THE
HEINZ
CENTER

April 15, 2003

Dear Colleague,

We are writing to request your participation in a survey dealing with data gaps in our nation's environmental monitoring programs. The survey is designed to reveal the priorities that policy makers inside and outside government should place on filling a large number of data gaps highlighted by the 2002 Report, *The State of the Nation's Ecosystems.* What follows in this package is an introduction to the survey and the survey itself.

Depending on how much of the survey you choose to complete and how familiar you are with the indicators in the 2002 Report, it may require an hour or more to complete the survey. We realize that this is a huge sacrifice to make in your schedule, however, your contribution to this process is vitally important.

Please contact either of us if we can help resolve any confusion (202.737.6307, or by email: bares@heinzctr.org and omalley@heinzctr.org).

Please feel free to share this survey with your colleagues. Additional copies can be downloaded from www.heinzctr.org/ecosystems/survey.pdf, or obtained by contacting Elly Rivera (202.737.6307, or rivera@heinzctr.org).

We would be grateful for your reply by May 27th, and we sincerely hope that you will take the time to move this important national initiative forward!

Best regards,

Kent Cavender-Bares
Fellow

Robin O'Malley
Senior Fellow and Project Director

THE H. JOHN HEINZ III CENTER FOR SCIENCE, ECONOMICS AND THE ENVIRONMENT
1001 Pennsylvania Avenue, N.W., Suite 735 South, Washington, D.C. 20004
Telephone (202) 737-6307 Fax (202) 737-6410 www.heinzctr.org

INTRODUCTION

The recently released Heinz Center report, *The State of the Nation's Ecosystems*, identified 103 indicators that can be used to describe the condition and use of the various ecosystem types in the United States. The report is a major step toward non-partisan, credible, and sustained reporting that has the potential to become the common ground in many debates about the environment. Interestingly, a primary outcome of this report is that it highlights the extensive gaps in our ability to characterize the environment in the ways described by these indicators.

Thirty-three of the indicators had an adequate amount of data available to be "fully reported." To be included in this group, it was necessary for data to represent the country as a whole rather than just a particular region, to be of high quality, and to come from a program or programs that were expected to continue producing similar data. For 25 of the indicators, only some of the needed data were adequate for national reporting, and major gaps existed in the available data for 31 of the indicators. Overall, partial or complete data gaps existed for 56 of the 103 indicators—these indicators are the target of this survey.

Note that in order to have an evaluation of available data, it was necessary for the indicator to have been clearly defined. However, the expert panels could not come to agreement on the specifics for 14 of the 103 indicators. These indicators need to be further refined before it will be possible to make statements about data availability that are as explicit or detailed as those for well-defined indicators.

The Predicament

The Heinz Center report has set the stage for a discussion to answer the question: *what should be the national priorities for filling the most important data gaps in our environmental monitoring efforts?* It is an underlying assumption of the Center report that all of the identified data gaps are *important*—however, at some point we as a society need to decide which of these gaps should be filled first. That is, which of the gaps represent the most pressing national priority? Or, alternatively, where should limited funds be spent first on strengthening our ecosystem monitoring and reporting infrastructure?

A Two-Part Solution: Evaluation of Costs and Priorities

The Heinz Center process has been as even-handed as possible, involving individuals from businesses, environmental organizations, universities and museums, and federal, state and local governments. Thus, the report represents the voices of a wide cross section of society. In other words, the collection of 103 indicators can be viewed as those indicators most important to *all* of society collectively, rather than those important to any one segment of society. Of course, any particular indicator may not be of great importance to everyone; there will be indicators of particular importance to some groups that are of little importance to others. The end result, however, is a suite of indicators that, on the whole, meets the needs of as many perspectives or values in society as possible.

It is critical that the process of paring down the list to a set of "priority data gaps" be grounded in the same even-handed approach taken in the development of *The State of the Nation's Ecosystems*. Thus, the Heinz Center is distributing this survey widely to ensure opinions from a broad range of interests, including—as with the report itself—businesses, environmental organizations, academia, and government. ***Your response is very important to ensuring a balanced view of priorities for collecting and reporting data.***

Priorities identified from this survey will be combined with detailed cost estimates for each of the data gaps for presentation to non-governmental data providers, federal offices and agencies, key committees in Congress, and others.

The Survey

The survey requests your opinion on the priority that should be attached to filling each of the data gaps identified in *The State of the Nation's* Ecosystems, and is organized by ecosystem type. Keep in mind that all of these indicators were selected as part of an extensive process, and that each is considered to be *important* as part of an overall package of indicators and is of particular importance to some key constituencies.

