

# Evaluation Sourcebook

## Measures of Progress for Ecosystem & Community-Based Projects



Ecosystem Management Initiative  
School of Natural Resources & Environment  
University of Michigan



*The Ecosystem Management Initiative promotes landscape-scale conservation and sustainable natural resource management through ecosystem-based teaching, research and outreach.*

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## Downloading

This publication and supporting documents and tools are available online at:

<http://www.snre.umich.edu/ecomgt/evaluation/tools.htm>

**We welcome your comments and questions! Please contact us at**

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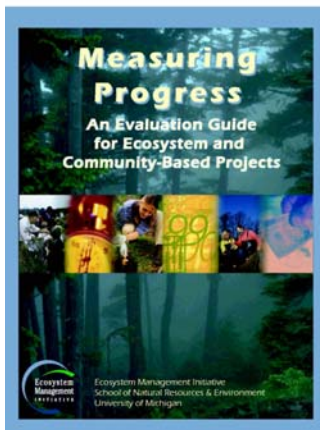
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## WHO CAN USE THIS SOURCEBOOK

*Are we making progress? What are we accomplishing?  
How do we know?*

Whether you are part of a small volunteer group doing community based conservation on a single forest preserve or are in an interagency collaborative applying ecosystem management to a whole watershed, you are likely faced with these questions. Tracking progress can allow you to document and celebrate successes, gain support and understanding for what you do, make informed decisions and be more effective.

The Evaluation Sourcebook draws on the experience of many on-the-ground ecosystem and community-based projects, as well as the extensive literature on ecological, social and organizational evaluation. It is designed to help you *clarify* and *communicate* what you are trying to achieve and to *measure progress* on multiple levels so that you can track improvements in ecosystem health, economic vitality, quality of life, sustainability or even trust and collaboration.



The Sourcebook can be used together with *Measuring Progress: An Evaluation Guide for Ecosystem and Community-Based Projects*, which is a step-by-step workbook that takes you through the process of evaluation.

The Sourcebook can also be used on its own, as a ready reference of metrics and other evaluation tools to assist you in project planning and adaptive management.



# CONTENTS

<b>WHO CAN USE THIS SOURCEBOOK .....</b>	<b>I</b>
<b>INTRODUCTION .....</b>	<b>1</b>
EVALUATION: WHAT IS IT AND WHY DO IT? .....	3
MULTIPLE MEASURES OF PROGRESS .....	4
WHAT MAKES A GOOD INDICATOR? .....	6
HOW TO USE THE SOURCEBOOK .....	8
SOURCES OF INFORMATION FOR EVALUATION .....	12
WHERE TO GO FOR MORE HELP .....	13
<b>MAP OF SOURCEBOOK TOPICS .....</b>	<b>15</b>
<b>OBJECTIVES .....</b>	<b>17</b>
<b>ECOLOGICAL OBJECTIVES .....</b>	<b>19</b>
<b>INTRODUCTION TO ECOLOGICAL OBJECTIVES .....</b>	<b>21</b>
<b>Landscape diversity and connectivity .....</b>	<b>28</b>
EXTENT AND REPRESENTATION OF COMMUNITIES IN THE LANDSCAPE .....	28
ARRANGEMENT AND CONNECTIVITY OF COMMUNITIES IN THE LANDSCAPE .....	30
<b>Habitat quality .....</b>	<b>32</b>
COMPOSITION AND DIVERSITY OF SPECIES .....	32
HABITAT STRUCTURE AND FOOD WEBS .....	34
<b>Species .....</b>	<b>36</b>
POPULATION DEMOGRAPHY AND DYNAMICS .....	36
GENETICS .....	38
PHYSIOLOGY AND BEHAVIOR .....	40
<b>Water, air and soil .....</b>	<b>42</b>
WATER QUALITY .....	42
WATER QUANTITY AND HYDROLOGY .....	44
AIR QUALITY .....	46
SOIL STRUCTURE, COMPOSITION AND FERTILITY .....	48
<b>Key processes .....</b>	<b>50</b>
ENERGY FLOW AND NUTRIENT CYCLING .....	50
FIRE AND OTHER KEY DISTURBANCE AND SUCCESSION PROCESSES .....	52

<b>SOCIAL OBJECTIVES.....</b>	<b>55</b>
<b>INTRODUCTION TO SOCIAL OBJECTIVES.....</b>	<b>57</b>
<b>Healthy and enduring local economy: .....</b>	<b>60</b>
DIVERSE AND STABLE INDUSTRIES .....	60
LOCAL INVESTMENT, DEVELOPMENT AND GROWTH.....	62
LIVING-WAGE JOBS .....	64
<b>Community character .....</b>	<b>66</b>
HISTORIC AND CULTURAL HERITAGE.....	66
LAND USE .....	68
QUALITY OF LIFE .....	70
<b>Community interaction and engagement .....</b>	<b>72</b>
RELATIONSHIPS AND TRUST.....	72
PARTICIPATION AND ENGAGEMENT .....	74
<b>Community capacity .....</b>	<b>76</b>
SERVICES.....	76
RECREATION AND LEISURE .....	78
EDUCATION .....	80
<b>Sustainability: Balancing community &amp; ecosystem needs.....</b>	<b>82</b>
ENVIRONMENTALLY RESPONSIBLE STEWARDSHIP .....	82
ECOLOGICALLY SUSTAINABLE ECONOMY.....	84
<b>ORGANIZATIONAL OBJECTIVES .....</b>	<b>87</b>
<b>INTRODUCTION TO ORGANIZATIONAL OBJECTIVES .....</b>	<b>89</b>
<b>Characteristics of an effective organization .....</b>	<b>92</b>
CLEAR AND COMPELLING PURPOSE .....	92
EFFECTIVE PARTICIPATION.....	94
GOOD WORKING RELATIONSHIPS.....	96
EFFECTIVE DECISION-MAKING AND PLANNING PROCESSES .....	98
ADEQUATE RESOURCES AND CAPACITY.....	100
GOOD LEADERSHIP .....	102
<b>THREATS.....</b>	<b>105</b>
<b>INTRODUCTION TO THREATS.....</b>	<b>107</b>
<b>Ecological threats .....</b>	<b>110</b>

HABITAT DEGRADATION, LOSS OR FRAGMENTATION .....	110
INVASIVE AND OVERABUNDANT SPECIES .....	112
WATER DIVERSION (ALTERED HYDROLOGY) .....	114
WATER POLLUTION/CONTAMINATION .....	116
AIR POLLUTION.....	118
LITTERING OR SITE CONTAMINATION.....	120
DISRUPTION OF SOIL QUALITY / FERTILITY.....	122
ALTERED FIRE REGIME .....	124
<b>Ineffective management or use of natural resources: .....</b>	<b>126</b>
OVER-EXPLOITATION OF NATURAL OR PROTECTED POPULATIONS .....	126
DESTRUCTIVE RESOURCE USE/EXTRACTION .....	128
DISRUPTIVE/DESTRUCTIVE RECREATION.....	130
UNFAVORABLE POLICIES, LAWS OR LEGAL PROCESSES .....	132
<b>Social stresses .....</b>	<b>134</b>
SPRAWL/UNPLANNED DEVELOPMENT .....	134
DEMOGRAPHIC CHANGE .....	136
ECONOMIC DECLINE .....	138
CRIME, POVERTY OR POOR HEALTH .....	140
<b>Problematic attitudes or inadequate understanding .....</b>	<b>142</b>
CONFLICT OR LACK OF TRUST .....	142
LACK OF KNOWLEDGE, AWARENESS OR CONCERN .....	144
INSTITUTIONAL OR CULTURAL BARRIERS .....	146
<b>Organizational problems.....</b>	<b>148</b>
INEFFECTIVE OR INEFFICIENT ORGANIZATIONAL MANAGEMENT .....	148
INADEQUATE RESOURCES .....	150
<b>ASSETS.....</b>	<b>153</b>
<b>INTRODUCTION TO ASSETS.....</b>	<b>155</b>
<b>Natural resources .....</b>	<b>156</b>
EXISTING HIGH QUALITY ECOSYSTEMS, HABITATS OR POPULATIONS.....	156
HIGHLY VALUED NATURAL AREAS OR SPECIES .....	158
<b>Social assets .....</b>	<b>160</b>
COMMUNITY COHESION .....	160
AVAILABLE EXPERTISE AND INFORMATION .....	162
<b>Political support.....</b>	<b>164</b>
FAVORABLE POLICIES, LAWS AND INCENTIVE PROGRAMS.....	164

SUPPORT OF KEY PEOPLE OR ORGANIZATIONS .....	166
<b>Organizational strengths .....</b>	<b>168</b>
GOOD TRACK RECORD OR REPUTATION .....	168
DEDICATED AND CAPABLE PEOPLE.....	170
ESTABLISHED AND POTENTIAL PARTNERSHIPS .....	172
<b>STRATEGIES .....</b>	<b>175</b>
<b>INTRODUCTION TO STRATEGIES.....</b>	<b>177</b>
<b>Protection, restoration, and management .....</b>	<b>180</b>
PROTECTING LAND AND WATER THROUGH PURCHASES, EASEMENTS AND PRESERVES .....	180
RESTORING SPECIES, HABITATS AND PROCESSES.....	182
MANAGING NATURAL RESOURCE USE .....	184
<b>Economic and community development .....</b>	<b>186</b>
ATTRACTING NEW BUSINESSES OR INVESTORS .....	186
DEVELOPING SUSTAINABLE INDUSTRIES OR BUSINESSES PRACTICES .....	188
PROVIDING JOB OR SKILLS TRAINING.....	190
BUILDING COMMUNITY.....	192
<b>Law and policy.....</b>	<b>194</b>
REFORMING LAWS OR POLICIES .....	194
ENFORCING OR ENCOURAGING AGENCY ENFORCEMENT.....	196
<b>Education and outreach.....</b>	<b>198</b>
COMMUNICATING WITH THE PUBLIC .....	198
WORKING WITH LOCAL SCHOOLS .....	200
<b>Organizational management .....</b>	<b>202</b>
BUILDING AND SUSTAINING ORGANIZATIONAL RESOURCES .....	202
GATHERING AND MANAGING INFORMATION .....	204
DEVELOPING STRATEGIC DIRECTION AND ADAPTING OVER TIME.....	206
BUILDING COLLABORATIONS AND PARTNERSHIPS .....	208
<b>PHOTO CREDITS .....</b>	<b>211</b>
<b>INDEX .....</b>	<b>214</b>



# INTRODUCTION

**Use this section to help you answer questions like:**

**What does it mean to engage in “evaluation” or “adaptive management”?**

**What is an indicator? How do I choose among potential indicators of progress?**

**How can I best use this Evaluation Sourcebook?**

**How will I get the information I need for evaluation?**

**Where can I find more help?**



## EVALUATION: WHAT IS IT AND WHY DO IT?

Evaluation is a broad set of activities that includes:

- **Goal setting and strategic planning:** Developing a clear picture of what you are trying to achieve and how you plan to affect the system to get there.
- **Asking questions:** Identifying what you need to know to assess progress, test uncertainties and inform decisions.
- **Information gathering:** Obtaining information or data to answer to your questions.
- **Adaptive management:** Linking new information back to decision-making to increase project effectiveness.

Evaluation helps projects face one of their greatest challenges: having a positive impact on complex ecological and social systems with limited resources. Evaluation can increase your ability to make decisions, be effective and obtain support.

### THE BENEFITS OF EVALUATION

- **Maximize the impact of limited resources.** Insights gained through evaluation enable you to identify the strengths and weaknesses of your approach and adjust accordingly: which aspects of your project work, which don't, and why?
- **View your project's role within a complex system.** Diverse activities and circumstances – from natural disturbances to political cycles – are affecting the status of natural resources, the economy, and the community. Evaluation helps you make sense of this complexity.
- **Improve group dynamics and processes.** By facilitating dialogue among people and organizations involved in the project, evaluation activities can help build a shared understanding of the project, leading to clearer task assignments and greater accountability.
- **Build support.** Being able to demonstrate success can promote support from community and political officials and increase funding.
- **Deal with uncertainty and change.** Knowledge gained through evaluation allows for adaptive management – learning from experience and adjusting activities accordingly.

## MULTIPLE MEASURES OF PROGRESS

How do you know or how can you communicate to others that you are moving in the right direction?

Many projects answer this question by cataloging the **activities** they have completed, such as *number of river clean-up days, number of meetings held per year or number of interpretive displays developed.*

While these provide a measure of the extent to which strategies have been implemented, they are only one way to measure progress. You may also want to know whether your strategies are effective. For example, how well are you reducing **threats** such as water pollutants or building on **assets** such as supporters? To answer these questions you could measure: *concentration of toxic chemicals in the water or amount of funds received from donors.*

Ultimately, however, you want to know the **outcomes** of your efforts. Is forest integrity or quality of life improving? Progress at this level could be measured as *changes in native species diversity or the level of trust among neighbors.*

These examples illustrate different measures of progress, all of which are informative especially when they are reviewed together. That is, you can relate your activities to short and long-term changes on the ground to help you understand and document impact.

OBJECTIVES, THREATS, ASSETS & STRATEGIES OF A PROJECT			
	What is it?	Example	Why evaluate it?
<b>Objective</b>	A desired condition or state of something. Collectively, objectives represent your project's goal or mission.	<ul style="list-style-type: none"> <li>• Viable salmon populations</li> <li>• High quality recreational opportunities</li> </ul>	Ultimately, you want to be able to show progress toward goals.
<b>Threat</b>	A circumstance or situation that hinders progress toward goals	<ul style="list-style-type: none"> <li>• The spread of invasive species</li> <li>• Lack of trust among stakeholders</li> </ul>	A decrease in key threats can be a direct and often near-term measure of your effectiveness.
<b>Asset</b>	An opportunity or resource that fosters progress toward goals	<ul style="list-style-type: none"> <li>• Existing protected land</li> <li>• A large volunteer base</li> </ul>	Identifying assets can help you ensure that you are building on existing strengths.
<b>Strategy</b>	Activities you undertake to address threats and use assets to achieve objectives	<ul style="list-style-type: none"> <li>• Acquire corridors between parks</li> <li>• Revegetate stream bank</li> </ul>	Completed activities are the first sign of progress.

Together with thinking about progress on different levels, from reaching completing strategies to accomplishing long-term goals, you would want to measure progress across the range of issues your projects deals with. Ecosystem and community-based projects often focus on the **ecological** system – issues such as biodiversity, endangered species and water quality – and on the **social** system whose community character, economy, well-being and capacity are tightly linked with these ecosystems. At the same time, organizations and collaborative projects need to be concerned with their **organizational** process – how they are making decisions, communicating and carrying out project activities.

#### ECOLOGICAL, SOCIAL & ORGANIZATIONAL ASPECTS OF A PROJECT

<i>Ecological</i>	Concerns associated with the species or processes of an ecosystem, such as biodiversity, endangered species, or water quality.
<i>Social</i>	Concerns associated with the human communities living in or near ecosystems, such as their economy, heritage and quality of life.
<i>Organizational</i>	The variety of ways that project participants make decisions, communicate, and carry out activities.

By evaluating these various issues at many levels you create a **multi-metric approach to measuring progress**, as in the following example:

	<i>Ecological</i>	<i>Social</i>	<i>Organizational</i>
<i>Objectives</i>	Population size over time of characteristic species	Percent of community with living-wage jobs	Number of awards received for good collaboration
<i>Threats</i>	Concentration of water pollutants	Percent unemployment	Staff turnover rate
<i>Assets</i>	Size of existing high quality habitat	Attendance at community celebration events	Number of active volunteers
<i>Strategies</i>	Number of trees planted in riparian buffer zone	Number of participants in job skills training programs	Number of grant proposals submitted

This ‘menu’ of metrics can be useful for reporting progress in the short *and* long-term to a *variety* of audiences and decision-makers.

## WHAT MAKES A GOOD INDICATOR?

You will be faced with choosing among many possible measures of your project's progress. To help you make these decisions, we provide specific guidelines for evaluating ecological, social and organizational objectives, threats and assets and strategies at the beginning of each of major section in this book.

You can also use the following set of *general* criteria, developed by many researchers and practitioners<sup>1</sup>.

### A good indicator is:

- ***Relevant and useful to decision-making***
  - Provides information that can be used to test management effectiveness and help make strategic choices
  - Provides information that can be acted upon or used to motivate action
- ***Easy to interpret***
  - Has a clear, well-documented or understood link to particular attributes or stresses of the system
  - Has low or understood levels of background variation and human measurement error so that these can be distinguished from changes of interest
- ***Sensitive to change***
  - Responds quickly enough to key stresses or other influences to allow adaptive management in response to these changes
  - Has potential to provide an early warning signal
- ***Feasible and cost-effective to obtain***
  - Is already being collected, is accessible at low cost or is feasible in terms of equipment, time and expertise, to collect *and* analyze
  - Could feasibly be collected repeatedly
  - Is not overly destructive to collect
- ***Easily communicated to target audience***
  - Is understood by different audiences, such as decision-makers, scientists and the general public
  - Can be summarized or compiled into simple indices, charts or pictures

---

<sup>1</sup> A good review of literature on the criteria of a good *ecological* indicator is available through the National Park Service Monitoring Internet (<http://science.nature.nps.gov/im/monitor/index>): *Example Criteria and Methodologies for Prioritizing Indicators*: <http://science.nature.nps.gov/im/monitor/docs/CriteriaExamples.doc>

It is also helpful, if your chosen indicator is:

- **Widely used**, such that there are already agreed-upon standards or threshold values of the indicator, existing protocols and/or available baseline data. Widespread use of the same indicator also allows for comparing across sites and scaling up from local to regional assessments.
- **Integrative**, in that it provides information about multiple levels or aspects of your system, such as an indicator that reflects both ecological and social improvements, such as miles of greenways, or both a species and ecosystem-level change, such as density of fire-tolerant plant species.

