

3. Membership statistics for selected environmentally-oriented organizations throughout the Lake Ontario Basin. Target numbers or percent of population to be determined.

4. Extent to which people keep track of their elected representatives' voting records on environmental issues (e.g., Maloney et al., 1975). Target mean score or percent of population to be determined.

(4) Barriers to Stewardship. This set of subindicators involves analysis of perceived reasons why personal behaviors do not equal intentions, i.e., what specifically prevents people from carrying out their intentions. Barriers include sociodemographic and economic characteristics, knowledge of stewardship and the Lake Ontario ecosystem, and other elements from each of the other major components of the study. Other barriers may include elements such as perceived access to decision-making structures and processes.

Example subindicators:

1. To help illustrate the concept of barriers, note that the Human Health Subcommittee has proposed developing a Public Perception Indicator that could be incorporated into the Stewardship study. The Health Subcommittee's purpose was to "gauge if people are not using certain resources because of perceived health risks." An example of one of the human health perception subindicators proposed was the extent to which people keep and eat the fish they catch from Lake Ontario. Considering the barriers to fish consumption that might exist, however, a more indicative subindicator might be a comparison of what people actually eat versus what people would like to be eating if contaminants in the system were not a problem. The target for such a subindicator would be a 1:1 ratio.

2. Extent to which people know where the water (and wastes) in their local sewer and drainage systems ultimately travel. Target value to be determined.

3. Extent to which people perceive they have access to information and persons with authority to make and implement changes in government at all levels. Perceived low access will be indicative of a barrier to stewardship.

(5) Sociodemographic and Economic Characteristics. These data should be collected as part of the Stewardship Survey Project for purposes of analysis, and

include employment, family status, length of residence in community, regional mobility, age, gender, education, etc. Format for gathering these data will be coordinated for comparability with U.S. and Canadian statistics.

III. Developing Measures to Calculate the Four Indicators

As described in Section IV, a mail survey would be the primary technique for measuring the four indicators. In an April, 1992 memo, J. O'Connor summarized the criteria expressed by the Subcommittee as important for judging the indicators. These criteria included: (1) must be scientifically defensible; (2) must be quantitative; and (3) must provide information useful to environmental managers/policymakers and the public.

To be scientifically defensible, measures for calculating these four indicators should be based on a solid and rigorous review and synthesis of literature (theory and empirical studies) on measures of environmental stewardship. Second, the measurements for the four indicators should reflect items of importance to environmental managers/policymakers and the public. To meet these criteria, a thorough review of the literature will be necessary to ensure these indicators are based on well-grounded measurements, possibly with the potential for comparison to other geographic locations or demographic groups. As discussed at the November subcommittee meeting, a pilot test of a draft survey instrument would be necessary to guarantee that the measurements will provide the desired indicators. To ensure the indicators provide useful information to environmental managers/ policymakers and the public, these groups would be invited to review draft survey instruments. The draft budget below reflects the costs involved with literature review; draft questionnaire development, review, and revision; implementation of the pilot survey based on an approximate 400 sample size distributed between "public" and "leaders" as described in Section IV; and final revision of the survey instrument so that it would be ready to implement under the activities and budget proposed in Section IV. Travel is not included in this budget, but it is assumed necessary travel would be supported by the EOWG.

Draft Budget. These figures are draft (1993) U.S. dollars for discussion purposes only until this proposal is submitted officially through Cornell University. The proposed project time period is July, 1993 - September, 1994).

Salaries	
Principal Investigator (10% time over 15 months)	$ 6,562
Research Support Specialist (25% time over 15 months)	9,375
Research Aide	2,500
Administrative Assistant	1,500
Total Salary	19,937
Fringe Benefits (36%)	7,177
Supplies, including postage	2,500
Printing and photocopying	1,000
Telephone	500

Total Direct Costs	31,114
Indirect Costs (59%)	18,357
TOTAL COSTS	49,471
Proposed Cornell Cost-share, of half of Indirect Costs	9,178
TOTAL REQUESTED	40,293

IV. Survey Design and Implementation: Measuring the Four Indicators' Baseline (Current) Values

The development of indicator measures and a survey instrument described in Section III would serve as the basis for the implementation of indicator measurement. We propose this project be conducted through the Human Dimensions Research Unit in the Department of Natural Resources at Cornell University. The University has the capability to conduct this research, and the Human Dimensions Research Unit (HDRU) is known nationally for social science research on environmental and natural resource issues.

The general approach will involve a set of mail surveys, following the standard operating procedures of the HDRU. This approach includes a 4-wave mailing (cover letter and questionnaire; reminder letter; reminder letter and replacement questionnaire; reminder letter) and a telephone survey with a sample of nonrespondents from the mail survey (if needed). This approach may be modified for some of the target populations. For example, to reach the sample of key leaders from the Lake Ontario policy community, wave 1 may consist of a facsimile sent to the leader, with wave 2 following with a letter and questionnaire.