As discussed above, there is an effort underway to determine accurate cost estimates for the various data gaps. We have included very preliminary estimates of the costs. Ideally, we would like you to prioritize the data gaps without considering the cost associated with filling them. However, this may be impractical in all cases, thus we have indicated whether we think a modest cost (e.g., < $100,000) or a major addition to a national data monitoring program will be required. (These initial estimates are very rough, and have not been reviewed by the relevant agencies and data collection organizations; also, we have added question marks in cases where we are particularly uncertain about our classification.)

Thank you very much, in advance, for your assistance on this crucial aspect of *The State of the Nation's Ecosystems* project.

Tell Us About Yourself
(This information will only be used internally.)

Name _____

Affiliation _____

Please return survey to:
Kent Cavender-Bares
The Heinz Center
1001 Pennsylvania Ave., NW
Suite 735 South
Washington, DC 20004

In order to ensure that the results from this survey are as representative as possible, please check the appropriate boxes below.

My line of work is *best* described as (please select only one):

- ❑ government
- ❑ academic
- ❑ environmental non-governmental organization
- ❑ industry/business
- ❑ other, please describe _____

Of the following ecosystem types, my work is *focused* on (check multiple boxes if appropriate):

- ❑ Coasts and Oceans
- ❑ Farmlands
- ❑ Forests
- ❑ Fresh Waters
- ❑ Grasslands & Shrublands
- ❑ Urban & Suburban Areas
- ❑ other, please describe _____

Instructions for Completing the Survey
This survey presents each of the data gaps identified in *The State of the Nation's Ecosystems*. The goal is to identify, from among these high priority indicators that lack data, the ones for which data should be obtained first. Please rank each data gap on a scale of 1 to 5, with 1 being the highest priority meaning that you believe it is very important to obtain data for this indicator. If, for a given data gap/indicator, you prefer not to record an opinion, please select the "NA" box. The example that follows shows how to mark a data gap having a very high priority, although not the highest priority in your opinion.

High PRIORITY Low					
1	X	3	4	5	NA

Feel free to indicate priorities for data gaps that may be outside of your immediate expertise—in fact we encourage you to do this. To distinguish between low priorities (5) and no opinion (NA) and to score your survey fairly, we will score results based on these rules:

- If you rank some indicators and leave some blank within an ecosystem type (including the national core indicators), those that are left blank within that system will be assigned the lowest priority ranking (5).
- If you wish to rank one or two indicators within an ecosystem type but are not confident about ranking the remaining indicators, please enter "NA" marks for those that you have not ranked (NA ranks will not affect the overall average rank of an indicator).
- If you leave all the indicators blank within an ecosystem type (e.g., Farmlands), all of the indicators will be assigned a ranking of "NA."

You may feel strongly that all of the data gaps merit the highest ranking (1), however, keep in mind that the goal of the survey is to discern some differences in priorities. Fiscal constraints will prevent all gaps from being filled initially, so a range of priorities will be critical to informing those who will have to make the hard decisions about which of the gaps to fill first.

How the Results will be Used

You were asked above to list the ecosystem type or types that best describe your area of specialization. The challenge for the Heinz Center will be to elicit roughly equal responses from people who specialize in each of the ecosystem types. As part of any publication of the survey results, we will certainly have to demonstrate the uniformity of responses, or lack thereof, across ecosystem types.

At a minimum, our plan is to report the average priority for a given data gap based first on all respondents and then based only on those who identify themselves as specializing in that particular ecosystem. We will also report statistics on the number of respondents who specialize in the various ecosystems types as well as who work in the various sectors of society (e.g., business/industry, academia, etc.).

Priorities identified from this survey will be combined with detailed cost estimates for each of the data gaps for presentation to non-governmental data providers, federal agencies, key committees in Congress, and others.

Multiple Responses From the Same Organization/Agency

In the hopes of getting good coverage, we have, in some cases, sent surveys to multiple people at a given organization or government agency. Our approach for dealing with potential duplication will develop as the returns come in. Clearly, if the multiple responses reflect different perspectives within the organization (e.g., one person studies farmlands and another forests) we will count them equally. In other cases, where several people all can fairly be described as having the same perspective (e.g., all grassland experts), then we may consult with those respondents to come up with an "average" ranking for that organization or agency that is agreeable to the group of respondents. We will take every effort to make sure that a fair process is used so that final survey results are not biased by a particularly responsive organization or agency!

Description of Your Logic in Filling Out the Survey

It was suggested to us by people in our test audience that we invite respondents to include a short description of the logic used in approaching the survey. In addition, some people felt it was very helpful to read through the entire survey before deciding on an approach. Approaches included high priority for landscape indicators, or species indicators, or low-cost data gaps. If you wish to make comments on your strategy, please use the space following the Table of Contents. Those receiving our final report on data gaps will find common themes on how respondents approached the survey very useful when interpreting the responses.