Together, these criteria can help you choose or prioritize among many possible indicators, keeping in mind what makes the most sense for *your* system and specific evaluation needs and capacity. Some criteria are more important than others. For example, it is not sufficient for an indicator to be easy to measure. It must also be relevant and meaningful to your evaluation needs.

### MEASURES, INDICATORS, & INDICES

Evaluation includes a variety of terms. For example, we can talk about a **direct measure**, such as air temperature. A quantitative measure may also be referred to as a **metric**.

A direct measure may be distinguished from an **indicator**, which is a measure that can provide information about multiple attributes of a system without direct measurement of those attributes. For example, the number of a particular bird species can be an indicator or surrogate measure of an area's average temperature, density of vegetation, and fire frequency.

You may also hear about an **index**, such as the Index of Biology Integrity (IBI), the Cost of Living Index, or the Dow Jones industrial average. These are summary measures, derived from a formula that balances or weighs a variety of individual measures.

**Because in practice there is a lot of overlap between these concepts, we simply use the term *indicator* to refer to any measure, metric or index.**

## HOW TO USE THE SOURCEBOOK

You can use the wide range of evaluation topics and tools in this Sourcebook to

- Clarify and communicate what it is you are trying to achieve and
- Develop multiple measures of project progress.

### WARNING!!

**This book is *not* meant to be read cover-to-cover** (though have fun with it if you do!!). Instead, you can dive in wherever the information is most useful to you. To do this, we suggest you first get a sense of how the sourcebook is organized and how the individual parts can assist you in evaluation.



### How is the Sourcebook organized?

After the Introduction, the Sourcebook is divided into the following sections (see [Multiple measures of progress](#), p.4):

- Project **OBJECTIVES**, including **ecological** concerns such as species viability, **social** concerns such as healthy economies and process or **organizational** issues, such as leadership
- **THREATS**, which are circumstances or forces that can hamper progress toward goals, such as invasive species, economic decline or lack of funding
- **ASSETS**, which are positive circumstances or opportunities, such as seed banks, available expertise or political support
- **STRATEGIES** or approaches used by projects to achieve their objectives, such as habitat restoration, job training, policy reform or outreach and education

### FRAMEWORKS FOR MEASURING PROGRESS

While this Sourcebook cuts across a wider variety of ecological, social and process topics, it is organized much like other systems used to measure progress. For example, the widely applied **Pressure-State-Response** (PSR) framework, developed by OECD (Organization for Economic Cooperation and Development), organizes indicators according to “pressures” (what we call *threats*), “state” (related to *objectives*), and “response” (what we call *strategies*). **The Nature Conservancy’s 5S** management process also makes a distinction between the “systems” or “biodiversity targets” they manage (what we call *objectives*), the “stresses” and their “sources” that affect these systems (what we call *threats*), and the strategies used to address stresses. See the EMI website for more information and links to other evaluation frameworks:

<http://www.snre.umich.edu/ecomgt/>



Within each section you will find:

1. **Introductory pages** with topic- specific evaluation tips and
2. A series of “**two-page spreads**” like this one, with evaluation questions, indicators and data sources to help you evaluate one particular aspect of your project.

ECOLOGICAL OBJECTIVES
LANDSCAPE
INTRODUCTION
OBJECTIVES
THREATS
ASSETS
STRATEGIES

**EXTENT AND REPRESENTATION OF COMMUNITIES IN THE LANDSCAPE**

Changes in the type, size, and arrangement of habitats within the landscape can impact the species that live there by affecting how they move around, how fire spreads, or what resources are available. Even if you are focused on the health of a particular habitat or park, the quality of the larger landscape can be key to your project's success.

To understand how the landscape is changing you could measure:

- the type of communities, habitats, or vegetation types present in the landscape,
- the area covered by these communities, and
- how well certain communities are represented relative to their relative area.

**Sample Evaluation Questions & Indicators**

**Q** Are we gaining or losing certain habitats or community types in the area?  
How does the current number or type of communities in the landscape compare to the historic or natural range?

- ◆ Number of different vegetation types relative to pre-settlement patterns
- ◆ Presence/absence of certain communities, habitat-types, or ecosystems

**Q** Are the physical characteristics of the landscape changing in areas of land use?

- ◆ Topographic relief, slope, aspect, elevation
- ◆ Soil types
- ◆ Shorelines, banks and channel attributes

**Text boxes provide definitions and key tips and resources.**

**Q** Sample evaluation questions provide ideas of what to *ask* to assess progress or improve decisions and **◆ indicators** are ideas of what you could *measure* to answer your evaluation questions.

**Q** Data sources can help you find the information you need to measure your chosen indicators.

**Q** Real world examples with web links show why others have been interested in this topic, how they measured it, and how they made use of this information.

**ECOLOGICAL OBJECTIVES** | **LANDSCAPE** | Habitats | Species | Water, Air & Soil | Key Indicators

**Introductory explanations help you better understand an issue and the need to evaluate it. You may also want to use this material to communicate aspects of your project to others.**

**Headers on each page let you know where you are among the specific (left page) and general (right page) topic areas.**

**PRIORITIZE:**  
Evaluate the extent or representation of:

- Critical habitat for sensitive species
- Ecologically sensitive or critical areas (e.g. riparian buffer zones, floodplain, wetland pool, flooding grounds)
- Hotspots (areas with high species richness)
- Specific geographic features (holes in glades, wetland borders, open cliffs)
- Rare/impaired ecological types
- Impaired habitat/community types & riparian or glacial biodiversity

**Data sources**

- GIS data (see the Federal Geographic Data Committee <http://www.fgdl.gov/>)
- Vegetation maps
- Public lands surveys (see <http://www.gcn.com/communication/land/>)
- Satellite images (see <http://landsat.usgs.gov/index.php>)





**Example**

The San Pedro River community was interested in examining long-term change across their watershed. Partnering with scientists and managers from several agencies and universities they used existing Landsat satellite remote sensor measurements. The stakeholder community decided on a 10-vegetation class system to categorize communities in the watershed, and digital land cover maps from 1973 to 1989 were analyzed using ARC/INFO software. Information about changes in the composition and extent of communities in the landscape is now being used by the interagency San Pedro Partnership Committee in community planning and developing wildlife corridors.

For more info see: <http://www.epa.gov/nerles/dl/land-ol/san-pedro.htm> or <http://www.tucsonaz.gov/saka/salsahome.html>

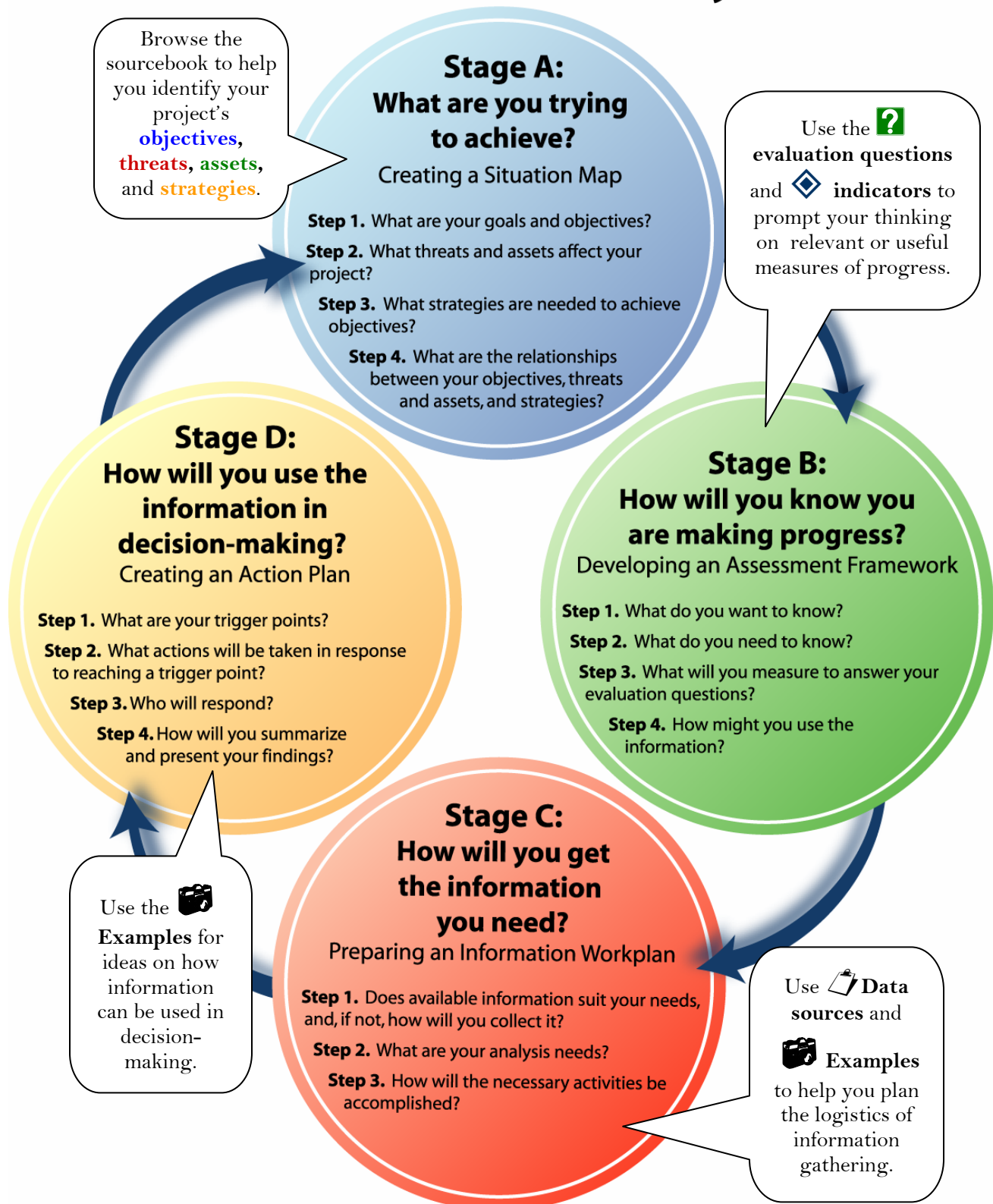
## How do I use the Sourcebook to engage in evaluation?

Now that you know how the sourcebook is organized, you can use it in different ways to meet your evaluation needs. The following steps can help you select the relevant sections or tools to support an *existing* planning, evaluation or adaptive management processes or to develop a *new* evaluation plan.


1. Get a feel for the *Sourcebook contents* by skimming the [Map of Sourcebook Topics](#), p. 15 and the introductory pages of each section:
  - [Ecological Objectives](#), p. 21
  - [Social Objectives](#), p.57
  - [Organizational Objectives](#), p.87
  - [Threats & Assets](#), p.105
  - [Strategies](#), p.175
  
2. *Develop lists* of your project **goals**, what you think is hindering (**threats**) or helping (**assets**) your progress towards those goals and the **strategies** that you are using. You could do this alone or in a group, from scratch or by consulting existing planning documents.
  
3. Use the content of the topic-specific 2-page spreads that correspond to your listed goals, threats/assets and strategies to *prompt your thinking about*:
  - a. What do we need to know to inform decision-making or document progress? ( **Evaluation questions**)
  
  - b. What will we measure to answer our evaluation questions? ( **Indicators**)
  
  - c. Where could we get the information we need? ( **Data Sources**)
  
  - d. How will we use this information in decision-making or to gain support or understanding for what we do? ( **Example**)
  
4. If you would like more guidance on how to develop an evaluation plan consult *Measuring Progress – An Evaluation Guide for Ecosystem and Community-Based Projects*. This is a step-by-step workbook that takes you through the process of creating a systematic plan for measuring progress (available as a downloadable pdf or an interactive program on the EMI web site – see next section).

The following page shows how the Sourcebook can be used at each stage of the *Measuring Progress* workbook. You can also simply use these questions to guide your evaluation thinking.

# The Evaluation Cycle



SOURCES OF INFORMATION FOR EVALUATION

Within each topic, you will find sample topic-specific  **Data sources.** For example, public land surveys are a data source for measuring the percent of land in agriculture. A range of other data sources might be relevant to your chosen indicators. Some of this information is already available; other information will need to be collected in a way that matches the level of detail, time scale and location of interest.

COMMON DATA SOURCES BY TYPE OF INFORMATION

People’s opinions, perceptions, understanding, or intentions

- *Surveys, interviews, focus groups, polls, self-assessments, or journals of key people: participants, beneficiaries, critics, victims, experts, collaborators, funders, decision-makers, residents, etc.*
- *Speeches, conversations, or other existing verbal communications*
- *Program documents, such as minutes of meetings, project proposals or plans, or vision or mission statements*
- *Editorials and headlines in the media*
- *Images such as children’s drawings or area graffiti*

People’s behaviors and social or economic conditions

- 
- Databases of local, state or regional agencies or organizations collecting census, demographic, service industry, employment or real estate data
  - Program documents, such as accomplishment reports, receipts, newsletters, activity logs, etc.
  - Observations of people’s presence, behaviors, reactions, and interactions at meetings, community events, interpretive centers, etc.
  - Surveys, polls, etc. about people’s actions
  - Images, such as photos of a place over time or videos of people interacting
  - Experimental results or expert opinion of researchers from universities, NGO’s or agencies

Environmental conditions

- 
- Ongoing monitoring data of local, state or regional agencies or organizations collecting information on species, waterways, pollutant levels, etc.
  - Data from plots or transects, completed forest or watershed inventories, etc.\
  - Images such as on-the-ground or aerial photographs over time
  - Experimental results of researchers from universities, NGO’s, agencies, etc.
  - Expert opinion of ecologists or naturalists familiar with that system
  - Photographs, writings, observations or experiences of long-term or previous residents

## WHERE TO GO FOR MORE HELP

The EMI website on evaluation and adaptive management (<http://www.snre.umich.edu/emi/evaluation/index.htm>) has other resources to help you in collaborative, strategic evaluation and adaptive management, including:

- **Step-by-step guidance** on the process of designing an evaluation plan including the workbook *Measuring Progress – An Evaluation Guide for Ecosystem and Community-Based Projects* (Available as a downloadable pdf or as an interactive program)
- **Sources** from the literature and case studies that informed the ecological, social and organizational process topics and indicators covered here.
- **Links to online evaluation resources**, including tools and guidance to monitor the health of specific ecosystem types, design a participant survey or find free data.

### ILLUSTRATIVE, NOT EXHAUSTIVE

There are a wide range of possible project objectives, threats, assets and strategies and endless lists of possible indicators or measures. The sourcebook is not meant to be exhaustive (or exhausting!). Instead it presents *common* topics and a *sample* of the wide array of existing indicators, especially those that may be more practical and relevant.

We encourage you to use other resources together with the Sourcebook to choose effective measures of progress tailored to your project!



# Map of Sourcebook Topics

## OBJECTIVES

### ECOLOGICAL

**Landscapes diversity and connectivity**  
Extent & representation of communities  
Arrangement & connectivity of communities

#### Habitat quality

Composition and diversity of species  
Habitat structure and food webs

#### Species

Population demography and dynamics  
Genetics  
Physiology and behavior

#### Water, air and soil

Water quality  
Water quantity and hydrology  
Air quality  
Soil structure, composition and fertility

#### Key processes

Energy flow and nutrient cycling  
Fire and other key disturbance and succession processes

### SOCIAL

#### Healthy and enduring local economy

Diverse and stable industries  
Local investment, development and growth  
Living-wage jobs

#### Community character

Historic and cultural heritage  
Land use  
Quality of life

#### Community interaction and engagement

Relationships and trust  
Participation and engagement

#### Community capacity

Services  
Recreation and leisure  
Education

#### Sustainability

Environmentally responsible stewardship  
Ecologically sustainable economy

### ORGANIZATIONAL

Clear and compelling purpose  
Effective participation  
Good working relationships  
Effective decision-making and planning processes  
Adequate resources and capacity  
Good leadership

## THREATS & ASSETS

#### Ecological threats

Habitat degradation, loss or fragmentation  
Invasive and overabundant species  
Water diversion (altered hydrology)  
Water pollution/contamination  
Air pollution  
Littering or site contamination  
Disruption of soil quality / fertility  
Altered fire regime

#### Ineffective management or use of natural resources

Over-exploitation of natural or protected populations  
Destructive resource use/extraction  
Disruptive/destructive recreation  
Unfavorable policies, laws or legal processes

#### Social stresses

Sprawl/unplanned development  
Demographic change  
Economic decline  
Crime, poverty or poor health

#### Problematic attitudes or inadequate understanding

Conflict or lack of trust  
Lack of knowledge, awareness or concern  
Institutional or cultural barriers

#### Organizational weaknesses

Ineffective or inefficient management of organization  
Inadequate resources

#### Natural resources

Existing high quality ecosystems, habitats or populations  
Highly valued natural areas or species

#### Social assets

Community cohesion  
Available expertise and information

#### Political support

Favorable policies, laws and incentive programs  
Support of key people or organizations

#### Organizational strengths

Good track record or reputation  
Dedicated and capable people  
Established and potential partnerships

## STRATEGIES

#### Protection, restoration and management

Protecting land and water through purchases, easements & preserves  
Restoring species, habitats and processes  
Managing natural resource use

#### Economic and community development

Attracting new business/investors  
Developing sustainable industries or business practices  
Providing job or skills training  
Building community

#### Law and policy

Reforming laws or policies  
Enforcing or encouraging agency enforcement

#### Education and outreach

Communicating with the public  
Working with local schools

#### Organizational management

Building and sustaining organizational resources  
Gathering and managing information  
Developing strategic direction and adapting over time  
Building collaborations and partnerships





## ECOLOGICAL, SOCIAL & ORGANIZATIONAL OBJECTIVES

The ultimate aim of your project is to achieve certain ecological, social and/or economic *goals*. For example, you may seek improved ecosystem health, economic stability or community quality of life. Within these broad goals, you may have more specific *objectives* related to particular species or features of your community, such as viable salmon populations or protected historical buildings. Tracking how close you are to meeting your goals and objectives is not only key to assessing and documenting progress, but also to understanding the complex system you are trying to influence.