Two major sampling approaches will be needed, one to sample the general public audiences, the other to sample key leaders in federal, state, and local governments, the business community, environmental organizations, education, and research institutions. A general public sample will be purchased (e.g., Survey Sampling, Inc.). A list of key leaders will be compiled with assistance from selected informants (e.g., Niagara Institute, environmental consultants). The sample will be of sufficient size to ensure completed replies from 1,000 public respondents on each side of the border (1,000 in New York; 1,000 in Ontario) who live in the basin. In addition, we will sample nongovernment key leaders on each side of the border in the following categories, aiming for completed replies as follows (note that some of these groups are necessary for the "subsurveys" described in Figure 1 as a complement to the proposed subcommittee indicators): 200 business leaders from each side (e.g., manufacturing industries, chambers of commerce), 200 environmental leaders from each side, 200 scientists from each side, and 200 educators from each side. We will sample government leaders on each side of the border in the following categories, aiming for completed replies as follows: 100 elected local on each side, 100 appointed local on each side, 100 elected county on each side, 100 appointed county on each side, 100 elected state/provincial on each side, 100 appointed state/provincial on each side, 100 federal on each side (i.e., 700 government leaders from each side). The total final target of respondents would be 2,500 on each side (5,000 total). To achieve that number of completed replies, we will have to draw a sample of about 8,330 people

who would be asked to participate (assuming an approximate 60% response rate overall).

To develop the sample, we will define the Lake Ontario ecosystem of interest to include "any political jurisdiction that is 1/2 or more in the Lake Ontario watershed, including the Niagara River watershed." This description defines our sampling frame.

Each of the sampled respondents will be contacted with the standard mail survey techniques noted earlier. Key leaders are an important part of this study. They will be asked, similar to general public participants, to respond to the stewardship indicators survey from their own perspective to allow assessment of stewardship by key leaders. In addition, however, key leaders will be asked to indicate how they believe the public will respond to key questions from the stewardship survey. With this information, we will be able to identify discrepancies that exist between public opinions and the perceptions of public opinion held by leaders in the Lake Ontario policy community. For logistical reasons, we will likely place these questions (perceptions of public opinion) immediately following the corresponding questions about the key leader's opinion.

Because of the binational and multiple agency involvement in the Stewardship Indicators project, we emphasize the importance of clear, close, and frequent communications with governments and sponsors at all stages of the Stewardship Study. We will build into the project timeline and study design collaborative development and review of draft survey instruments, development of data analysis plans, data interpretation, report writing, and information dissemination.

The budget figures below are draft (1993 U.S. dollars), for discussion purposes only, and are based on assumptions that the research project will be conducted through Cornell University. Other assumptions include a sample size of 8,300, time needed for coordinated interagency review of survey instruments and draft reports, and assistance with sample selection. The anticipated timeframe for this project would be 1.5 years.

Salaries	
Principal Investigator	$ 7,000
Research Support Specialist	10,000
Research Aide	12,000
Administrative Assistant	6,000
Total Salaries	35,000
Fringe Benefits (36%)	12,600
Purchase of sample	2,000
Supplies (cover stock, paper, envelopes, postage, etc.)	14,400
Printing and photocopying	7,200
Computer expenses	3,000
Telephone	5,000
Travel	3,500

Total Direct Costs	82,700
Indirect Costs (59%)	48,793
TOTAL COSTS	$131,493

V. Literature Cited

Bertram, P.E. and T.B. Reynoldson. 1992. Developing ecosystem objectives for the Great Lakes: policy, progress, and public participation. Journal of Aquatic Ecosystem Health. 1:89-95.

Connelly, N.A., B.A. Knuth, and C.A. Bisogni. 1992. Effects of the health advisory and advisory changes on fishing habits and fish consumption in New York sport fisheries. HDRU Series No. 92-9. Department of Natural Resources, Cornell University. Ithaca, NY. 120 pp.

Dunlap, R.E. and K.D. Van Liere. 1978. The New Environmental Paradigm: a proposed measuring instrument and preliminary results. Journal of Environmental Education. 9:10-19.

Gigliotti, L. 1990. Survey instrument: Cornell University environmental attitudes study. Human Dimensions Research Unit, Department of Natural Resources, Cornell University. Ithaca, NY.

Knuth, B.A. and L.A. Nielsen. 1989. Social and institutional performance indicators for wildlife and fishery management systems. Society and Natural Resources. 2:329-244.

Maloney, M.P., M.P. Ward, and G.N. Braucht. 1975. A revised scale for the measurement of ecological attitudes and knowledge. American Psychologist. July: 787-790.

Milbrath, L.W. 1984. A survey of the beliefs and values that people living on each side of the Niagara Frontier hold about the Great Lakes. University at Buffalo, Buffalo, NY. manuscript.