Comments on Indicators

We would welcome any comments you might have on the indicators. Feel free to jot down comments next to the indicator description or on a separate sheet.

Feel free to recommend the survey to your colleagues

Additional copies of survey can be downloaded from: www.heinzctr.org/ecosystems/survey.pdf
or requested in hard-copy (email: rivera@heinzctr.org; phone: 202.737.6307, ask for Elly)

TABLE OF CONTENTS

System	Page
Data Gaps for the Core National Indicators	5
Data Gaps for the Coasts and Oceans Indicators	8
Data Gaps for the Farmland Indicators	12
Data Gaps for the Forest Indicators	14
Data Gaps for the Freshwater Indicators	16
Data Gaps for the Grasslands and Shrubland Indicators	19
Data Gaps for the Urban and Suburban Indicators	21

Comments on Strategy for Approaching the Survey (or General Comments):

Space for Comments:

DATA GAPS FOR THE CORE NATIONAL INDICATORS

Indicator:	Ecosystem Extent
Required Data:	the extent of brackish water
Estimated Cost:	major expense
Text in 2002 Report:	p. 40 (tech. note p. 207)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Brackish waters were selected for the coasts and oceans ecosystem type because they are extremely productive waters, and their area will change over time depending on freshwater inputs from rivers and runoff. Data needs to include estuaries and coastal waters within bounds of about 1 to 30 parts per thousand (ppt; or PSU; practical salinity units). It may be that data from a variety of state and federal agencies could be used, although they have not yet been merged together.

Indicator:	Chemical Contamination
Estimated Cost:	major expense
Text in 2002 Report:	p. 48 (tech. note p. 210)

A) Required Data: contaminants in the edible portion of freshwater fish tissue

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available on a whole-fish basis and are used to evaluate risks to aquatic life. However, because contaminants are not distributed evenly throughout the fish, it is more appropriate to evaluate contaminant concentrations in those tissues (i.e., filets) that are commonly eaten by humans.

B) Required Data: contaminants in saltwater fish tissue—whole fish, not just the edible portion

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: In order to evaluate the significance of chemical contamination to other aquatic life, it is necessary to have data on the amount of contaminants on a whole-fish basis. These data exist for freshwater fish.

C) Required Data: contaminants in the edible portion of saltwater fish

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: As in the freshwater fish case above (A), it is necessary to evaluate contamination in the edible portion of saltwater fish in order to assess the significance of contamination for humans who eat fish. Note that this indicator is similar to the "Selected Contaminants in Fish and Shellfish" found in the Coasts and Oceans chapter (p. 83), which is also a data gap.

Indicator: At-Risk Native Species
Estimated Cost: major expense
Text in 2002 Report: p. 53[i] (tech. note p. 214)

A) Required Data: trend data

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Considerable conceptual work is needed to develop a framework for collecting and reporting National Heritage data to describe trends. An element of the rankings currently presented has to do with changes in populations over time, however, these are not easily translated into trend information.

B) Required Data: ability to distinguish between species that are naturally rare and those that are declining

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: The current rankings do not fully distinguish between a species that has been found infrequently in the past and in only a few places and is, therefore, "naturally" rare, and a species whose population is declining and is, therefore, less abundant and found in fewer locations than previously.

C) Required Data: ability to distinguish between actual declines and threats

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: The rankings currently found in the Report take into account both measured declines in species abundance and information on the threats to which a particular species is exposed. It is desirable to be able to distinguish these factors, in part because threat assessments may involve larger amounts of professional judgment, and thus may be more open to contention than are assessments of population decline.

D) Required Data: data on marine animals

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator parallels those in many of the other ecosystem types, where the risk category is reported for a variety of species. These risk categories indicate species' relative risk of extinction (i.e., vulnerable, imperiled, or critically imperiled). It is expected that data for marine animals will be considerably easier to obtain than marine plants (see below).

E) Required Data: data on marine plants

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator parallels those in many of the other ecosystem types, where the risk category is reported for a variety of species. These risk categories indicate species' relative risk of extinction (i.e., vulnerable, imperiled, or critically imperiled). The range of marine plants to include is an open question. If it is to include marine algae, this will be an even greater task.

[i] note that this data gap (trends) and the next two (distinguishing between rare and declining; and distinguishing between declines and presumed threats) are also relevant to At-Risk Native Species indicators for Coasts and Oceans (p. 75), Forests (p.124), Fresh Waters (p. 144), and Grasslands and Shrublands (p. 168).

Indicator: Outdoor Recreation
Estimated Cost: less than $100,000
Text in 2002 Report: p. 60 (tech. note p. 217)

A) Required Data: data on running and jogging

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data from the 1995 National Survey on Recreation and the Environment (NSRE) did not have data on recreation participation (i.e., number of times per year) that Americans ran or jogged. To the best of our knowledge, the 2001 NSRE also does not have these data.