This section of the Sourcebook is broken down into a range of specific [Ecological](#) (p.21) and [Social](#) (p. 57) topics, from landscape connectivity and water quality to living wage jobs and cultural heritage.

The third objectives section focuses on [Organizational](#) objectives (p. 87). This information can help you evaluate how well you are improving or maintaining your organization, program or collaborative. For example, do you have effective participation and leadership, a good process for making decisions and adequate resources to implement your strategies? Organizational objectives, while not ultimate goals in themselves, enable your project to achieve ecological and social improvements effectively and efficiently.

### BALANCE AMONG GOALS

Although objectives are categorized as either ecological or social, these issues are tightly inter-related and sometimes even in conflict. Recognizing this, many projects have goals related to achieving *sustainability* or a *balance* between ecosystem and community needs. Questions and indicators related to balance among goals are captured throughout the Sourcebook, but especially in the Social Objectives section on [Sustainability](#) (p.80).



# ECOLOGICAL OBJECTIVES

Use this section to help you answer questions like:

What ecological, ecosystem or environmental improvements or conditions do we hope to achieve?

What are the long-term or cumulative impacts of our efforts on the environment? Are ecosystems healthier? Are species populations more viable? Has habitat quality increased?

## ECOLOGICAL OBJECTIVES

### Landscape

Extent & representation of communities  
Arrangement & connectivity of communities

### Habitats

Composition and diversity of species  
Habitat structure and food webs

### Species

Population demography and dynamics  
Genetics  
Physiology and behavior

### Water, Air and Soil

Water quality  
Water quantity and hydrology  
Air quality  
Soil structure, composition and fertility

### Key Processes

Energy flow and nutrient cycling  
Fire and other key disturbance and succession processes

## INTRODUCTION TO ECOLOGICAL OBJECTIVES

Many projects identify broad, over-arching ecological goals, such as improved ecosystem health, integrity, biodiversity or sustainability. These terms are useful because the general public views them positively. On the other hand, they are too broad to direct specific management activities or evaluate progress.



By definition, overarching goals like biodiversity, health, integrity and sustainability are based on the occurrence of *many* properties and parts of ecosystems, including living organisms, the physical environment and the processes that link them. Project objectives need to be stated in these more specific terms, because they are more directly manageable and measurable than the overarching goals they support.

### WHAT DO THEY MEAN?

<b><i>Biodiversity</i></b>	The <i>variety and variability</i> of living organisms at different levels – from genes to species to communities. Also the ways in which organisms interact with each other and with the physical environment
<b><i>Ecosystem Health</i></b>	Free from ecosystem illness. Relatively <i>stable</i> (maintains some sort of organized or structured state) and <i>resilient</i> (able to recover to its original state after disturbance).
<b><i>Ecosystem Integrity</i></b>	Whole or <i>complete</i> ; having all the parts and processes that are characteristic or natural for that region.
<b><i>Sustainability</i></b>	A <i>balance</i> between ecosystem use and protection; ecosystems are <i>used</i> in such a way that health, integrity or biodiversity are maintained over long periods of <i>time</i> .

So what are the measurable or manageable elements of ecosystems that together contribute to overall health, integrity or biodiversity?

Many practitioners consider ecosystems in terms of **biotic** (all living things) and **abiotic** (all nonliving things) parts. Levels of biotic or biological components include:

- individual organisms
- populations (made up of many individuals)
- species (made up of many populations)
- communities or habitats (made up of many species)
- landscapes (made up of many communities)

Elements of the physical or abiotic environment include:

- water
- air
- rocks and minerals

Alternatively, because the biological and physical components are really very tightly linked, others consider ecosystems in terms of three primary attributes:

- **composition** – the identity and variety of elements (e.g., number and type of species in a community)
- **structure** – the physical organization or pattern of these elements (e.g., proximity of habitat fragments in the landscape) and
- **function** – the ecological and evolutionary processes linking these elements (e.g., nutrient cycling).

In this Sourcebook ecological topics *combine* the focal biotic and abiotic and features of ecosystems with the linking concepts of composition, structure and function.

### ECOLOGICAL PROGRESS: COMPARED TO WHAT?

To assess progress you need to know how “here and now” compares to some other *benchmark* or reference. This will give you an idea of whether you are moving *toward* your ecological objectives.

Some useful comparisons for assessing progress toward ecological objectives include:

- A “pristine” or low impact site such as a designated wilderness area or unused area
- Different degrees of disturbance (e.g. moderately *vs.* severely polluted, no-till *vs.* conventional agriculture, or low *vs.* high intensity fire)
- Different kinds of disturbance or resource use (e.g. agriculture *vs.* development)
- Different management or restoration approaches (e.g. herbicide *vs.* herbicide + fire *vs.* fire only *vs.* a no treatment control)
- Before *vs.* after restoration or management activities
- Before *vs.* after uncontrolled or catastrophic event (drought, flood, fire). This can inform you about how *resilient* a system is – how well it rebounds from disturbance.
- Today *vs.* last year or *vs.* 50 years ago, depending on the time scale you expect the ecosystem attribute to change
- The range of natural variability

## HOW TO IDENTIFY AND EVALUATE *YOUR* PROJECT'S ECOLOGICAL OBJECTIVES

Choosing a few objectives and metrics from *each* of the ecological objective categories in the Sourcebook will capture what is meant by biodiversity, ecological integrity or health. That is, you should consider goals and measures related to landscapes, habitats, species, water, air, soil and key processes.

But how do you further prioritize and tailor your choices? There are several things you can consider to help you select measures of ecological progress that are relevant and realistic for your particular ecosystem.

### What are the ecological priorities for your ecosystem?

When setting ecological objectives and prioritizing ecosystem features to evaluate consider:

- **Landscape** and/or **habitat** objectives and measures for
  - **Characteristic and/or unique** areas (regionally or globally rare habitat types like old growth forest, special geographic features like bedrock glades or interior beaches)
  - **Regionally and/or globally significant communities**, including biodiversity hotspots with especially high native species richness
  - **Critical habitat** for key species, such as imperiled, threatened, endangered, sensitive or economically-important species (including breeding grounds or spawning habitat, migration stopovers, germination sites, etc.)
  - **Ecologically sensitive zones** (riparian buffer zones, floodplains, vernal pools, estuaries, etc.)
- Ecosystem process objectives and measures for **processes that are key to the maintenance or proper functioning of your particular ecosystem**, often called ecosystem drivers (such as fire, flooding, predation, stream productivity, etc.)
- Objectives and measures for those landscapes, habitats, species, physical resources or processes that are **most vulnerable** to local stressors or **threats** (areas within a landscape becoming fragmented by land use, water quality in an area with run-off from development or agriculture, threatened or endangered species, etc.)
- Issues of **public interest or concern**, or others that would motivate behavior, such as drinking water quality, economically important species, favorite scenic or recreation areas or ecosystem services<sup>2</sup> such as flood control, pollination or air purification.

<sup>2</sup> For more information on “ecosystem services” see <http://www.esa.org/science/Issues/TextIssues/issue2.php>

### What is “natural” or “appropriate”?

The ecologically appropriate type and amount of species, nutrients or water in an ecosystem will depend on the system. ***More is not always better.*** For example, nutrients in a grassland are generally cycled more quickly than in a forest, bog species diversity is lower than fen diversity and natural fire frequencies differ greatly among ecosystems.

To determine what is ‘right’ for a particular system many resource managers are increasingly relying on the “**range of natural variability.**” This approach, developed through the collaboration of scientists and practitioners, is useful not only for setting ecological goals, but also having meaningful *benchmarks* or comparisons against which to measure progress.

Natural variability encompasses two principles:

- Past or historical features of an ecosystem give an idea of what is appropriate or “*natural*” for that system
- *Variability*, which includes both spatial heterogeneity and change over time, is an integral feature of all ecosystems

Using information on the range of natural variability you can set objectives to bring species, water flow, nutrients and other key parameters within the range of what is ecologically appropriate for that ecosystem and area.

#### INFORMATION TO DETERMINE THE RANGE OF NATURAL VARIABILITY

- Long-term data sets from permanent plots, forest inventories, or stand records, especially available if your site is on or near a Long-Term Ecological Research program sites – see <http://lternet.edu/sites/>)
- Historical records or paleo-ecological information (from local universities) such as palynology, packrat middens, climate records, or dendroclimatology
- Expert opinion of ecologists or naturalists familiar with that system
- Photographs, writings, observations or experiences of long-term or previous residents

### What is realistic?

Ecological goals cannot be set without considering:

- **Societal needs** and land use expectations: A purely ecological approach to management, or one that attempts to eliminate human influences from the system, will not be successful because it is unrealistic.
- **Time frame** and **budget** to achieve your objectives: What level or amount of change from current conditions is feasible for your project to accomplish?
- **Starting conditions:** How much can they be changed?



### Indicator species: A key tool in ecological evaluation

Species have the power to modify ecosystems, motivate action and inform practitioners. For these reasons they are often the focus of project objectives, strategies and monitoring programs. As the table below shows, indicator species are just one of the many different types of focal species.

<i>Focal Species</i>	<i>Description</i>	<i>Examples (site-dependent)</i>
<b>Keystone</b>	Have an ecological impact larger than would be expected from their numbers alone (most evident when they are lost from the system)	Top predators, Dominant herbivores, Ecosystem engineers
<b>Ecosystem engineer</b>	Have a large effect on other species by dramatically altering their environment	Gopher tortoise, beaver, prairie dogs, coral, humans
<b>Umbrella</b>	Either need large areas to persist or use multiple habitats and therefore, if protected, would also protect many other species	Large carnivores, wolves, grizzly bears, northern spotted owl
<b>Flagship</b>	Popular, charismatic species that can attract public support for conservation	Panda, monarch butterfly, wolves, harp seal, salmon
<b>Representative</b>	Characteristic, common or even unique to the community type of interest	Karner blue butterfly of oak savannas, Jack pine of Midwestern pine barrens
<b>Exotic (alien, non-native)</b>	Did not evolve in that location; non-natives that spread rapidly and widely are also invasive	Yellow starthistle, purple loosestrife, salt cedar, zebra mussels, Argentine ant
<b>Resource / game</b>	Harvested and/or used for economic gain, subsistence or recreation; often popular and can attract public support for conservation issues	White-tailed deer, salmon, ponderosa pine, trout, etc.
<b>Special status</b>	Monitored or of interest because their persistence is or may be precarious	Threatened, endangered, special concern, rare, vulnerable or sensitive species
<b>Indicator</b>	Species that by their presence, absence, abundance or health indicate ecosystem conditions too difficult or expensive to measure directly; what they indicate about the system depends on their physiology, habitat requirements, relationships with other species and/or sensitivity to certain conditions	Gopher tortoise highly sensitive to soil disturbances; Cyanobacteria ( <i>Oscillatoria rubescens</i> ) signifies impending eutrophication; Longleaf pine associated with frequent fires in Florida

Different focal species are useful in different ways. For example:

- To *motivate action* you could use flagship, game or special status species
- To *set project goals* and management actions you may focus on keystone and representative species
- To *measure progress* toward ecological objectives you would use indicator species, which may include umbrella or non-native invasive species

#### MANAGED SPECIES

Indicator species are diagnostic tools. They tell you about the health of an ecosystem, but they do not usually *produce* health. This means that species whose presence depends on active management are not good indicators of the health of the system. For example, the presence or abundance of species maintained by reintroduction or supplementation programs or those that are regularly removed tell you more about human actions than they do about the state of the system.

Keep in mind that whatever species you focus on, no *one* species is sufficient to measure or produce ecosystem health or integrity.

#### WHAT MAKES A GOOD INDICATOR SPECIES?

Having economic importance or even being a keystone species does *not* necessarily make a species a good indicator. Useful indicator species should be meet ALL of the below:

- Sensitive to the physical, chemical or biological change of interest, which often requires a short generation time
- Practical and inexpensive to monitor or survey
- Easy to identify and distinguish from other species
- Has a well studied biology and natural history

### Putting it all together: An Example

A collaborative ecosystem management project working in southeastern Michigan found that historically their ecosystem was an oak hickory forest. Currently, however, it is a regionally rare prairie community with many unique and representative species. Project members also know that the ecosystem faces some critical but partially solvable threats, including invasive species and fragmentation caused by agriculture.

Considering all of this they decided to maintain and restore the prairie ecosystem rather than work toward converting it to its historical oak-hickory forest condition. They will use information on the range of natural variability of regional prairies to guide their efforts. Their overall ecological goal is “a restored, healthy, high quality prairie ecosystem.”

#### PUT A HISTORICAL SNAPSHOT INTO ITS CURRENT CONTEXT

To determine your ecological goal consider:

- The regional rarity of the current and historical habitat types
- The quality of the current ecosystem (what species are there and what condition are they in?)
- The level of problems (see [Ecological threats](#), p.109) that undermine habitat quality or restoration potential

Based on their goal, they *set more specific ecological objectives and measures of progress in terms of relevant ecosystem features*, shown here together with the Sourcebook section they used:

Increased connectivity of different prairie communities across the landscape	<a href="#">Arrangement and connectivity of communities in the landscape</a> (p.30)
High quality prairie habitat, with characteristic species and interactions among them, such as pollination	<a href="#">Composition and diversity of species</a> (p.32) and <a href="#">Habitat structure and food webs</a> (p. 34)
Viable species, especially representative and keystone prairie species	<a href="#">Population demography and dynamics</a> (p. 36), <a href="#">Genetics</a> (p. 38) and/or <a href="#">Physiology and behavior</a> (p. 40)
Restored soil that can support prairie diversity	<a href="#">Soil structure, composition and fertility</a> (p.48)
Natural hydrology and fire regime	<a href="#">Water quantity and hydrology</a> (p.44) and <a href="#">Fire and other key disturbance and succession processes</a> (p. 52)

***NEXT: Two page spreads on specific ecological objective topics***

## EXTENT AND REPRESENTATION OF COMMUNITIES IN THE LANDSCAPE

Changes in the type, size and arrangement of habitats within the landscape can impact the species that live there by affecting how they move around, how fire spreads or what resources are available. Even if you are focused on the health of a particular habitat or park, the quality of the larger landscape can be key to your project's success.

A **landscape** is typically a large area, such as a watershed or basin, that contains a collection of communities or ecosystems (e.g., oak hickory forest, prairie) or land cover types (e.g., agriculture, urban development, forest.).

To assess landscape-level changes you could measure:

- *Types* of communities, habitats or vegetation types present in the landscape
- *Area or extent* of these communities
- *Relative area* of certain communities, as a measure of how well they are *represented*

Generally the larger the area, the more species it can support. However, be aware that area, while easy to measure, is not in itself a *sufficient* measure of habitat quality. The placement and shape of an area can be just as important (see next section).


Knowing about changes in the presence, acreage or representation of certain community types in your landscape could allow you to:

- Assess the impact of prescribed vs. natural fires, urban sprawl, water diversion or other land use changes
- Identify key parcels for acquisitions or easements
- Obtain a large or coarse scale assessment of overall diversity


### Sample objectives

- *Increase the acreage of protected land in the project area*
- *Maintain riparian buffer zones along at least 60% of the Dana River*
- *Represent the diversity of ecosystem types characteristic of this region*

### Sample evaluation questions and indicators

 Are we gaining or losing certain habitats or community types in the area?  
How does the current number or type of communities in the landscape compare to the historic or natural range?

- ◆ Number of different vegetation types relative to pre-settlement patterns
- ◆ Presence/absence of certain communities, habitat-types or ecosystems

 How is the physical landscape changing in areas under different land use?

- ◆ Topographic relief, slope, aspect, elevation
- ◆ Soil types
- ◆ Shorelines, banks and channel attributes

**?** Are we increasing the extent of protected, natural or intact areas?  
 How well are we representing unique community types?  
 To what extent does the current landscape match the representation of communities here in the past?

- ◆ Number of patches of particular habitat types
- Percent of stream miles with different types of land cover
- Area of habitat for selected species
- Area of forest type by age class

Size of the largest patch of each ecosystem type in the landscape  
 Relative area of different types (Percent open space; proportion natural cover type; ratio of forest to pasture, etc.)  
 Presence of indicator species characteristic of certain ecosystem types

### PRIORITIZE

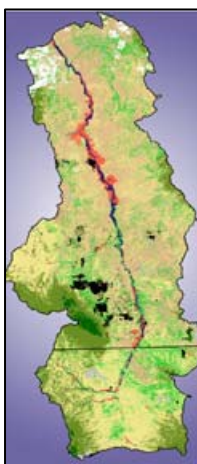
#### Evaluate the extent or representation of:

- Critical habitat for sensitive species
- Ecologically sensitive or critical zones (e.g., riparian buffer zones, floodplains, vernal pools, breeding grounds)
- Hotspots (areas with high species richness)
- Special geographic features (e.g., bedrock glades, interior beaches, open cliffs)
- Rare, imperiled or endangered types
- Important habitat/community types for regional or global biodiversity



#### Data sources

- GIS data. See the Federal Geographic Data Committee (<http://www.fgdc.gov/>)
- Vegetation maps
- Public land surveys. See: [http://www.geocommunicator.gov/GeoComm/lsis\\_home/home/index.html](http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html)
- Satellite images (see <http://landsat7.usgs.gov/index.php>)



#### Example

**The San Pedro River** community was interested in examining long-term change across their southeastern Arizona watershed. Partnering with scientists and managers from several agencies and universities, they used existing Landsat satellite remote sensor measurements. The stakeholder community decided on a 10-vegetation class system to categorize communities in the watershed and digital land cover maps from 1973 to 1997 were analyzed using ARC/INFO software. Information about changes in the composition and extent of communities in the landscape is now being used by the interagency San Pedro Partnership Committee in community planning and developing wildlife corridors.

For more info see: <http://www.epa.gov/nerlesd1/land-sci/san-pedro.htm> or <http://www.tucson.ars.ag.gov/salsa/salsahome.html>

## ARRANGEMENT AND CONNECTIVITY OF COMMUNITIES IN THE LANDSCAPE

Arrangement describes how communities or habitat patches are distributed in the landscape – their shape, how close together they are, what is at their boundaries. Knowing this gives meaning to the measure of area. For example, 10 acres of fen meadow may be distributed as 10 1-acre patches separated by 10 miles each or as 2 adjacent 5-acre patches. Closer patches have higher potential connectivity, allowing organisms to disperse among them and species interactions, such as breeding to occur. Similarly, a patch that is 10 miles long but only 2 miles wide is mostly edge, while a patch that is 4 by 5 miles is the same area but has a larger core. Core area is usually much higher quality than edge.



Measuring shape and proximity of habitats is especially important if you are concerned about habitat fragmentation or maintaining existing high quality areas, such as protected lands or riparian buffers.

### 🎯 Sample objectives


- *Enhance habitat connectivity*
- *Restore the ability of species to move throughout their range*
- *Increase viable habitat of species sensitive to edge effects*

### Sample evaluation questions and indicators


❓ Have management practices increased connectivity of communities in the landscape?<sup>3</sup>  
Are patches of the same type and/or different types well linked?

- ◆ Number, area and length of corridors between patches
  - Total area vs. number of patches
  - Patch perimeter to area ratio
  - Distance between patches
  - Length of habitat adjacent to non-natural habitat
  - Contagion index (measure of clumping or aggregation of similar land types)
  - Mean, minimum and/or maximum distance between patches
  - Difference in species composition (and other measures of [habitat quality](#), p. 32) between patches and surrounding matrix
  - Persistence of species sensitive to fragmentation, such as amphibians
  - Presence of wide-ranging species
  - Presence of specific gene stocks among populations, which indicates gene flow – see [Genetics](#) (p.38).
  - Observation of different types of species moving between patches or using corridors

<sup>3</sup> For additional more sophisticated measures of connectivity see Calabrese, J. and W. Fagan. 2004. A comparison-shopper's guide to connectivity metrics. *Frontiers in Ecology and Environment* 2(10):529-536.

 Are acquisitions improving the shape and therefore viability of an area?  
Does the shape of areas more closely match natural patterns?

- ◆ Area to perimeter ratio
  - Core area vs. edge area
  - Abundance of characteristic edge species
  - Proportion of natural habitats whose shape is: circular or ovoid (generally best), square or rectangular, irregular or long and thin (generally worst)

 Is the quality of the intervening habitat (*matrix*) increasing?  
Are created wildlife corridors more effective than the matrix that was already there?

- ◆ Degree of ecological dissimilarity between matrix and patches
  - Observation of different types of species moving between patches or using corridors

### Data sources

- GIS data (see the Federal Geographic Data Committee <http://www.fgdc.gov/>)
- Vegetation maps, public land surveys, etc. – see Geography Network data: <http://www.geographynetwork.com/data/index.html>
- Satellite images (see <http://landsat.usgs.gov/index.php>)
- Aerial photographs

### Example

**Natural Lands Trust**, a nonprofit land trust in the greater Philadelphia region, has been acquiring, conserving and protecting land since 1953. In 1997 they realized that open spaces were becoming fewer in number and that they needed to be more efficient with their land conservation efforts. However, they discovered there was “no clear, scientifically based criteria for identifying these lands.” To remedy this, they helped develop Smart Conservation – “a dynamic method of identifying, evaluating and prioritizing landscape resources using a variety of criteria.” One aspect of Smart Conservation is the use of GIS to analyze whether a potential habitat is worth conserving in terms of *how it is arranged in the landscape*. To do this, they measure acreage using a potential habitat size worksheet and the shape of the contiguous habitat using a shape conversion chart.

For more information see: <http://www.natlands.org>; and for detailed information about habitat size worksheets and shape conversion charts see: <http://www.smartconservation.org>

## COMPOSITION AND DIVERSITY OF SPECIES

Many projects aim to maintain or restore *good quality habitat* for native species. This requires first identifying the habitat or community<sup>4</sup> and then getting a better idea of which species are represented there. How those species interact and the structures they live in are also important for habitat quality and are covered in the next section.

Site-specific changes in composition, such as the arrival of non-native species or the loss of sensitive native species, can be important indicators of community quality change. Note that while the *number* of species present is a common measure of community condition, knowing *which* species are present is critical to evaluating success. An increase in species number may simply reflect an undesired change in the soil, a loss or over abundance of native predators or the arrival of exotic species.

It may also be useful to know whether certain species are more dominant than others in the community. Measures of representation – relative abundance and species **evenness** – require some estimate of the number or amount of each species.

**Diversity** includes both an assessment of how many different species there are (species **richness**) and how many individuals there are of each species (species **evenness** or relative abundance).

### 🎯 Sample objectives

- *Increase native species diversity*
- *Maintain species that characterize the area's unique ecosystem*
- *Restore high quality habitats for native species*

### Sample evaluation questions and indicators

- ❓ Are characteristic species returning to managed areas?  
Are restored sites becoming more similar to undisturbed sites?

- ◆ Index of Biological Integrity
- Floristic Quality Index
- Presence/absence or abundance of certain species
- Observed successful reproduction of characteristic species (presence of eggs, plant seeds, young animals, etc.)
- Appearance of community in photos (may require expert assessment)

#### MEASURES OF HABITAT QUALITY BASED ON SPECIES COMPOSITION

**Index of Biological Integrity (IBI)**, commonly used in aquatic habitats, compares the species in a site to one with little human impact. The specifics of an IBI depends on the area and habitat for which it is developed.

**Floristic Quality Index (FQI)** compares the plant species among sites or over time using the Coefficient of Conservatism (C), a measure of how likely it is that a plant species would occur in a relatively unaltered landscape

<sup>4</sup> Habitat types or communities can be classified broadly or more finely depending on the evaluation question. For examples of how to classify community or land use types see: <http://www.fgdc.gov/>, <http://www.esa.org/vegweb/>, <http://landcover.usgs.gov/classes.php>, or [http://www.rsgis.msu.edu/pdf/lclu/MIRIS\\_2\\_definitions.pdf](http://www.rsgis.msu.edu/pdf/lclu/MIRIS_2_definitions.pdf)



**?** How have land use changes affected the number of species living in this community? Has species richness increased? Has diversity increased?

- ◆ Total number of species within certain guilds or taxonomic groups  
Diversity index<sup>5</sup> (for a particular group of species), such as Fisher's Alpha, Simpson's Diversity index (D) or Shannon index (H)

**?** Are some species becoming more rare or dominant?  
Does the current representation of species fall within the range of natural variability?  
Do native species make up a greater proportion of the community than before?

- ◆ Relative number of individuals per species (or percent cover or biomass for vegetation)  
Dominance index



#### Data sources

- Species inventories (including presence/absence checklists, such as those done by the National Audubon Society, the Nature Conservancy, Natural Heritage Program, Christmas Bird Count or other organizations, schools or clubs, including North American Amphibian Monitoring Program: <http://www.pwrc.usgs.gov/naamp/> , North American breeding Bird Survey: <http://www.pwrc.usgs.gov/bbs/>
- Photo-monitoring program



#### Example

**Texas Parks and Wildlife Department** was interested in how non-game birds on mesquite rangeland in the Rolling Plains responded to management specific for bobwhite quails, which included disked strips, brush shelters and food plantings. Researchers counted non-game birds on the managed site and on a similar unmanaged site. They found that management increased the availability of seeds for more birds than just bobwhites: in ten of twelve months there were more species and higher densities of non-game birds on the managed than unmanaged site. Thus they were able to determine some of the effects of management on other species in the community.

For more information see:

[http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_lf\\_w7000\\_1142.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_lf_w7000_1142.pdf) and [http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_rp\\_w7000\\_1025.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_rp_w7000_1025.pdf)

#### PRIORITIZE

##### Evaluate species groups that

- Have key functional roles (top predators, pollinators, decomposers, soil-stabilizing plants, insect herbivores, etc.)
- Have particular habitat requirements (e.g. amphibians, understory plants, fire-dependent plants, ground-nesting birds, migratory birds, etc.)
- Are indicators of a healthy ecosystem, such as ants (compared to disturbed system), characteristic tall-grass prairie forbs, etc.

<sup>5</sup> To calculate some diversity indexes see: <http://www.smartconservation.org/utilUtilityList.asp>

## HABITAT STRUCTURE AND FOOD WEBS

A viable community is not just one where species are present, but where they interact and are arranged in ways that support biodiversity.

The presence of *structure* in a community, such as a dead standing tree, submerged aquatic vegetation or a gopher's mound, can be just as critical as its species and can change dramatically under different kinds of management. Measures of *food web* structure relate to how organisms are distributed across different feeding or trophic levels (producers, herbivores, carnivores, etc.) and can be a valuable indicator of important ecosystem processes, such as productivity and energy flow, which may be more difficult to measure.


Species *interactions* form the basis of food webs. They include competition, predation, parasitism, disease, herbivory, pollination, seed dispersal, protection mutualisms, etc. Measuring them can alert you to important changes in the community, such as the decline of top predators or the loss of suitable habitat for a critical pollinator.

### Sample objectives

- *Restore high quality habitats for native species*
- *Maintain structural complexity of communities*
- *Restore natural species interactions*
- *Recover natural rates of predation*



### Sample evaluation questions and indicators


 Has the structural complexity of the community increased?

Is species richness higher in areas with more complex structure?

How are prescribed burns affecting the thickness or layering of vegetation?

- ◆ Presence or density of key living or non-living structures (forests: deadwood<sup>6</sup>; streams: large woody debris, marsh grasses or eel grass beds)
- ◆ Presence of species that rely on logs, snags (standing, dead trees), woody debris, etc. as habitats
- ◆ Appearance of community structures or layering in photos over time
- ◆ Size and arrangement of vegetation gaps (light map)
- ◆ Percent cover or percent openness
- ◆ Ratio of water to emergent vegetation (wetlands)
- ◆ Canopy openness
- ◆ Relative abundance of different life forms (e.g. shrubs, trees, herbs)
- ◆ Number of strata or vegetation layers
- ◆ Percent of trees in different height classes
- ◆ Nesting success of ground-nesting birds
- ◆ See also [Water quantity and hydrology](#) (p.44)

<sup>6</sup> Deadwood, including snags (dead standing trees) might make a forest look “messy,” but they can be home to one-third of all forest species and contribute to soil fertility as they decompose. How much deadwood is enough depends on the forest type - its density, fire regime, etc.

-  Are species interactions occurring appropriately?  
 Are top carnivores present and influencing the ecosystem?  
 Has herbivore pressure on native plants decreased?  
 Is pollination/seed dispersal adequate for the reproduction of native plants?

- ◆ Relative dominance of known competitors or predators
- Reproduction of pollinator-dependent species
- Pollen flow distance and amount
- Persistence of indicator species that requires certain species interactions, such as a specialized herbivorous insect

-  Has the food web changed or become less complex?

- ◆ Number of feeding levels or guilds
- Presence/absence of top predators, dominant herbivores or other trophic levels
- Relative proportions of different functional feeding groups (especially useful for aquatic invertebrates)

### Data sources

- Species inventories or presence/absence checklists by the National Audubon Society, the Nature Conservancy, Natural Heritage Program, Christmas Bird Count, schools, clubs, North American Breeding Bird Survey (<http://www.pwrc.usgs.gov/bbs/>) or Amphibian Monitoring Program: <http://www.pwrc.usgs.gov/naamp/>
- Stream or wetland monitoring surveys (data from USFW , EPA, etc.)
- Photo-monitoring program

### Example

**Project Prairie Birds** is a multi-party partnership studying the distribution and habitat preferences of grassland bird species in an effort to inform land management and planning throughout Texas. Using a “citizen science” approach, they coordinate volunteer birders to measure a variety of habitat features, including community structure. Within permanent transects, they determine the percent cover of grass, forbs, leaf litter, bare ground and water. They also measure the vertical thickness of the vegetation, the number of fire ant and gopher mounds and the number of woody shrubs, trees and snags. The information is being used to understand how critical habitat for grassland bird species is changing over time.

For more information and detailed sampling methods see:  
[http://www.tpwd.state.tx.us/huntwild/wild/birding/project\\_prairie\\_birds/](http://www.tpwd.state.tx.us/huntwild/wild/birding/project_prairie_birds/)

## POPULATION DEMOGRAPHY AND DYNAMICS

Simply measuring whether a species is present or absent in a community may suffice, but it often helps to have more information about the health of key species populations.


Demography captures the vital statistics of a species – how many there are, the relative number of males, females, juveniles, etc. Dynamics describes how these statistics are changing over time. Tracking these features can allow you to assess:

- how *viable* a whole species or particular population is
- whether it is *recovering* from disease or from being over-exploited
- whether, for the case of an invasive species, it is *spreading* more rapidly than before or
- what the health of the overall system is (for key *indicator* species).


### Sample objectives

- *Restore self-sustaining populations of endangered and threatened species*
- *Maintain viable fish populations*
- *Maintain natural age distributions of forest trees*


### Sample evaluation questions and indicators

 What is the overall condition of the species?  
Is it improving?


- ◆ Number of populations that repeatedly complete life cycle without human intervention  
Evidence of continued recruitment (seedlings, offspring, etc.)  
Percent cover of a plant species from photographs or observed plots

 Are populations of rare species growing?  
Is the population size closer to the minimum viable population size (if known)?  
Do managed habitats support more individuals than other areas?

- ◆ Numbers of localities present and number of individuals per locality  
Density estimate (number per area) from limited area sampling  
Observed frequency of breeding/rearing behavior

 Is the density of individuals closer to the range of natural variability?  
Are individuals less crowded in protected areas?

- ◆ Distance between individuals (nearest neighbor)  
Degree of clumping

 How does the age structure of populations differ in managed areas?  
Are there more young or reproducing individuals?



- ◆ Percent of population that is of reproductive age

### PRIORITIZE

#### Evaluate populations of

- Key species, such as keystone, harvested, representative or special status species or species that can indicate something more about the health of the ecosystem
- Species that are under different management practices

Age class distribution (proportion of juveniles, fledglings, saplings vs. adults)  
Percent of forest that qualifies as old growth

-  What is the population size likely to be next year?  
Are populations of rare species growing more or less rapidly than previous years?
-  Birth rates; frequency of reproductive events; litter size  
Number of new recruits per year (recruitment rate; fledgling success)  
Death or mortality rates  
Growth rate<sup>7</sup>  
Frequency of immigration and emigration  
Sex ratio

### Data sources

- North American Amphibian Monitoring Program:  
<http://www.pwrc.usgs.gov/naamp/>
- North American breeding Bird Survey: <http://www.pwrc.usgs.gov/bbs/>
- South Atlantic Migratory Bird Initiative: <http://samigbird.fws.gov/>
- Natural Heritage, Audubon or other organization or university surveys
- Harvesting records (USFS, timber companies, State hunting/fishing records)
- Roadside sightings, point counts or estimates

### Example

Bobwhite quails in Georgia have declined by more than 70 percent since the 1960s. In order to address this decline, Georgia's Department of Natural Resources implemented the **Bobwhite Quail Initiative (BQI)** – a landowner program that improves quail nesting and brood rearing habitats (two factors limiting quails) across Georgia's landscape. BQI works with farmland owners and helps landowners make habitat changes to their farmland so that it is beneficial to Bobwhite quails. To measure the effect of the habitat changes they compared quail population numbers on BQI farms to farms that did not make any habitat changes (control farms). The number of calling quails (covey-call-counts) served as an indirect measure of the number of quails at a site. After two years, BQI found that quail populations were increasing on BQI farms and declining on control farms. This information provides concrete feedback on the effectiveness of their habitat change program.

For more information see:

<http://georgiawildlife.dnr.state.ga.us/content/displaycontent.asp?txtDocument=108>

<sup>7</sup> A population does not have to be growing to be viable. Many natural populations fluctuate at around zero net growth. A *decline* in growth rate indicates the need to look at possible threats to the population.

## GENETICS

Genetic features of a population, such as the presence of certain genes or the level of genetic variation, are not always difficult to measure and can reveal information about a species that is critical to its viability. Genetic variation, for example, can in some cases be measured as observable variations in color or morphology. This variation can indicate whether small populations have high levels of inbreeding (and are therefore prone to poor breeding success), can bring to light changes in selection pressures or the degree of isolation of a population due to low habitat quality or fragmentation.



### Sample objectives

- *Maintain genetic diversity*
- *Preserve the integrity of natural genetic material*
- *Viable species populations*

### PRIORITIZE

#### Evaluate the genetics of species or populations that are:

- In *captive breeding programs*, where sufficient genetic variation is critical to the species' evolutionary potential
- Indicators of *habitat fragmentation or the effectiveness of habitat corridors*. That is, the degree of genetic differences among isolated populations can give you a sense of how well individuals are moving among populations.
- *Pest* species, because knowing how variable the pest is can improve the effectiveness of programs to breed resistance in organisms affected by the pest.
- Species whose *genetics are well known* and therefore more easily measured (historically well-studied species and/or the focus of local university research).

### Sample evaluation questions and indicators



What is the level of variation in populations within fragments?