B) Required Data: distinction between saltwater and freshwater recreation

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Neither the 1995 NSRE or the 2001 NSRE data provide a separation between activities that occur in saltwater versus freshwater environments. The exception is fishing. Activities requiring a distinction include motor boating, water skiing, sailing, floating, and rowing.

DATA GAPS FOR THE COASTS AND OCEANS INDICATORS

Indicator: Coastal Living Habitats
Estimated Cost: major expense
Text in 2002 Report: p. 69 (tech. note p. 218)

A) Required Data: area of shellfish beds

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator is about habitat that is created by other organisms. In this case, shellfish beds that are no longer living still provide valuable habitat. Thus, the area of both living and non-living shellfish beds is needed. The National Shellfish Register is an obvious source of data for this indicator. However, there is concern that changes in area reflected in this report may reflect changes in monitoring effort rather than actual changes in bed area.

B) Required Data: area of seagrasses and other submerged aquatic vegetation

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: For this data gap, the area of seagrass beds and other submerged aquatic vegetation including kelp is required.

C) Required Data: area of coastal vegetated wetlands in remaining regions

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data in the 2002 report reflect only Atlantic and Gulf Coast wetlands. Data is required for remaining areas of the U.S. Coast.

D) Required Data: area of coral reefs

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: The federal interagency Coral Reef Task Force (CRTF) has a plan to map all coral reefs in the United States in the near future. Thus, it is possible that no additional funds will be necessary to collect these data.

Indicator: Shoreline Types
Required Data: data for remaining regions
Estimated Cost: less than $100,000
Text in 2002 Report: p. 70 (tech. note p. 219)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: For the 2002 report, data were extracted from NOAA's Environmental Sensitivity Index (ESI) atlases. As of mid-2002, this extraction had not been done for the North Atlantic, Mid-Atlantic, Gulf of Mexico, Gulf of Alaska, Bering Sea, or Hawaii.

Indicator: Areas with Depleted Oxygen
Required Data: data for entire indicator
Estimated Cost: major expense
Text in 2002 Report: p. 71 (tech. note p. 220)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator is to report the area of coastal waters (including estuaries, and out to 25 miles from the coast) that have oxygen levels in one of several ranges for at least one month (anoxic—no oxygen; hypoxic—less than 2 ppm; low—2 to 4 ppm; adequate—more than 4 ppm). Presumably, measurements would be most critical in bottom waters.

Indicator: Contamination in Bottom Sediments
Estimated Cost: major expense
Text in 2002 Report: p. 72 (tech. note p. 220)

A) Required Data: data in estuaries for remaining regions

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: Data were available for the Mid-Atlantic, South Atlantic, and Gulf of Mexico. Data are needed for one of three categories of potential negative effects from contaminants (possible effects—from 1 to 4 contaminants; possible effects—for 5 or more contaminants; probable effects—for 1 or more contaminants) for the remaining regions: North Atlantic, Pacific Coast, Alaska, and Hawaii.

B) Required Data: data in coastal waters within 25 miles of shore

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: Data were reported for some estuarine areas (see above). Data are also needed for one of three categories of potential negative effects from contaminants (possible effects—1 to 4 contaminants; possible effects—5 or more contaminants; probable effects—1 or more contaminants) for coastal waters to within 25 miles from the coastline.

Indicator: Coastal Erosion
Required Data: data for entire indicator
Estimated Cost: major expense
Text in 2002 Report: p. 73 (tech. note p. 221)

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: Currently, data collection on coastal erosion has primarily been for single-purpose projects. Thus, a large amount of potentially useful data exists, but has never been compiled for national reporting. Data are needed for those coastlines that have erosion management in-place (% of shoreline armored or nourished) and those without management (% of shoreline accreting, stable, or eroding). Beyond data collection, a minor task will be to decide on physical definitions for accreting and eroding shorelines.

Indicator: At-Risk Native Marine Species
Estimated Cost: major expense
Text in 2002 Report: p. 75 (tech. note p. 214)

A) Required Data: data on marine animals

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: This indicator parallels those in many of the other ecosystem types, where the risk category is reported for a variety of species. These risk categories indicate species' relative risk of extinction (i.e., vulnerable, imperiled, or critically imperiled). It is expected that data for marine animals will be considerably easier to obtain than marine plants (see below). SAME AS GAP LISTED IN NATIONAL CORE INDICATOR SECTION—PLEASE SCORE THE SAME IF YOU SCORED THIS GAP IN THE CORE NATIONAL INDICATORS.