Are these populations highly inbred?

Is this species evolving? Are management practices changing gene frequencies?



Degree of variation (heterozygosity)

Change in gene frequencies over time

Proportion of different morphotypes

Frequency of deleterious mutations

Change in color or other morph frequencies over time



### Data sources

- Population genetics studies (from local research by graduate students or other researchers) on species of interest
- Observed variation in species with known links between genetics and phenotypes
- Historical records of species morphology or color patterns for species with known links between genetics and phenotypes



### Example

#### The Eastern Slopes Grizzly Bear Project

(ESGBP) was interested in determining the overall effect of human development and activities on grizzly bear populations across Canada's Central Rockies Ecosystem (CRE). The ESGBP partnered with researchers from the University of Calgary to gather data on grizzly bears and to link this information with management decisions. Using nuclear and mitochondria DNA analyses to study grizzly bears in the Bow River Watershed,



ESGBP found several informative patterns. For example, they were able to determine that there was low maternal gene flow between bear populations in the Eastern Slopes and those in the Northern Continental Divide and that genetic variation (measured by heterozygosity) was lower in the Bow River watershed than more northern populations. ESGBP used these data to raise awareness and concern about the isolation of grizzly bear populations throughout the Central Rockies Ecosystem. They shared this information with a multi-stakeholder group so that management plans would improve the connectivity of grizzly bear habitat throughout the Central Rockies Ecosystem.

For more information see:

<http://www.canadianrockies.net/Grizzly/index.html> and

<http://www.canadianrockies.net/Grizzly/genetic.html>

## PHYSIOLOGY AND BEHAVIOR

The health of individuals of a species, measured in terms of their physiology and sometimes behavior, may be an important evaluation measure for those species of particular concern, such as threatened or endangered species or species with high economic value. Measures of species health can also serve as indicators of other changes in the system, such as:

- toxin levels
- disease spread or
- change in physical conditions such as salinity, air quality or water availability.

### 🎯 Sample objectives

- *Maintain healthy populations of endangered and threatened species*
- *Protect critical fisheries from disease*
- *Protect habitat critical to species health*

### Sample evaluation questions and indicators

❓ Are individuals of this species healthy? Are they healthier in managed vs. un-managed populations?

Has the condition of these plants or animals changed in areas with increased recreation?

- ◆ Animals:
  - Glycogen stores,
  - Blood chemistry
  - Sores, lesions
  - Behavior
  - Responsiveness
  - Mass to length ratio (fish)
  - Deformities
- ◆ Plants:
  - Carbohydrates stores
  - Nutrients and polyamines
  - Abnormal defoliation
  - Leaf color
  - Crown die-back
  - Percent of vegetation with disease/herbivory marks
- ◆ Plants or animals:
  - Growth rate
  - Enzymatic activity (e.g. detoxification enzymes)







### Data sources

- Wildlife veterinary records
- Crown health monitoring
- Observations made by hunters or anglers
- Vegetation surveys



### Example

The USDA Forest Service's **Forest Health Monitoring (FHM)** program tracks the condition of forests throughout the country by monitoring a variety of metrics within permanent plots, including measures of individual tree health or physiology, many of which are related to the condition of the foliage in the tree crown. For example, *crown dieback* is observable as the death of branches with fine twigs on the outer edge of the crown, moving inward toward the trunk. Species-specific crown dieback is an indicator of the severity of recent stresses to a tree, such as pests, disease and drought and the ability of the tree to cope with these stresses. Together with measures of the physical environment and other measures of tree health, species-specific crown condition is used to inform management plans that promote forest health and sustainability throughout the U.S.



For more information see:

<http://fhm.fs.fed.us/>

and for detailed standardized methods see:

<http://fia.fs.fed.us/library/field-guides-methods-proc/>

## WATER QUALITY

Even if your project is not focused on water, the condition of freshwater, estuary and marine ecosystems can be a bottom-line indicator of overall project success. Water quality (and [Water quantity and hydrology](#), next page), is directly linked to land use and restoration efforts, as well as human health and recreation.

Chemical, physical and biological aspects of water quality can be measured over time in one specific area and/or in terms of the miles of stream or coastline, percent of watershed or number of estuaries, wetlands, waterways, etc. that meet certain conditions or standards.

### MONITORING WATER QUALITY

Water quality lends itself well to volunteer monitoring because it's fun and has established protocols. The following provide specific guidance on establishing a water monitoring program:

- <http://www.deq.virginia.gov/cmonitor/guidance.html>
- <http://www.epa.gov/owow/monitoring/vol.html>
- <http://dipin.kent.edu/>
- <http://www.pca.state.mn.us/water/monitoring-guide.html>

### 🎯 Sample objectives

- *Improve water quality*
- *Maintain clean, unpolluted sources of drinking water*
- *Restore aquatic habitat for endangered mussel species*

### Sample evaluation questions and indicators

- ❓ Is water quality improving?  
 Is water quality higher downstream of restoration sites?  
 Have conditions for aquatic species improved?

◆ *Chemical:*

Dissolved Oxygen  
 pH  
 Nutrients (nitrogen, nitrites, nitrates, ammonia, phosphate, etc.)  
 Water color or odor  
 Presence/abundance of indicator species of salinity (e.g. *Siren* spp.), pH (e.g. diatoms) or eutrophication (e.g. dippers, *Cinclus cinclus*)  
 Number of fish consumption advisories  
 See also [Water Pollution](#) (p. 116)

◆ *Physical:*

Water temperature  
 Percent of river that is shaded at certain time of day and year  
 Turbidity/transparency



Total suspended solids  
 Conductivity  
 Streambed type/particle size distribution (silt, sand, pebbles, etc.)  
 Bank sloping angle  
 Amount and type of surface debris (trash, large woody debris, leaves, etc.)  
 Water Quality Index (WQI) based on chemical & physical data (see [http://www.nsf.org/consumer/just\\_for\\_kids/wqi.asp](http://www.nsf.org/consumer/just_for_kids/wqi.asp))

*Biological:*

Type and abundance of benthic macroinvertebrates  
 Presence/abundance of bacteria (total coliforms, fecal coliforms)  
 Chlorophyll *a* concentration (indicator of algal/phytoplankton abundance)  
 Percent cover by submerged aquatic vegetation (SAV)  
 Abundance, type and diversity of fish  
 Recruitment rate of fish or mussel species  
 Index of Biological Integrity (IBI) based on macroinvertebrate or fish<sup>8</sup>



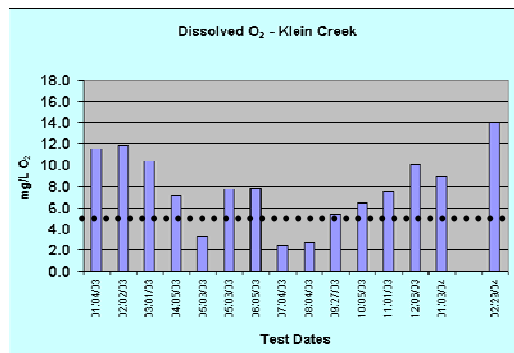
### Data sources

- Federal EPA, state DNR, DEQ, etc. (e.g. DEQ Water Quality Databases, EPA local drinking water information: <http://www.epa.gov/safewater/dwinfo/index.html>)
- Local watershed councils often have inventories of existing water monitoring programs, (e.g. <http://www.vwrrc.vt.edu/vwmc/Survey.asp>)
- USGS (<http://water.usgs.gov/nsip>) and other water monitoring stations
- Volunteer water monitoring groups
- Municipal water treatment plants
- Local soil and water conservation district



### Example

The **River Prairie Group** of the Sierra Club initiated a water-monitoring project for the Des Plaines watershed, which includes an identified impaired waterway. They measured chloride, ammonia, nitrates, dissolved oxygen and water temperature. These data are being used to establish trends (against a baseline) in the pollutants and parameters measured, as well as to set Total Maximum Daily Load (TMDL) limits for pollutants. The graph shown here compares dissolved oxygen data collected over two years from the Des Plaines watershed to the Illinois EPA minimum of 5.0mg/L (dotted line).



For more information see:

<http://illinois.sierraclub.org/RPG/watermonitorproj.htm>

<sup>8</sup> IBI combines several metrics about a species assemblage (species health, trophic level, pollution tolerance, etc.) into one value. Which measures are included in the IBI will depend on where you apply it.


## WATER QUANTITY AND HYDROLOGY

The flow and storage of water is directly related to the condition of many biological communities as well as [Water quality](#) (previous section). How much water is stored in lakes, ponds and in the ground and the way it moves above and below ground creates and maintains riparian, wetland and other critical species habitats across the landscape.

### Sample objectives

- *Restore natural water flow regime and drainage patterns*
- *Remove barriers to fish passage*
- *Preserve 100 acres of high quality wetlands*
- *Maintain the free-flowing character of the river*

### Sample evaluation questions and indicators

-  Are surface and ground waters flowing within the range of natural variability?  
 How have increased water removal rates affected stream hydrology?  
 Are we successfully returning this system to pre-dam condition?  
 Are current water flow patterns increasing pollutant resident times?

- ◆ Timing, magnitude, frequency, duration, velocity, variability and direction of water flow
- Frequency, intensity, extent and duration of flooding
- Water level fluctuations
- Water aquifer withdrawal and recharge rates
- Inflow/ Discharge
- Sediment and debris transport rates
- Distribution and extent (acres) of aquatic habitats: streams, wetlands, estuaries, etc.
- Structure of shoreline and/or bottom terrain of estuary, stream or lake (mean particle size, etc.)
- Salinity gradients
- Channel morphology and complexity (oxbows, backwaters, etc.)
- Pool to riffle ratio
- Abundance of hydrology-sensitive species, such as flood-tolerant vegetation, submerged aquatic vegetation (SAV) or floodplain spawning fish
- Size and distribution of logjams<sup>9</sup>

#### COMPARED TO WHAT?

It would be informative to compare hydrology measures before *vs.* after or upstream *vs.* downstream of known alterations such as:

- Water diversion for agriculture or industry
- Tiles or dikes
- Dams or other impoundments
- Channels

<sup>9</sup> Previously thought to be a problem to be removed, logjams are now recognized as an important part of a river's natural physical structure. They help reduce erosion and provide habitat for fish and wildlife. Woody Debris Management (WDM) is therefore often a part of efforts to restore water quality and hydrology.

? Are current water flow patterns increasing pollutant resident times?

- ◆ Concentrations of contaminants in sediments
- Numbers of health advisories for fish

? Is fish passage improved? Are fish able to migrate up-and downstream?

- ◆ Fish passage counts
- Adult to adult return ration above and below fish ladder
- Spawner to return ratios for initial colonizers
- Habitat productivity up and down-stream of removed fish barrier

### Data sources

- USGS water gauges and maps: <http://water.usgs.gov/nsip>; <http://water.usgs.gov/waterwatch>, <http://ngmdb.usgs.gov>
- Local or regional drain commissions
- USFWS Fish passage website <http://fisheries.fws.gov/FWSMA/FishPassage/fpprgs/overview.htm>
- American Rivers dam removal tool kit [http://www.americanrivers.org/site/PageServer?pagename=AMR\\_content\\_8cf8](http://www.americanrivers.org/site/PageServer?pagename=AMR_content_8cf8)

### Example

The **Smith Mountain Lake Association**, an alliance of upstream and downstream stakeholders in Virginia, wanted to manage water levels and water quality throughout the Roanoke River Basin. To do this they first collected and assessed data on historic water flow, looked for statistically significant monthly trends and constructed a computer model of water flow at Smith Mountain Lake. Based on this information they recommended water flow strategies to governmental agencies, increased awareness about water conservation throughout the watershed and assisted with the management of the lake levels for many different stakeholders. The association was successful in getting stakeholders with different agendas to look at water levels and water quality in a manner that maintained their current level of water quality, protected their wetlands and improved waters that were deemed impaired by State and Federal standards.



For more info see:

<http://www.lynchburg.net/smla/page6.htm>

## AIR QUALITY

Clean air is important to everyone and is often affected by how we manage land and water resources. Because air quality is usually managed in the context of reducing air contaminants or pollutants, a more extensive list of measures for evaluating the condition of the air, including reducing sources of air pollution, is located in the section on threats (see [Air pollution](#), p. 118).



### 🎯 Sample objectives

- *Improve air quality*
- *Maintain a clean, unpolluted atmosphere*
- *Improve human health*

### Sample evaluation questions and indicators

❓ Has air quality improved?

Are we meeting air quality standards?

Has our program to encourage non-motorized commuting improved air quality?

- ◆ Number of complaints about ambient air odor, color or visibility
- Number of asthma cases treated (sales of asthma/allergy medicines)
- Number of days of high particulate matter in the air
- Incidence and length of smog alerts issued
- Number of lakes with pH less than 6
- Number of calls about malodorous air
- Number of ozone action days by region per month
- Amount of area in non-attainment by pollutant (based on attaining national air quality standards)
- pH of rain water or lakes
- Amount of Ozone, CO, Nitrogen Oxides, Sulfur Dioxide, Lead, ad/or particulate matter – over time or in urban *vs.* rural communities

### 📋 Data sources

- Local or state Clean Air Coalition
- State Department of Environmental Quality (DEQ)
- Local and national air quality information at AIRNow  
<http://cfpub.epa.gov/airnow/index.cfm> and Air Data  
<http://www.epa.gov/air/data/index.html>
- State Commission on Environmental Quality
- EPA's Ambient Air Monitoring Group (AAMG) data and monitoring methods:  
<http://www.epa.gov/ttn/amtic/>

- EPA's Toxic Release Inventory database certain covered industry groups as well as federal facilities' release: <http://www.epa.gov/tri/>
- List of facilities in your area that produce and release air pollutants from EPA's Aerometric Information Retrieval System (AIRS): [http://oaspub.epa.gov/enviro/ef\\_home2.air](http://oaspub.epa.gov/enviro/ef_home2.air)
- American Lung Association (ALA): [www.lungusa.org](http://www.lungusa.org)
- Local media headlines and letters to the editor about air quality
- Medication sales (related to asthma, allergies, etc.) from pharmacies, county clinics, county health and human service agencies



### Example

**Clean Wisconsin**, an environmental advocacy organization, is interested in protecting air quality in Wisconsin using a variety of methods from educating the public to legislative campaigns. One of their aims is to reduce the amount of mercury emissions from power plants and require that old coal-fired power plants “meet pollution standards required of new plants.” They measure the success of their efforts through legislative victories (number of new laws that require power plants to decrease their emissions) as well as decreases in the amount of air-borne pollutants (number of coal plants that had installed pollution controls for mercury and number of old coal plants that met the pollution standards required of new plants).



For more information see:

<http://www.cleanwisconsin.org/campaigns/air.html>.

## SOIL STRUCTURE, COMPOSITION AND FERTILITY

Soil is the basis for biodiversity and monitoring changes in what's in it, its fertility or even its physical structure can be great measures of overall ecosystem function. Soil can tell you about key processes such as nutrient cycling, energy flow, primary productivity (plant growth), decomposition and disturbance, such as erosion, compaction, burning, trampling or grazing. In this way soil can be an early warning sign for land use impacts or an indicator of how well an ecosystem had recovered from previous use.



Soil can be thought of as having:

- *Physical properties and structure*, which includes layers and patches of different soil types, how the soil is sloped or compacted and how much water the soil holds; and
- *Chemical and biological composition*: the nutrients, particle types and living organisms present in the soil.

### 🎯 Sample objectives

- *Minimize soil rutting and compaction*
- *Preserve soil integrity and fertility*
- *Ensure the long term productivity of the land*
- *Maintain key ecosystem processes*

### Sample evaluation questions and indicators

- ❓ Are management practices changing the physical structure of the soil?  
Are soils less compacted?  
How has the amount of fertile topsoil changed?

- ◆ Soil moisture
  - Water-holding capacity or (infiltration, porosity)
  - Rise in river level after hard rain (measure of ability of soil to absorb water)
  - Change in amount of sediment running off into nearby streams
  - Topsoil depth
  - Bulk density (Weight/volume)
  - Slope or aspect (position in the landscape)
  - Patchiness (aggregation)
  - Tilth
  - Quality and amount of vegetation

- ❓ Have management practices changed the composition or fertility of the soil?

- ◆ Presence of microbes and fungi
  - Texture (proportion sand, loam, silt, clay)
  - Amount and type of organic matter

### COMPARED TO WHAT?

Soil characteristics can be measured over time in one location, or across sites under different management. For example, bulk density, a measure of the degree of soil compaction, is likely to be higher in areas logged using heavy equipment vs. low-impact logging areas. Over-compaction of the soil can prevent new plant growth.



Nutrient content (nitrogen, phosphorous, potassium, etc.)  
 Mineral content (parent material)  
 pH or pH buffering capacity



What is the condition of soil health?

Has soil fertility increased? Have soils recovered from previous use?

Is soil condition supporting biodiversity?



Leaf litter depth

Biological activity (respiration, decomposition rates)

Nutrient availability: Ca, P, Si, N

Cation exchange capacity

Leaching

Sediment export to stream drainage or groundwater

Organic matter (amount, quality index)

Quality and amount of vegetation

Microbial community composition

Microbial biomass

Soil invertebrates

Productivity maintained during period of shortage (e.g. drought)

Percent plant cover after disturbance



### Data sources

- USDA Natural Resources Conservation Service (NRCS) soils site:  
<http://soils.usda.gov/>
- Volunteer group measures of leaf litter depth
- Farm records
- Soil analysis lab of state university



### Example

The **Natural Resources Conservation Service** (NRCS), a division of the United States Department of Agriculture, provides tools, information and resources to help people assess soil quality and decrease soil erosion. For example, NRCS' "Soil Quality Test Kit Guide" details the "Revised Universal Soil Loss Equation" so that planners can determine the amount and type of ground covers and structural additions (i.e., sod, mulch, silt fences, hay bales...) that are necessary to maintain soil quality and decrease soil erosion and sediment export into streams and rivers. In addition to soil on construction sites, NRCS also provides detailed instructions for how to assess soil quality in other urban and agricultural areas.