B) Required Data: data on marine plants

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: This indicator parallels those in many of the other ecosystem types, where the risk category is reported for a variety of species. These risk categories indicate species' relative risk of extinction (i.e., vulnerable, imperiled, or critically imperiled). The range of marine plants to include is an open question. If it is to include marine algae, this will be an even greater task. SAME AS GAP LISTED IN NATIONAL CORE INDICATOR SECTION—PLEASE SCORE THE SAME IF YOU SCORED THIS GAP IN THE CORE NATIONAL INDICATORS.

Indicator: Unusual Marine Mortalities
Required Data: data on sea turtles, seabirds, fish, and shellfish
Estimated Cost: major expense
Text in 2002 Report: p. 77 (tech. note p. 223)

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

Synopsis: It is not clear if data exist on unusual mortality events (UMEs) for marine turtles. For seabirds, fish, and shellfish, data do not exist in a national database, and decisions will be needed to define appropriate guidelines for UMEs. For example, for fish, a UME might be 1000 individuals of two or three species.

Indicator: Condition of Bottom-Dwelling Animals
Estimated Cost: major expense
Text in 2002 Report: p. 79 (tech. note p. 225)

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

A) Required Data: data for remaining estuaries

Synopsis: Data were not available for estuaries from the EPA-EMAP program for the following regions: North Atlantic, west coast, Alaska, and Hawaii. This indicator reports condition in categories of "undegraded," "moderate," and "degraded."

B) Required Data: data for coastal waters extending to 25 miles from the coast (excluding estuaries)

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

Synopsis: No data were available for non-estuarine coastal waters. This indicator reports condition in categories of "undegraded," "moderate," and "degraded."

Indicator: Chlorophyll Concentrations
Estimated Cost: major expense
Text in 2002 Report: p. 80 (tech. note p. 226)

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

A) Required Data: data for estuaries

Synopsis: Remote sensing data were available for open-ocean waters, however, protocols had not been fully developed for estuaries. Alternatively, discrete samples could be used for this indicator. Data will be reported in categories of low (< 5 ppb), moderate (5-20 ppb), and high (< 20 ppb) concentrations.

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

B) Required Data: improved data for open-ocean waters

Synopsis: Remote sensing data were available for open-ocean waters. However, future data are expected to have a resolution at least 10 times greater. Also, data analysis protocols are expected to improve. Some steps toward this goal are underway and presumably will not require additional investment.

Indicator: Status of Commercially Important Fish Stocks
Required Data: data on remaining fish stocks
Estimated Cost: major expense
Text in 2002 Report: p. 82 (tech. note p. 227)

High PRIORITY Low: 1 | 2 | 3 | 4 | 5 | NA

Synopsis: The current indicator lacks data on a considerable percentage of commercially important species. However, the presentation of data was justified given the understanding that the limited number of stocks for which data exist represent at least 75 percent by weight of the fish and shellfish landed in U.S. waters. This data gap deals with the remaining 25 percent.

Indicator:	Selected Contaminants in Fish and Shellfish
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 83 (tech. note p. 228)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator is to report data on the presence of PCBs, mercury, and DDT in the edible portion of fish and shellfish landed in U.S. coastal waters, extending out to the boundary of the U.S. EEZ. This indicator is similar to part of the Chemical Contamination indicator within the Core National Indicator section.

Indicator:	Recreational Water Quality
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 84 (tech. note p. 228)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data on the concentration of *Enterococcus*, which indicates contamination from human or animal waste, along the nation's beaches is required. These data would be presented in several categories (< 35, 35-104, and > 104 cells per milliliter) and as a percentage of total beach-mile-days (e.g., one week at 40 cells/ml for 10 miles of beach would be 70 beach-mile-days in the 35-104 concentration range).

DATA GAPS FOR THE FARMLAND INDICATORS

Indicator:	Fragmentation of Farmland Landscapes by Development
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 93 (tech. note p. 231)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator describes the degree to which suburban development fragments the farmland landscape (croplands plus intermingled "natural" areas such as forests, wetlands, and grasslands and shrublands). Satellite data are available for this, although an appropriate analysis approach has not been determined.

Indicator:	Shape of "Natural" Patches in the Farmland Landscape
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 94 (tech. note p. 232)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator describes the shape of "natural" fragments in the farmland landscape (i.e., intermingled "natural" areas such as forests, wetlands, and grasslands and shrublands). Long, slender patches may provide different habitat than circular patches of the same total area. Satellite data are available for this, although an appropriate analysis approach has not been determined.

Indicator:	Soil Organic Matter
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 99 (tech. note p. 234)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Baseline data exist for much of the country through the Soil Survey reports. However, there is no program in place for systematic monitoring of organic matter changes. Indicator applies only to croplands.

Indicator:	Soil Salinity
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 101 (tech. note p. 235)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: It is not clear how widespread such data are, and there is no program in place to bring together salinity measurements that are often included in routine soil tests. Indicator applies only to croplands.

Indicator:	Soil Biological Condition
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 102 (tech. note p. 236)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the Nematode Maturity Index (NMI), an index that rates soil in low, medium, and high categories that can be related to the amount of soil disturbance. There is no program in place for routine monitoring of this soil parameter. Indicator applies only to croplands.

Indicator:	Recreation
Required Data:	data for entire indicator
Estimated Cost:	major expense (?)
Text in 2002 Report:	p. 109 (no tech. note)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the number of days spent fishing, hunting, viewing wildlife, etc. on farmlands. Currently the major Forest Service recreation survey (National Survey of Recreation and the Environment) does not make an ecosystem-based distinction in recreation data.

DATA GAPS FOR THE FOREST INDICATORS

Indicator:	Forest Pattern and Fragmentation
Required Data:	data on fragmentation by small features and other land cover types
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 120 (tech. note p. 240)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: While this indicator will be receiving attention from a soon-to-be-convened task group that will deal with all of the fragmentation indicators, the current indicator suggests that small landscape features (e.g., roads, clearings, etc.) and other land cover types (e.g., grasslands and shrublands) might be used to delineate patches.

Indicator:	Carbon Storage
Required Data:	data on soils, forest floors, wood products, and nontimberland forests
Estimated Cost:	major expense
Text in 2002 Report:	p. 123 (tech. note p. 241)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data were available only for the carbon stored in trees on timberlands (including bole, stump, branches, coarse roots, bark, and foliage). This indicator should report on all above and below ground carbon, including soils and forest floors— including nontimberland forests—as well as forest products in use and those stored long-term in landfills.

Indicator:	At-Risk Native Forest Species
Required Data:	data on forest plants
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 124 (tech. note p. 214)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available on a variety of plants found in forest habitats. Because this indicator applies to species that are "strongly associated" with forests, a species-by-species assessment is needed to identify forest associated plants.

Indicator:	Area Covered by Non-native Plants
Required Data:	data for entire indicator
Estimated Cost:	major/ underway ?
Text in 2002 Report:	p. 125 (tech. note p. 242)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are needed both on understory and overstory plants. We understand that this may be—at least partially—underway as part of the Forest Service's FIA program.

Indicator:	Forest Age
Required Data:	for trees on lands that are not classified as timberlands
Estimated Cost:	major/ underway ?
Text in 2002 Report:	p. 126 (tech. note p. 242)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: We understand that this may be—at least partially—underway as part of the Forest Service's FIA program.

Indicator:	Fire Frequency
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 127 (tech. note p. 243)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data on current fire frequencies, if not available, are fairly straightforward to acquire. It will be much more difficult to establish nationwide estimates of historic fire frequencies that are based on actual measurement rather than primarily on expert knowledge and modeling.

Indicator:	Forest Community Types with Significantly Reduced Area
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000 ?
Text in 2002 Report:	p. 129 (tech. note p. 243)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: It will be necessary to estimate both current and historic forest area for this indicator using an appropriate system to classify "community types." There may be work underway by NatureServe and the Forest Service.

Indicator:	Recreation
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000 ?
Text in 2002 Report:	p. 132 (no tech. note)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the number of days engaged in recreational activities on forest lands. Currently the major Forest Service recreation survey (National Survey of Recreation and the Environment) does not make an ecosystem-based distinction in recreation data. Work underway in the Forest Service may make forest-specific recreation data available shortly.

DATA GAPS FOR THE FRESHWATER INDICATORS

Indicator:	Extent of Freshwater Ecosystems
Required Data:	miles of small, medium, & large streams and rivers
Estimated Cost:	major expense ?
Text in 2002 Report:	p. 139 (tech. note p. 246)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Considerable data do exist on streams and rivers. However, because the indicator did not specify which of several methods for distinguishing stream size was to be used, it is not clear which of these data will be useful. In other words, it is not clear how large the data gap currently is. Possible methods for judging stream size include stream order (the number of tributaries a stream has), discharge, and drainage area.

Indicator:	Altered Freshwater Ecosystems
Required Data:	data on wetlands, lake and pond shorelines, and streams
Estimated Cost:	major expense
Text in 2002 Report:	p. 140 (tech. note p. 247)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: For altered wetlands, some data do exist from the National Wetlands Inventory, however, they are not in a format that allows national reporting, and it is unclear if similar data will be collected on a regular cycle. For pond and lake shorelines, it will be necessary to have a database that distinguishes between lakes that are "natural" and those that are impoundments that have resulted from damming rivers. For streams and rivers, data are needed on the degree to which they have been channelized, leveed, or impounded behind dams.