For more information and descriptions of soil quality indicators see:

<http://soils.usda.gov/>

## ENERGY FLOW AND NUTRIENT CYCLING

A properly functioning ecosystem depends on the sometimes less obvious processes that maintain it. This includes the flow of energy and the cycling of nutrients through the living and non-living parts of the system.

Energy flow relates to *productivity*. Energy is stored in ecosystems in the form of carbon-carbon bonds in plants, animals and microbes. Thinking about changes in your system with respect to energy can alert you to pervasive or large-scale impacts. For example, energy is lost from a system when plants are harvested and removed. This energy change will reduce the amount of energy flowing to organisms higher on the food chain, affecting population sizes and species composition.

Nutrient cycling (of nitrogen, phosphorous, potassium, etc.) relates to fertility and can also alert you to more complex or far-reaching changes in ecosystem function. For example, a change in the normal flux of nitrogen in waterways can signal an increase in air pollution, over-use of fertilizer or the disruption of the river food chain.


**Ecosystem processes** are the range of dynamics or activities within an ecosystem that link its living and nonliving parts. Key processes include:

- Species interactions, such as predation & pollination (see [Habitat structure and food webs](#), p. 28)
- Water flow and flooding (see [Water quantity and hydrology](#), p. 38).
- Energy flow and nutrient cycling (this section)
- Fire and other disturbances related to the process of succession (next section)

### Sample objectives

- *Maintain resilient, functioning ecosystems*
- *Maintain productivity*
- *Restore the ecological processes that keep forests healthy*

### Sample evaluation questions and indicators

-  Have we restored natural levels of *productivity*?  
Can the ecosystem support current resource use?

- ◆ Net primary productivity
- Human appropriation of net primary productivity (HANPP)
- Leaf area density
- Tree growth

### PRODUCTIVITY & HUMAN USE

**Net Primary Productivity (NPP)** is the amount of new plant biomass produced in an area per year. It is important to distinguish between the *total* NPP (TNPP) and that which *remains* in the system (RNPP). For example, in agricultural systems, TNPP may remain the same over time, but as harvesting efficiency increases, more of the biomass is removed leaving less RNPP.

The difference between total biomass produced and the amount remaining after human use (TNPP – RNPP) is the **Human Appropriation of NPP (HANPP)**. This can be a good indicator of the relative sustainability of different resource use scenarios.

? How are nutrient cycles changing over time?  
How is management affecting nutrient cycling?

- ◆ Leaf litter depth
- Percent vegetative cover
- Leaf color
- Carbon storage (terrestrial)
- Trophic status (lakes)
- $^{14}\text{C}$ -CO<sub>2</sub> fixation rate (aquatic)
- Input/output budgets (landscape yield, run-off)
- Diel changes in O<sub>2</sub> and CO<sub>2</sub> fluxes (aquatic)
- Nutrient concentrations in soil, water or living/dead plant material  
(Nitrogen, organic N, NO<sub>x</sub>, ratio of C to N, Phosphorous ortho-P, particulate P, organic P, Calcium, Silicon, Potassium)
- Canopy or vegetation reflectance (remote-sensing)
- Fungi and soil microbial community composition
- Amount of nitrogen leaching to water or below rooting zone (vs. retention)



### Data sources

- Water or soil samples, such as from State University Soil Analysis Lab
- Tree or other plant growth data
- Harvesting or hunting records
- Long-term Ecological Research Network datasets (see: <http://www.lternet.edu>)
- Land-use cover maps, aerial photographs or remote sensing data
- Published NPP values for different vegetation covers

### Example

The **Coastal Ecology Institute** (CEI) provides university-based leadership and expertise to find solutions to problems in coastal and marine environments. CEI assessed the level of sustainable management in the Mississippi Delta by measuring changes over time in energy flow in terms of total and remaining net primary productivity (TNPP and RNPP, see previous page for definitions). They obtained this information using aerial landscape surveys of the coverage of different habitat types within the delta together with already published NPP values for different habitat categories and vegetation types (dune vegetation, barren sand, rice patties under historic or current harvest, etc.). Based on the decrease in RNPP in the area they were able to conclude that current management scenarios are not sustainable. They recommend continued monitoring of energy flows within the ecosystem by calculating changes in TNPP and RNPP every 5-10 years.

For more information see: <http://www.lsu.edu/cei/> or Cardoch, L., J. W. Day, Jr. and C. Ibàñez. 2002. Net primary productivity as an indicator of sustainability in the Ebro and Mississippi Deltas. *Ecological Applications* 12(4): 1044-1055.

## FIRE AND OTHER KEY DISTURBANCE AND SUCCESSION PROCESSES



Natural patterns of disturbance, such as fire, wind, tree falls, floods, grazing and the related process of **succession** (the shift in species composition in a community over time) are often the most important determinant of biodiversity in an area. In many cases the extent, frequency or intensity of these processes has been altered in a way that hampers native organisms from persisting. Measuring these dynamics can help you develop and assess your efforts to restore or maintain ecosystem integrity.

See also related questions and metrics on:

- Flooding in [Water quantity and hydrology](#) (p. 44) and [Water diversion](#) (p.114)
- [Altered fire regime](#) (p.124).

### 🎯 Sample objectives

- *Restore high quality habitats for native species*
- *Maintain properly functioning communities*
- *Restore the natural disturbance regime*

### Sample evaluation questions and indicators

❓ Has the rate of succession changed?  
How have management practices affected succession?

- ◆ Measures of community composition, representation and structure over time (see [Habitat quality](#) measures, starting on p. 32)
- Percent of community or landscape in different successional stages
- Presence or relative abundance of species characteristic of a successional stage (e.g. climax vs. pioneer species for vegetation, Nematode maturity index for soil)
- Relative abundance of shade tolerant plants
- Tree age distributions
- Rotation period of stand-replacing disturbances

❓ How closely do current conditions match natural or historical patterns of disturbance?

- ◆ Frequency, intensity, duration and extent of disturbance such as: fire, tree falls, insect outbreaks, drought, ice damage, herbivory, wind throw, trampling, grazing, etc.
- Change in [Community composition](#) (p.32)

### ADJUSTING OVER TIME

You may have different short- and long-term objectives for a system undergoing change. For example, if fire has been excluded from a site for many years and invasive species have taken hold, you may at first aim for a higher fire frequency than what occurred historically. Once the site is partially restored, you may adjust your objectives to be more within the range of natural variability.

Relative abundance of disturbance-tolerant species (such as fire- or flood-tolerant plants)

For tree falls: Size, frequency, arrangement of vegetation gaps (light map)

Diversity and abundance of species within light gaps compared to historical regeneration

Diversity of tree species in the understory compared to canopy tree diversity

Diversity of understory herbs today compared to historical records

Amount of standing dead wood (fuel)

Percent cover by invasive species

Dominant growth forms (tree, shrub, herbaceous perennial, annual)

### MEASURING FIRE

Systems for Environmental Management, a Montana nonprofit research and educational corporation, in cooperation with the Fire Sciences Laboratory of the USDA Forest Service, has developed public domain software to assist practitioners in measuring and predicting the behavior and effects of natural and prescribed fires. For more information see: <http://fire.org/>



### Data sources

- Historical records (pictures, land survey notes)
- University research
- Aerial surveys/GIS maps/Landsat images
- USDA Forest Service Fire Effects Information System (database of effects of fire and fire regimes for organisms throughout the U.S.): <http://www.fs.fed.us/database/feis/>
- The Nature Conservancy fire research (<http://nature.org/initiatives/fire/>)



### Example

**Rookery Bay National Estuarine Research Reserve** is 110,000 acres of pristine mangrove forest, uplands and protected waters at the northern end of Ten Thousand Islands on the gulf coast of Florida. The reserve is managing the ecological dynamics within the forests by reestablishing fire (to historic fire frequencies). Past fire suppression within the reserve greatly increased fuel loads and current policies encourage prescribed burns; however, managers wanted to understand the effect of prescribed burns on community dynamics. To do this they measured: i) the amount of fuel loads in different vegetation types before and after burns; ii) the number and types of resident wildlife before and after burns; and iii) habitat quality (by relating wildlife diversity and abundance to available fuel structure). Rookery Bay Reserve is using the data collected from this project to help determine what the best types of prescribed burns are to maintain community dynamics and biodiversity, and thereby decrease the numbers of invasive species.

For more information see:

<http://www.rookerybay.org/> and

[http://www.dep.state.fl.us/coastal/sites/rookery/management/prescribed\\_fire.pdf](http://www.dep.state.fl.us/coastal/sites/rookery/management/prescribed_fire.pdf)



## SOCIAL OBJECTIVES

Use this section to help you answer questions like:

What social, community, or economic improvements or conditions do we hope to achieve?

What are the long-term or cumulative impacts of our efforts on the community? Have we created a healthy and sustainable local economy? Are we maintaining a high quality of life? Is the community more vibrant?

## **SOCIAL OBJECTIVES**

### **Economy**

**Diverse and stable industries**

**Local investment, development, and growth**

**Living-wage jobs**

### **Community Character**

**Historic and cultural heritage**

**Land use**

**Quality of life**

### **Community Interaction and Engagement**

**Relationships and trust**

**Participation and engagement**

### **Community Capacity**

**Services**

**Recreation and leisure**

**Education**

### **Sustainability: Balancing Community & Ecosystem Needs**

**Environmentally responsible stewardship**

**Ecologically sustainable economy**



## INTRODUCTION TO SOCIAL OBJECTIVES

Although the ultimate focus of ecosystem or conservation projects may be ecological improvements, these are tightly interrelated with goals for the quality of *human* lives and communities in the area. For example, many projects seek to promote a healthy economy, protect community character, maintain an overall high quality of life or build a “sense of place.”



### WHAT DOES IT MEAN?

***Economic diversity, stability or health***

An economy with a variety of industries and businesses that moves beyond boom and bust cycles and maintains living wage jobs.

***Community Character and Resilience***

Community with a unique “feel” (rural, urban, historic, sense of place, “extraordinary place”) and an ability to adapt to social and economic changes for the benefit of the community. These ideas are also associated with “vibrant” communities.

***Sustainability***

A long-term balance between economic and ecosystem health. For example, maintaining community livelihoods and the culture associated with cattle grazing in a way that preserves high quality riparian habitat, wildlife, and water. Considers the effects of current resource use on the ability of future generations to enjoy those communities and natural areas.

***Quality of Life***

A complex mix of what people value, from the cleanliness of air or drinking water to good neighbors to diverse job opportunities to services such as health, education, job training, day care, and transportation.

Like the concepts of ecological health or integrity, these broad social and economic goals are made up of many more specific and tangible features of communities and economies. To set social and economic objectives for your community and then measure progress toward these objectives requires recognizing the measurable and valued features of your community

For example, measures of “quality of life” will depend on what people in your community value. Quality of life can be measured as a feeling of well being, the amount of hours within a day that one must work to meet survival needs, the cleanliness of drinking water or air quality or even as the number of people that smile in the streets.

The topics related to social objectives covered in this section cover this breadth of issues and are based both on themes in the social evaluation literature as well as common social and economic goals of on-the ground community and ecosystem management projects.

#### WHAT DO PEOPLE VALUE?

Understanding what people really care about in your community is useful not only for setting objectives, but also coming up with some tangible and meaningful measures of success. Ask people in the community or in your collaborative:

- What are the features of the community that make it familiar to you, that make you “feel at home” or give you a “sense of place”?
- Do you feel like your community is an “extraordinary place”? Why or why not?
- Is \_\_\_\_\_ important to you (public transportation, secondary education, day care, recreation opportunities, personal wealth, the historic town bridge, participating in local decision-making, saving salmon, etc.)?
- What do you consider to be meaningful employment opportunities?
- How would you describe a “vibrant” community?
- What do you think influences your quality of life?

## HOW TO IDENTIFY AND EVALUATE *YOUR* PROJECT'S SOCIAL OBJECTIVES

The social and economic topics and indicators contained in this Sourcebook can be used as a springboard to help you think about your own project's objectives and progress. You can hone in on the most important aspects for your community by considering the following.

### What are the priorities for your community?

When setting specific social objectives and prioritizing what about your community you should evaluate consider:

- *Characteristic and/or unique* features of your community (local industries, historic buildings, type of economy, land use and demographic information)
- Aspects of your community that are *most vulnerable* to outside threats (loss of jobs, loss of affordable housing, change in land uses, change in development patterns, changes in education programs).
- Aspects of your community most closely *tied to the health of ecosystems* (resource-dependent jobs, recreation opportunities, human health, etc.)
- What do people *value* or care about? Consider running focus groups or interviews to ask community members what matters most to them.

### What is realistic?

Social goals cannot be set without considering

- What are the **ecological limitations** to resource use? How do they compare to people's expectations? A purely social or economic approach to management or one that attempts to ignore long-term ecological impacts will not be successful because it is unrealistic.
- Within what **time frame** and **budget** do you hope to achieve your objectives? What level or amount of change from current conditions is feasible for your project to accomplish?
- What are the **starting conditions**? How much can they be changed?

#### A COMMUNITY PROFILE

The Southeast Michigan Council of Governments (SEMCOG) produces community profiles to provide a "picture" of the social and economic condition of counties and communities in Southeast Michigan. The profile includes measures of human populations, employment, and land use. You might find the glossary of these data helpful to determine how your project could assess your community:

<http://www.semco.org/data/communityprofiles/glossary.htm>

*Next: Two-page spreads on specific social and economic objective topics*

## DIVERSE AND STABLE INDUSTRIES

Diversity and stability are two important and interrelated components of healthy and enduring local economies. Diversity relates to the number of businesses and industries in a community or region and their relative importance, in terms of the number of people employed, wages earned and contribution to the revenue stream. Does the local economy rely too heavily on a single industry, such as timber extraction or winter-only tourism? Over-dependence on natural resource industries can lead to both economic and ecological collapse.

**Stability** is the absence of dramatic shifts in economic conditions. Some projects describe stability as “moving beyond the boom and bust cycle.”


Note that an economy that is consistently under-performing may be stable, but not desirable. Measures of stability and diversity must be understood in the context of other economic indicators as well.

An economy with a greater diversity of industries may be more resilient, stable and sustainable when faced with depressions in the price of a particular commodity, changes in global markets and economic downturns than an economy with fewer industries. What constitutes an “appropriate” level of diversity and stability will depend on popular consensus, but other communities can serve as a guide to determining feasible levels.


### Sample objectives

- *Promote a lasting and diversified economy*
- *Maintain the economic base of our community*
- *Promote local economic stability*

### Sample evaluation questions and indicators

 How diverse is the economic base of the community?  
How reliant is the community on particular industrial sectors?

- ◆ Total number of employers in community
- Percent employment by industry
- Jobs per industry
- Employment by top five employers
- Earned wages per industry

 How consistent are jobs, revenue and earnings?  
What signs point to future stability/instability?

- ◆ Change in jobs per industry
- Change in earned wages per industry
- Office vacancy rate compared to state or nationwide average

#### COMPARED TO WHAT?

In addition to looking at trends over time in economic indicators (measured annually or biannually), it is very informative to compare indicators in your community to:

- The state or nationwide average
- An exemplary or neighboring community
- Your community one, five, or ten years in the past (before key actions or influences).

Number of building permits issued  
 Capital assets  
 Equity (income and wealth distribution)  
 Home ownership rates  
 Value of homes  
 Percent of homes that are owner-occupied  
 Building permits for existing homes

### Data sources

- FedStats economic statistics: <http://www.fedstats.gov/programs/economic.html>
- City and County Plus
- Regional Economic Information System
- U.S. Department of Commerce

### ECONOMIC PROFILES

The Sonoran Institute, in partnership with the Bureau of Land Management, has developed an automated system that creates economic profiles for counties, regions, and other geographic scales in the Western States. Custom-made reports draw on data from the U.S. Department of Commerce's Bureau of Economic Analysis, the Bureau of Labor Statistics, and the U.S. Census Bureau and include tables and figures that illustrate long-term trends in population; employment, and personal income by industry; commuting patterns; average earnings; business development; retirement, and other non-labor income. For more information and free software, see [http://www.sonoran.org/programs/socioeconomics/si\\_se\\_program\\_tools.html](http://www.sonoran.org/programs/socioeconomics/si_se_program_tools.html).

### Example

The **Northern Forest Center** brings together ideas and dialogue on issues ranging from cultural heritage to economics, ecology and community development. The Center was established in 1997 to help build a healthy and productive future for the Northern Forest – a large, intact forest covering parts of New York, New Hampshire, Vermont and Maine – and its people by strengthening citizen leadership and regional collaboration. In assessing the “wealth” of the region, center staff examines financial wealth as well as a wide range of other factors, such as health, safety and the integrity of natural systems. The Center has identified “diversity of employment opportunities” in the region as an important component of financial health. To track where they are relative to this goal they use County Business Patterns data from the US Department of Commerce to track jobs per industry, change in jobs per industry, earned wages per industry and other measures as indicators of diversity in opportunities for employment.

For more information see:

<http://www.northernforest.org/>

## LOCAL INVESTMENT, DEVELOPMENT AND GROWTH

For many communities, local economic growth and development are central concerns. Growth and development are achieved in part by investment, both public and private, to help maximize efficiencies in the use of capital, whether human, natural or physical. One important form of investment is infrastructure, since it is a fundamental building block for economic well-being. Transportation networks, internet access, other communications and public services such as water and sewer, support local development and allow for the productive flow of goods, services and information.