Indicator:	Phosphorus in Lakes, Reservoirs, and Large Rivers
Required Data:	data for lakes and reservoirs
Estimated Cost:	major expense
Text in 2002 Report:	p. 141 (tech. note p. 248)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available for phosphorus in large rivers. It is possible that EPA's STORET data set would provide some data for lakes and reservoirs, however, considerable research will be needed to understand how well these data would represent the nation's lakes and reservoirs. Data would be presented in four ranges: < 20 ppb, 20-50 ppb, 50-100 ppb, > 100 ppb.

Indicator:	Water Clarity
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 143 (tech. note p. 250)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Clarity data can be gathered using a simple Secchi disk and there are volunteer networks that do sample quite a few lakes. It is also becoming more feasible to estimate lake clarity values from remote sensing data.

Indicator:	At-Risk Native Freshwater Species
Required Data:	data on freshwater and wetland plants
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 144 (tech. note p. 214)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available on a variety of plants found in freshwater habitats. Because this indicator applies to species that are "strongly associated" with fresh waters, a species-by-species assessment is needed to identify freshwater associated plants.

Indicator:	Non-native Species
Required Data:	data on non-fish species
Estimated Cost:	major expense
Text in 2002 Report:	p. 145 (tech. note p. 251)

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: The current indicator reports on the number of non-native fish species that have established breeding populations in the nation's watersheds. Data on other animal species, including mollusks and amphibians should be reported. Some of these data are collected by USGS, but the coverage is not comprehensive. In addition, data on non-native plant species are required.

Indicator:	Animal Deaths and Deformities
Required Data:	data on non-bird die-offs
Estimated Cost:	major expense
Text in 2002 Report:	p. 146 (tech. note p. 252)

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: Data are needed on unusual mortality events for fish, mammal, and amphibian die-offs. Data are also needed for amphibian deformities. USGS collects some of these data, but the coverage is not comprehensive.

Indicator:	Status of Freshwater Animal Communities
Estimated Cost:	major expense
Text in 2002 Report:	p. 147 (tech. note p. 253)

High **PRIORITY** Low

A) Required Data:	data for streams and wadeable rivers	1	2	3	4	5	NA

Synopsis: Data are needed on the degree to which the suite of bottom-dwelling animals in streams and wadeable rivers resembles what one might find in relatively undisturbed streams or wadeable rivers in the same region. Several states currently collect these data.

High **PRIORITY** Low

B) Required Data:	data on larger rivers and lakes	1	2	3	4	5	NA

Synopsis: Data are needed on the degree to which the suite of bottom-dwelling animals in lakes and larger rivers resembles what one might find in a relatively undisturbed lake or larger rivers in the same region. Several states collect data for streams and wadeable rivers. However, methods for measuring "biological integrity" for larger rivers and lakes have not been fully developed.

Indicator:	At-Risk Freshwater Plant Communities
Required Data:	data on riparian communities
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 148 (tech. note p. 253)

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: Data presented in the indicator are for wetland plant communities. It is necessary to determine which plant communities should be considered "riparian," which is not as straightforward as deciding which communities are "wetland.".

Indicator:	Groundwater Levels
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 151 (tech. note p. 255)

High **PRIORITY** Low

1	2	3	4	5	NA

Synopsis: This indicator targets regional aquifers, and will identify the percentage of aquifer area for which the water level has increased, decreased, or not changed significantly. These data are probably available from state and local entities, but have never been assessed or collated for national reporting.

Indicator:	Participation in Freshwater Recreation Activities
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000 ?
Text in 2002 Report:	p. 153 (no tech. note)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the number of days people take part in freshwater activities including: swimming and beachgoing; motor boating and water skiing; sailing, floating, rowing, etc.; viewing activities; hunting; and fishing. Currently the major Forest Service recreation survey (National Survey of Recreation and the Environment) does not make a freshwater/saltwater distinction, except for fishing. SAME AS GAP LISTED IN NATIONAL CORE INDICATOR SECTION—PLEASE SCORE THE SAME IF YOU SCORED THIS GAP IN THE CORE NATIONAL INDICATORS.

DATA GAPS FOR THE GRASSLANDS AND SHRUBLAND INDICATORS

Indicator:	Land Use
Required Data:	majority of indicator data (except CRP data)
Estimated Cost:	major expense
Text in 2002 Report:	p. 162 (tech. note p. 257)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available for Conservation Reserve Program (CRP) land. Data are needed on the area of land used for: livestock raising, oil and gas mining, rural residences, "protected areas," and high-intensity recreation. Note that some of these, such as protected areas, will require standardized definitions.

Indicator:	Area and Size of Grassland and Shrubland Patches
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 163 (tech. note p. 258)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: The data are available for these analyses, however, time and necessary funds have been unavailable for data processing.

Indicator:	Nitrate in Grassland and Shrubland Groundwater
Required Data:	data for entire indicator
Estimated Cost:	major expense/ underway ?
Text in 2002 Report:	p. 164 (tech. note p. 258)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are needed that would be analogous to those from the USGS's NAWQA program that were reported for farmlands (p. 95), forests (p. 122), and urban/suburban areas (p. 186).

Indicator:	Carbon Storage
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 165 (tech. note p. 259)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are needed for both soil and plants. Some baseline data may be available and other data may be collected, but no overall monitoring program is in place.

Indicator:	Depth to Shallow Groundwater
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 167 (tech. note p. 260)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the percentage of grasslands and shrublands with aquifer depths of: < 5 ft., 5-10 ft., 10-20 ft., and > 20 ft. These aquifers can be the primary source for springs, seeps, wetlands, potholes, and riparian areas—all of which provide essential habitat. Note: does not target deep, regional aquifers, as is the case in the Freshwater section's Groundwater Levels indicator..

Indicator:	At-Risk Native Grassland and Shrubland Species
Required Data:	data for grassland and shrubland plants
Estimated Cost:	less than $100,000
Text in 2002 Report:	p. 168 (tech. note p. 214)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are available on a variety of plants found in grassland and shrubland habitats. Because this indicator applies to species that are "strongly associated" with grasslands and shrublands, a species-by-species assessment is needed to identify grassland and shrubland associated plants.

Indicator:	Non-native Plant Cover
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 169 (tech. note p. 261)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator, as written, will distinguish between all non-natives and those that are invasive, as a percentage of total plant cover.

Indicator:	Fire Frequency
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 171 (tech. note p. 243)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data on current fire frequencies, if not available, are fairly straightforward to acquire. It will be much more difficult to establish nationwide estimates of historic fire frequencies that are based on actual measurement rather than primarily on expert knowledge and modeling. The design of this indicator is essentially the same as the one proposed for the Forest section.

Indicator:	Recreation on Grasslands and Shrublands
Required Data:	data for entire indicator
Estimated Cost:	less than $100,000 ?
Text in 2002 Report:	p. 174 (no tech. note)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the number of days people take part in grassland/shrubland recreational activities, including: hunting; ORV/motor sports/mountain biking/snowmobiling; bird watching/nature study; and hiking/camping. Currently the major Forest Service recreation survey (National Survey of Recreation and the Environment) does not make ecosystem-based distinctions.

DATA GAPS FOR THE URBAN AND SUBURBAN INDICATORS

Indicator:	Total Impervious Area
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 184 (tech. note p. 266)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator would report the percent of urban/suburban areas having a range of total impervious area (TIA): <10%, 10-20%, 20-30%, and >30%. Impervious areas include roads, parking lots, driveways, sidewalks, rooftops, and the like.

Indicator:	Chemical Contamination
Required Data:	data for urban/suburban soils
Estimated Cost:	major expense
Text in 2002 Report:	p. 189 (tech. note p. 268)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator would, like many of the other contaminant indicators, report both on detection of contaminants and how many of these contaminant detections are above standards for the protection of humans as well as other animal life.

Indicator:	Species Status
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 191 (tech. note p. 269)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: For metropolitan areas, this indicator will report on the degree to which "original" plants and animals are either absent entirely or are at risk of being lost from these areas. This would not be done for all "urban and suburban areas," but rather a subset of metropolitan areas (e.g., those with at least 100,000 people, or that cover more than 50 sq. miles).

Indicator:	Disruptive Species
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 192 (no tech. note)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: This indicator will report the number of metropolitan areas with different numbers of disruptive species (e.g., 5 or less, 6-10, 11-20, more than 20). Disruptive species are defined as having negative effects on natural areas and native species or causing damage to people and property.

Indicator:	Status of Animal Communities in Urban and Suburban Streams
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 193 (tech. note p. 269)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: Data are needed on the degree to which the suite of bottom-dwelling animals in streams and wadeable rivers resembles what one might find in relatively undisturbed streams or wadeable rivers in the same region. Several states currently collect these data. This indicator is analogous to the similarly-named indicator in the Freshwater section, however, data would be presented solely for urban and suburban streams.

Indicator:	Publicly Accessible Open Space per Resident
Required Data:	data for entire indicator
Estimated Cost:	major expense
Text in 2002 Report:	p. 194 (tech. note p. 269)

High PRIORITY Low

1	2	3	4	5	NA

Synopsis: In this case, open space is meant to be land that is dominated by "natural" surfaces, like grass or woods, along with lakes, rivers, beaches and wetlands. In order to be deemed "accessible," access should be free or only require a nominal fee (e.g., private country clubs would be excluded).