### BALANCE AMONG GOALS


Economic growth as a stand-alone goal can often lead to over-exploitation of resources and unplanned development or sprawl, and thereby, ultimately, economic decline and degraded quality of life. For this reason measures of economic growth should be considered in concert with other measures of ecological and social health. For ideas, see the section on [Ecologically sustainable economy](#), p. 78.

Strong local business can be a barometer of economic health and vitality. Likewise, community reinvestment – the extent to which local banks are able to meet the credit needs of local small business and residents – is often seen as a critical component of a sustainable local economy. An examination of local government decision-making, investments in infrastructure and local banking practices can shed light on how to catalyze and support local economic health.


### Sample objectives

- *Promote healthy small businesses*
- *Encourage local economic growth*
- *Create a market for resource-based products/services*

### Sample evaluation questions and indicators

 Is local infrastructure sufficient to support local business development?


- ◆ Quality of roads/road surface conditions
- Investment in high-speed internet access
- Investment in public assets (e.g. parks, public transportation, libraries, schools, etc.)

 Is local infrastructure excessive or reducing rural quality?


- ◆ Increase in traffic on roads
- Number of new housing developments
- Sprawl index (see [Sprawl/Unplanned Development](#), p. 134)

 Are current businesses undergoing growth/development?

- ◆ Number of new businesses
- Dollars spent in locally-owned businesses
- Percent of companies developing new products or services

 To what extent is wealth staying in the community?

- ◆ Deposits in locally-controlled banks (dollars per capita)
- Community Reinvestment Act lender ratings for local banks

 To what extent is wealth growing in the community?

- ◆ Deposits in locally-controlled banks (dollars per capita)
- Changes in property values (mean, median, range)
- Changes in individual incomes (mean, median, range)

### Data sources

- FedStats economic statistics: <http://www.fedstats.gov/programs/economic.html>
- Department of Transportation
- Business annual reports
- Chamber of Commerce
- Realtor Boards
- County/township offices

### Example

The **Economic Forecast Project** (EFP) is a community-sponsored research program that collects and verifies statistical data and other evidence about the changing business and economic environment. From the assessment of this data EFP monitors the status of the economy and provides projections of future economic activity in the local area. For example, EFP analyzed workforce travel behavior to determine whether Ventura County, CA, had sufficient transportation infrastructure to keep jobs. Specifically they measured changes in public transportation ridership (over ten years), the present operating speed and volume to capacity ratio on major highways, the origins of Ventura county car commuters, the number of vehicles per household and the amount of the workforce using public transportation. From these data they determined that traffic in Ventura county has increased at a higher rate than the population has grown, that the traffic infrastructure has not kept pace with the increasing demands on the system and that public transportation ridership has increased over ten years.

For more information see:

<http://www.ucsb-efp.com/default.htm> and  
[http://www.ucsb-efp.com/pdf/publications/VA\\_Wib\\_web.pdf](http://www.ucsb-efp.com/pdf/publications/VA_Wib_web.pdf)

## LIVING-WAGE JOBS

Jobs and job growth are extensions, as well as indicators, of economic growth and development. Project participants are often concerned with not only the quantity of jobs available, but also with the *quality* of those jobs. Some projects seek to promote “family-wage” or “living-wage” jobs, those that pay “a wage that is sufficient for workers to meet their basic material needs, plus some discretionary spending” (Business for Social Responsibility, 2003); others are interested in protecting “traditional livelihoods” (farming, ranching, fishing, etc.); or “green” jobs that are in balance with ecosystem needs (ecotourism, native landscaping, organic farming, etc.). Tracking traditional jobs is also of interest to many projects, especially those in areas where much of the employment base is dependent on natural resource use or extraction.



### Sample objectives

- *Create and maintain high-skill, high-wage jobs*
- *Create additional opportunities for employment*
- *Encourage profitable ranching and other traditional livelihoods*

### Sample evaluation questions and indicators



Is the number of jobs in the community increasing?

How is the employment rate changing?



Net job growth

Employment rate (compared to a point in the past or to other communities)

Percent of residents who want to work full time who actually work full time



Is the number of living-wage jobs in the community increasing?



Inflation-adjusted median income<sup>10</sup>

Distribution of people across income brackets

#### COMPARED TO WHAT?

Try comparing the indicator values in your community to those of communities similar to yours or to the national average.



To what extent is job training available?



Percent of residents who feel they have adequate job training opportunities

Number of training programs available to community members



Is the cost of living in the community changing?



Cost of living index

Total cost of a selected “basket of goods” (milk, bread, sugar, etc.)

Range and average monthly rent for apartments in the community

Range and average costs for housing purchases in the community

<sup>10</sup> Note that average income may *not* be an adequate measure of living-wage jobs, since in a small community it can be influenced by a few high outliers.



Food and heating costs  
 Food stamp payments  
 Number and percent of utility bills paid on time

**?** Are traditional livelihoods a changing part of the workforce?

- ◆ Percent of jobs in the forest services sector compared to X years ago
- Number or percent of jobs in \_\_\_\_ (ranching, fishing, boat building, natural-resource based, etc.)

### Data sources

- FedStats economic statistics: <http://www.fedstats.gov/programs/economic.html>
- State Employment Security Department
- State Department of Social and Health Services
- University surveys or research

### Example

**Sustainable Seattle** is a non-profit organization dedicated to enhancing the long-term quality of life in the Seattle/King County area of Washington. They believe that a sustainable society would permit low- and middle-income families to meet society's standard of living without working more than 40 hours a week, thereby allowing individuals to participate in important family, community and recreational activities in their non-work time. To assess if they are meeting this goal they track "work required for basic needs" based on: i) the average wage in King County (obtained from the Washington State Employment Security Department) and ii) the cost of a market basket of basic requirements, including food, rent and clothing (obtained from the Washington State Department of Social and Health Services). By combining these two figures, they estimate the number of hours of work at an average wage that are required to support a family of four for a month. They have found negative trends in this indicator since 1993 in the Seattle/King County area. Increases in basic housing, utilities and transportation costs have overwhelmed modest hourly wage increases, meaning that low-income families are finding it increasingly difficult to maintain a basic standard of living. Sustainable Seattle publishes this information (as well as 40 other indicators) to educate residents, government and businesses to promote action towards a better future.



For more information, see the Indicators of Sustainable Community Report at <http://www.sustainableseattle.org/>.

## HISTORIC AND CULTURAL HERITAGE

Historic landmarks, events or modes of livelihood can shape or create the identity of a particular community, as can the national or ethnic backgrounds of its residents. Many ecosystem and community-based projects have goals related to historic and traditional culture. These include a concern for protecting and maintaining a community’s “cultural heritage,” “aesthetic benefits,” or “rural lifestyle.”

A goal of your project may also be to create or revive a community identity associated with historic or cultural heritage. For example, residents may not currently recognize their heritage or see it as a part of what makes living in their community unique or valuable. You may seek to change this by holding cultural events or establishing interpretive sites with local history. You can then see whether your efforts paid off by tracking residents’ perceptions of their historic and cultural heritage before and after these activities.

**Community character** is sometimes difficult to put your finger on, but for many it is defined by history, traditional culture, the look of the landscape, a “sense of place,” or quality of life. These connections between people and their home are a strong foundation for collaborative decision-making.

You can use surveys or focus groups to better identify what it is about your community’s “character” that residents value.



### 🎯 Sample objectives

- *Maintain our cultural heritage*
- *Protect the historic rural culture and ranching community*
- *Foster a sense of community identity*
- *Revive our community heritage*

### Sample evaluation questions and indicators

**?** To what degree do residents recognize and appreciate local history and culture?

- ◆ Number of registered historic sites
- Number of residents visiting historic and cultural sites
- Number of and attendance at traditional community events/festivals

**?** What do local residents feel is important or special about their community?  
 How do people in the community describe themselves in the context of the community?  
 How knowledgeable are residents about the local natural environment and human history of the community?

- ◆ Responses to survey, interview and/or focus group questions
- Responses to “sense of place” survey
- Media coverage of local environment or history topics

 **Data sources**

- Surveys, interviews and focus groups on what historic and cultural elements of your community are meaningful to residents
- Historic registry information
- Local newspapers' cultural or events reports
- Local/regional historical society databases, libraries and catalogs

 **Example**

“Respected Historic and Cultural Resources” is one of the 17 goals identified by residents participating in the **Livable Tucson Vision Program**. They have defined this goal to include the preservation and celebration of local landmarks, buildings, neighborhoods, archeological treasures, open spaces, cultures and traditions that make Tucson unique. To track their progress, evaluators look at several indicators, including the number of historical sites (based on records from the National Register of Historic Sites), dollars invested to restore older or abandoned buildings (based on records from Tucson’s Development Services Department) and the number of people visiting historic and cultural sites (based on attendance records from selected museums, parks, churches, etc.).



For more information see:

<http://www.ci.tucson.az.us/lv-indicator12.html>

## LAND USE

Traditional land use patterns, such as farming or ranching, may be key to a community's sense of character or identity. A project goal may be to maintain current patterns of land use in the face of change such as urban sprawl, which detracts from community character, as well as health, community cohesion and other aspects of community well-being.

**Land use** can refer to the dominant type of the land use or cover (agriculture, residential/commercial development, public/private forest, etc). It can also refer to how residents interact with parts of the landscape. For example, are city parks well-maintained and used? Are streets and vacant lots kept clean?

For an example of a land use classification system see the Southeast Michigan Council of Governments detailed land use summary on:


<http://www.semcog.org/cgi-bin/comprof/profiles.cfm>

Different groups within the community may have different land use pattern goals. Creating affordable housing or commercial space, for example, may result in the conversion of natural habitat or open space that is valued by the community; at the same time, this change may be addressing other high priority needs identified by the community.


### Sample objectives

- *Preserve and protect the rural agricultural community character*
- *Protect open space*
- *Transform vacant lots*

### Sample evaluation questions and indicators

 How is the local landscape changing? How do residents perceive these changes?

- ◆ Number of farms converted to non-farm activities in the past year
- Number of new parks/recreation areas created
- Number of new residential developments/new homes built
- Number of acres of open space near villages? Towns? Communities?
- Number of community garden plots within city limits
- Cleanliness of community
- Responses to survey, interview and/or focus group questions

 What is the pattern of development on the landscape? Does it reflect “smart growth” principles? (see also [Sprawl/Unplanned Development](#), p. 134)

- ◆ Miles of road (“pavement”)
- Adoption of a regional growth strategy
- Vehicle ownership, fuel consumption and travel per capita
- Proportion of surface area that is impervious surface
- Percent of residences located within ½ mile of a market
- Percent of new residential lots within ¼ mile of services
- Privately owned acres placed under conservation easement
- Ratio of urban space to developed land

### Data sources

- County or city planning office or reports
- Aerial photography
- Neighborhood monitoring or visual surveys conducted by volunteers on foot
- Surveys, interviews and focus groups on what land use patterns residents value related to how they perceive changes in land use
- Local/regional land trusts (<http://www.lta.org>)
- GIS maps of community that calculate the percent of land cover by use (recreational, farming, park space, residential, commercial, etc.)
- University research programs cataloging land use patterns over time

### Example

The **Southern Alberta Land Trust Society (SALTS)** was established by a group of ranchers to address changes in land use patterns in southwestern Alberta. They were especially concerned with the loss of open space and native rangelands that was changing the face of the area in which they lived and worked. In addition to increasing general awareness about the causes of rangeland loss, SALTS provides information to landowners about ways of reducing land use change, such as intergenerational transfers of ranching operations (i.e., tax and succession planning) and the application of conservation easements to conserve rangeland and wildlife habitat. One measure of success that SALTS uses to track how well they are maintaining open space and the character of their region is the amount of private land placed under conservation easements. To date they have acquired seven conservation easements which permanently preserve ~3,800 acres of grassland/ranchland.



For more information see:

<http://www.salts-landtrust.org/index.html>

## QUALITY OF LIFE

Community character goes beyond cultural and land use concerns and includes aspects of “quality of life” as well. Quality of life can be measured in terms of standard existing indicators like the crime rate, the ratio of children living in poverty and human health indicators like life expectancy. But the overall view of “quality of life” is also much more complex and can be captured in surveys, interviews and focus groups of people about what they value in their community and lives and what gives them a “sense of place.”

### 🎯 Sample objectives

- *Revitalize neighborhoods*
- *Ensure the safety of parks and schoolyards*
- *Provide safe streets and schools for children*
- *Maintain our quality of life*
- *Promote a healthy environment*



### Sample evaluation questions and indicators

❓ How safe is our community compared to the past? Compared to other communities?  
Do people feel safe in parks and schoolyards?

- ◆ Crime rate by type of crime
- Accidental death rate
- Number of EMS or 911 calls per year, by category (e.g. fire, domestic violence, etc.)
- Number of cases referred to Child Protective Services
- Number of calls to local “graffiti removal team”
- Responses to survey, interview and/or focus group questions
- Percent of houses with gated fences or windows with bars


❓ How healthy is our community? Is overall health increasing or decreasing?  
Does the state of the local environment pose a health threat?

- ◆ Life expectancy compared to national average
- Cancer rate relative to statewide average
- Suicide rate compared to neighboring communities
- Asthma hospitalization for children
- Surface water quality
- Tap water quality
- “Good” air quality days
- Responses to survey, interview and/or focus group question


❓ To what extent is poverty being alleviated in our community?  
Has poverty decreased since the start of our project?

- ◆ Ratio of children living in poverty
- Proportion of households classified as low income
- Number of public assistance claims

Ratio of public school children eligible for free or reduced lunch

 Do the streets of our community have a vital and vibrant character?

- ◆ Number of empty storefronts
- Cleanliness of major commercial areas
- Sidewalk traffic in commercial areas
- Number of houses in poor repair/at risk of condemnation
- Number of open or green spaces within the community (parks/gardens),  
number of Land Trust holding,s or number of acres green space per capita

 Is quality of life increasing?

- ◆ Subjective well-being (survey)
- Proportion of people who say they lock their houses or cars
- Neighborliness measures (height of fences between houses, number of people  
on porches, number of people that smile when they pass on the street, etc.)
- Percent of graduates who leave town instead of staying

### Data sources

- Surveys, interviews and focus groups of residents
- Federal government agency statistics at FedStats <http://www.fedstats.gov/>
- Crime statistics from local and state police
- Health department data
- Monitoring of use of parks and common areas

### Example

The **Quality of Life Project** was established in 1999 because of a concern for how increasing urbanization in New Zealand was affecting the well being of residents. To provide information to decision-makers the project measured quality of life through a variety of social, economic and environmental indicators. For example, to assess levels of local pride, they asked residents whether they agreed or disagreed with the statement “I feel a sense of pride in the way my city looks and feels”. The project found that residents who agreed with this statement gave reasons such as gardens, parks and open spaces or that they felt the city was clean and tidy. Those who disagreed with the statement had concerns about safety, graffiti; and traffic congestion. This information can guide city and national efforts to maintain quality of life.

For more information see: <http://www.bigcities.govt.nz/>

## RELATIONSHIPS AND TRUST

Networks or relationships in a community both build and depend on trust. Social networks may be formal, such as through membership in organizations, or informal, through ties based on family, geography (neighbors) or friendship. They may also be “horizontal,” as in relationships among equals or “vertical,” such as between members of a community and a powerful politician. A community that builds relationships in both horizontal and vertical directions will have greater chances for success in mobilizing community assets at the local level and influencing policy at a broader level.

**Social capital** is the “glue” that holds communities together. It is the web of relationships, the action of engaging with one another, and the reservoir of trust in the community.

In general, the stronger the community interaction, engagement and trust, the more the community is able to accomplish its goals and the better off are its members. Social capital, then, like financial and natural capital, is both an asset and a goal.

Forming and strengthening relationships can be a project objective in itself, or it can be a means towards other objectives, such as greater community involvement in stewardship activities or increased trust between stakeholder groups currently in conflict.


### Sample objectives

- *Provide opportunities for discussion of responsible use of resources*
- *Create a community dialogue*
- *Strengthen existing regional and neighborhood partnerships and coalitions*

### Sample evaluation questions and indicators


 Are social networks in our community getting stronger? Weaker?

- ◆ Number of neighborhood or block associations
- Number of groups that meet or interact regularly (e.g. book clubs, bowling leagues, community gardening groups, support groups, church groups, bridge clubs, civic associations, etc.)
- Number of hate crimes reported each year for the past five years
- Number of organizations that cosponsor events, activities, projects
- Responses to surveys or focus groups relating to social networks (such as, Do neighbors informally keep an eye on one another's homes? Do people in community build or create things together? Do you know your neighbors by name?, etc.)

 To what extent is our group cultivating “vertical” relationships?

- ◆ Number of policymakers (or others with decision-making authority or other forms of power) on the organization’s board
- Number of influential individuals or “VIPs” in attendance at project events
- Number of activities that are designed to establish contact with influential individuals or organizations



 Are opportunities for community dialogue and discussion increasing?

- ◆ Participation rates in community meetings
- Percent of population receiving a local newspaper
- Number of public meetings/hearings on issues of community interest

### Data sources

- Surveys, interviews and focus groups
- Observation/monitoring of local events
- Local newspapers
- County elections offices
- Other city and county government bodies

### Example

In 1997, the City of Tucson developed the **Livable Tucson Vision Program** to define sustainable community goals and track progress towards those goals. One of their goals was to have an engaged community and responsive government. In addressing this goal they developed a set of programs as well as a set of progress indicators. For example, Livable Tucson encouraged “vertical” relationships so they developed Neighborhood Enhancement Teams. These teams were comprised of staff members from city departments who volunteered to help neighborhoods have direct access to city services. In order to determine whether this program was successful, they developed three main indicators of progress: i) the number of active, cohesive neighborhoods (the number of neighborhoods registered with the Citizen and Neighborhood Services Division and/or the number of mailings of neighborhood newsletters); ii) participation of neighborhood groups in community meetings; and iii) percent of citizens rating local government as responsive (from a survey). To date, the number of active neighborhood groups is increasing and more neighborhood groups are involved with their local government.



For more information see:

<http://www.ci.tucson.az.us/lv-indicator2.html>

## PARTICIPATION AND ENGAGEMENT

Trust and relationships are the foundations of community participation and engagement. People are more likely to contribute to their communities when they perceive that their “investment” will lead to some future benefit. In a climate of trust with frequent interaction, one may be reasonably confident that “If I help you today, someone else in turn will be more likely to help me out tomorrow.” Increased civic involvement and positive interaction in a community generate more social capital, which encourages greater involvement, building in an upward spiral.




A particular concern for many ecosystem-based groups is to increase the participation and engagement of local residents in decisions related to resource use and management. The Northeast Nevada Stewardship Group, for example, seeks to increase opportunities for local participation in land management decisions in an area where there is a large public land base and many residents’ livelihood depends on the land.


### Sample objectives


- *Promoting community involvement*
- *Giving residents a voice in determining local priorities*
- *Ensuring full consideration of public values*
- *Building capacity for involving residents in resource use decision-making*

### Sample evaluation questions and indicators

-  How engaged is the general public in community activities?  
 Are there opportunities for the residents to interact with one another?  
 Are community events of various kinds well-attended?  
 Do people in the community know “what’s going on” in the community?

- ◆ Voter participation in elections
  - Attendance rates in community meetings
  - Charitable giving to local organizations
  - Library use (number books checked out per month)
  - Community use of public gathering places
  - Number of inches of newspaper space devoted to community issues
  - Number of community members at youth events
  - Number of people who can name two city council members in resident survey

 Are community members more involved in local decision-making processes?  
 To what extent have collaboration approaches improved public engagement?  
 Have community education efforts increased resident participation in resource management planning?

-  Number or diversity of people attending public hearings
- Number of appeals and protests
- Presence of formal or informal collaboration between government and nongovernmental groups or residents
- Participation by key stakeholders in ecosystem or resource assessments
- Residents' perception of the resource decision-making process
- Level and diversity of membership in local watchdog or advocacy groups
- Number of comments in NEPA process

### Data sources

- Surveys, interviews and focus groups
- Observation/monitoring of local events
- Local newspaper articles; letters to the editor
- County elections offices
- Other city and county government bodies
- Public hearing records

### Example

**Sustainable Seattle** is a non-profit organization dedicated to enhancing the long-term quality of life in the Seattle/King County area through policy advocacy, education and civic action. As a measure of progress towards their goal of increased civic action they measure the amount of community participation in regional primaries. The level of voter turnout in local primaries not only gives them direct information on the commitment that the citizens have to their local political system, it also reflects the percentage of people involved overall in political decision-making. Specifically, they measured the number of voters and number of registered voters in odd-year primaries (even-years were not used because of the potential that presidential elections can skew the results). On average, voter turnout and registration have been slowly improving in recent years. While both of these indicators show trends toward increasing sustainability, Sustainable Seattle feels that many people in the local community are still left out of the democratic process (voter participation average ~30%), and as such they have placed “increasing active citizenship” as a high priority.

For more information see:

<http://www.sustainableseattle.org/>

## SERVICES

Fostering high quality services and maintaining a safety net for residents is frequently of concern to community members. Aspects of particular concern include affordable housing, day care, health care and transit. Such services reduce stress and uncertainty, allow elderly residents to continue to live in a community, support families and promote human health and quality of life. These services may be especially difficult to access in rural settings, yet they are of central importance for residents' well being.


**Community capacity** refers to the overall ability to live, work, and play in the community. A community with capacity is able to support residents with services, employment, education, and recreation opportunities, allowing them to develop and use their skills for personal and public benefit.

An examination of available services can help your project understand the ways in which residents' needs are being met and to devise strategies that are sensitive to those needs. In addition to gathering empirical data on the availability of services, interviewing residents in the context of individual questionnaires or focus groups can help your project assess community perceptions of the provision of services and their *accessibility*—information that might be difficult to ascertain from numerical figures alone.


### Sample objectives

- *Increase lifelong health care*
- *Expand opportunities for affordable housing*
- *Support an accessible, affordable and convenient mass transit system*

### Sample evaluation questions and indicators


 How accessible is healthcare in our community? Is accessibility improving?

- ◆ Local hospital capacity
  - Percent of people with health insurance coverage
  - Availability of prenatal care
  - Responses to survey that asks respondents to rate health care accessibility

 Is there enough affordable housing in our community?

- ◆ Number of new dwelling units
- Percent of households reporting housing problems
- Number of homeless adults and children
- Average monthly rent
- Apartment vacancy rate
- Responses to survey on difficulty obtaining housing



 Can families who want affordable, high quality day care obtain this service?

- ◆ Number of day care facilities within city limits
- Number of families on day care facility waitlists
- Average cost of day care per hour per child
- Responses to survey that asks respondents to rate affordability and accessibility of day care options

 To what extent is mass transit utilized in our community?

- ◆ Ridership rates of bus or train systems
- Number of bus or train passes sold per year
- Number of busses that pass through an area (frequency/ease of use)
- Percent of neighborhoods within 0.5 miles of mass transit
- Responses to survey that asks respondents to report bus or train use

### Data sources

- Local businesses, hospitals, newspapers, school boards
- Surveys, interviews and focus groups
- Local or state government offices
- Utility companies
- Transportation authority
- Realtor Boards
- Federal government statistics at FedStats at <http://www.fedstats.gov/>

### Example

The **Toronto Community Foundation** (TCF) is a community organization that provides leadership and funding to address the needs of the community to help ensure the vitality of Toronto. TCF developed “Vital Signs”, a program that identifies and gathers research on issues deemed important to the quality of life of Toronto residents. One of these issues was providing high quality services and a safety net to its residents. To assess progress towards this goal, Vital Signs measured a variety of factors related to affordable housing: i) the percent of income spent on rent; ii) the number of families on waiting lists for subsidized housing; iii) the number of people staying in emergency shelters; and iv) the number of seniors on waiting lists for nursing homes. Based on this information, Vital Signs determined that housing is very expensive and rent rates are rising faster than inflation. They also found that the demand for subsidized housing is increasing, while the dependency on shelters is not changing. In response, TCF has directed much of their current funding toward programs directly addressing housing services.

For more information see: <http://www.tcf.ca/index.html> and [http://www.tcf.ca/vital\\_signs/vitalsigns2004/index.html](http://www.tcf.ca/vital_signs/vitalsigns2004/index.html)

## RECREATION AND LEISURE

Ecosystem and community-based projects are often interested in helping expand recreation opportunities for residents. This can include not only outdoor recreation (parks, boating, angling, etc.), but also opportunities related to the arts (museums, performances, etc.).

As with other aspects of community capacity, individual *perception* of recreation and leisure opportunities in the community can be as important, or more important, than the actual numbers of opportunities that exist. Surveying those perceptions through resident interviews or focus groups can inform you of issues related to different expectations or problems with accessibility.




### Sample objectives

- *Improve public access to recreational facilities*
- *Enhance people’s use and enjoyment of the areas natural resources*
- *Provide high quality recreation opportunities for residents*

### Sample evaluation questions and indicators

 To what extent are recreational opportunities improving in our community?

- ◆ Miles of hiking trail per square mile
- ◆ Number of people using recreation facilities each month
- ◆ Acres of parkland per person
- ◆ City parks or recreation expenditures per capita
- ◆ Percent of residences within half a mile of designated open space
- ◆ Percent of new developments (residential) designed with open spaces
- ◆ Number and quality of community garden plots

 Are the diversity of opportunities for recreation and leisure within the city limits increasing?

- ◆ Number of different recreational opportunities in a region (parks with fishing, hunting, hiking and/or bird watching, community gardening plots, community arts organizations, ice skating rinks, etc.)
- ◆ Percent increase in number of multi-use parks per capita
- ◆ Percent increase in community arts organizations (per 10,000 people) or arts funding

**BALANCE AMONG GOALS**

Increasing the recreational opportunities within natural areas, parks, and open spaces can sometimes lead to over-use of trails, erosion, over-hunting, increased litter, and other negative ecological impacts. For this reason it is important to consider recreation goals in concert with other ecological or social goals. Also, you can keep watch for possible negative impacts of recreation (see [Disruptive/ destructive recreation](#), p.130 ).

? To what extent are residents satisfied with the recreation and leisure opportunities available in the community?

- ◆ Responses to surveys, interviews and focus groups
  - Number of repeat visits to facilities
  - Number of yearly or monthly passes purchased
  - Percent public participation in the arts (performances, events, etc.)

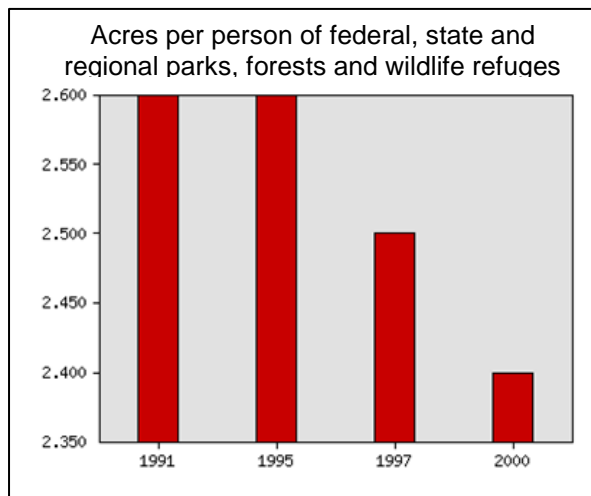
### Data sources

- Surveys, interviews and focus groups
- County, state, national park use data
- Local universities/graduate students doing research within recreational areas
- Land-use maps for the community
- State geospatial data on parkland and open space (for example: MN Geographic Data Clearinghouse (<http://www.lmic.state.mn.us/chouse/>))

### Example

**Minnesota Milestones** is a tool developed by the Minnesota Planning Agency (within the State and Community Services Division) to help its citizens create goals and measures of progress for their communities. Minnesota Milestones determined that Minnesotans want opportunities to enjoy their natural resources. To assess whether the state was achieving the goal of preserving natural resources for personal enjoyment, Minnesotan Milestones measured changes in the amount of land set aside specifically for parks and open space in

terms of the number of acres per person of federal, state and regional parks, forests and wildlife refuges over time. They found that parkland and open space increased, but the increase was not keeping pace with population growth. While the total amount of parkland increased, the amount of parkland per person decreased. They used this information to inform the State that open spaces may be more crowded and to motivate them to increase the amount of land protected.



For more information see:

<http://www.mnplan.state.mn.us/mm/indicator.html?Id=69&G=42>

## EDUCATION

The community's ability to provide consistent, high-quality education to its residents is an important aspect of community capacity. To assess education it is necessary to go beyond measures that shed light on the quality of education provided to youth through school systems. The indicators below demonstrate traditional and non-traditional educational opportunities for adults, such as public library accessibility, continuing education classes and use of job training programs.




For more ideas on assessing specifically the implementation and effectiveness of *environmental* education, see [Education and outreach](#) (p.198), which includes working with the public and with local schools.


### Sample objectives

- *Support community outreach and education programs*
- *Provide youth education and adult training*
- *Increase lifelong educational opportunities*

### Sample evaluation questions and indicators


 To what extent is our community providing a quality education to its youth? How does our community compare to the national average?

- ◆ High school graduation rate
- SAT scores of high school seniors
- Achievement test scores at various grades
- Teacher-student ratios
- Percent of high school seniors planning to pursue further education
- Capacity of early childhood education programs

 To what extent is our community addressing the educational needs of the adult population?

- ◆ Adult literacy rate
- Capacity of adult literacy programs
- Community computer access
- Public library use (measured by number of books checked out per month)
- Number of neighborhoods within 5 miles of a public library
- Diversity of adult education programming
- Number of different types of job training
- Capacity of job training programs
- Number of residents who feel they have adequate job training opportunities



 Are there opportunities to learn about natural resources or environmental problems? Are their programs/curricula to train youth/adults to be good environmental stewards?

◆ Number of local colleges or universities with environmental studies or ecology departments/programs

Media coverage of natural resource issues

Number of environmental education/nature centers

See also indicators in [Education and Outreach](#) (p.197) and [Environmentally responsible stewardship](#) (p. 82).

### Data sources

- Surveys and interviews on usage of educational programs in your community
- Local/State School Boards
- Department of Education (State/Federal: <http://www.ed.gov/>)
- Public Libraries

### Example

The **New Jersey Sustainable State Institute** (NJSSI) is an independent, non-profit institute providing information, analysis and strategies to help New Jersey develop sustainably. One of the goals of NJSSI is to provide their citizens with an accessible, quality and lifelong education so that students have the knowledge and skills necessary for employment and personal fulfillment. They use several metrics to assess progress towards this goal, including: i) high school graduation rates (indicator of future economic and social potential); ii) student to teacher ratio (indicator of the quality of education); iii) changes in levels of high school proficiency (indicator of the efficiency of educational programs); and iv) access to higher education (indicator of equity within higher education). From these measurements they found that graduation rates were decreasing, that they had one of the lowest student to teacher ratios in the country and that there was little change in the level of proficiency of students and in the access to higher education. Using this information NJSSI is working with the state to develop strategies aimed at key educational issues.

For more information see: <http://www.njssi.net/index.htm>

## ENVIRONMENTALLY RESPONSIBLE STEWARDSHIP

Environmentally responsible stewardship suggests that natural resources are cared for, managed or used in a way that maintains a balance between community and ecosystem needs. This means that there is an awareness, understanding and appreciation for this interconnectedness that is reflected both in people's values, but especially their actions.

**Sustainability** relates to the ability of communities to meet their needs while sustaining the integrity or health of the ecosystems in which they live.

Jointly defining what sustainability or balance means can bring to light commonly held values and can motivate people from different perspectives to engage in collaborative problem solving.

Environmentally responsible stewardship encompasses a range of behaviors from engaging in low impact logging, to limiting development, to reducing pollution, to using mass transit. Measuring the extent to which your community engages in environmentally responsible behavior can provide important feedback about whether your day-to-day activities (including introducing best management practices or running environmental education programs) is having any impact on your target population.

The field of sustainability is very broad and is represented by only a sample of indicators here. For more information see also:

- *Indicators and Information Systems for Sustainable Development*: A guide to the development of good indicators for sustainable development  
<http://www.sustainer.org/pubs/Indicators&Information.pdf>.
- *International Sustainability Indicators Network*: working on indicators to measure sustainable development. One current initiative focuses on indicators for sprawl and smart growth.  
<http://www.sustainabilityindicators.org/workgroups/WorkGroups.html>.
- *The Pattern Map*: A guide to the balance between natural, social and economic capital in a Conservation Economy. <http://www.conservativeconomy.net/>



### Sample objectives

- *Develop an environmentally responsible community*
- *Promote sustainable use of natural resources*
- *Become model stewards of the land*

### Sample evaluation questions and indicators



To what extent are community members changing their behavior to be more environmentally responsible or engage in stewardship behavior?

- ◆ Percent of target population using best management practices
- Surveys of “ecological footprint” of individual residents over time
- Per capita energy or water use (BTU/person or gallons/day/person)
- Total greenhouse gas emissions compared to three years ago
- Renewable energy as a percent of total energy use in the region
- Municipal solid waste generation

Number of brown sites being remediated  
 Percent of new developments with clustered homes  
 Amount of green space (parks, fields, etc.) in the community  
 Participation in environmental activities/events sponsored by local groups  
 (bird count, tree plantings)  
 Number and percent of local businesses that recycle  
 Compliance with local ordinances/restrictions on lawn-watering, car  
 washing, etc.  
 Number of communities that have access to curbside recycling

**?** To what extent is the community engaged in environmental activism or aware of environmental issues?

- ◆ Responses to surveys, interviews or focus groups
- Local newspaper coverage of local environmental issues
- Number of environmental community associations (e.g. Trees Forever, Ducks Unlimited, Sierra Club) in county organization guide from Extension or EPA office
- Attendance at environmental events (clean-ups, education events, outings)
- Number of times federal and state authorities reference local environmental and/or natural-resource management plans as part of their decision-making process (from meeting minutes or funding proposals)

#### Data sources

- Surveys, interviews and focus groups
- Environmental advocacy groups
- Local or state government offices, such as municipal planning authority

#### Example

The **Sustainable Development Commission of the City of Portland**, Oregon developed several measures to determine “just how sustainable is Portland?” They gathered data on a variety of information such as air quality, vehicle miles traveled, traffic congestion, toxic releases, tree canopy, recycling, carbon dioxide emissions, poverty, home ownership, building codes, job and housing growth in central cities, water consumption and parks acreage. They compared Portland to six other cities across the nation that had similar populations and costs of living and three additional cities considered to be well managed. They found that Portland fared very well on many sustainable benchmarks, but fared poorly on certain issues such as toxic releases. This information helped the city identify its strengths and, more importantly, identify issues needing more attention.

For more information, see: [http://www.sustainableportland.org/stp\\_benchmarking.html](http://www.sustainableportland.org/stp_benchmarking.html).



## ECOLOGICALLY SUSTAINABLE ECONOMY

In an ecologically sustainable economy, long term ecosystem health is considered in decisions about the economy and resource use. For example, when a community decides to fund the construction of a new road, they would give equal weight to the economic benefits (attracting businesses, reducing transport costs, etc.) and the ecological costs (increased air pollution, decreased water quality from impervious surface run off, etc.). This ensures a decision that maximizes net economic *and* environmental benefits for both present and future generations.

The sample of sustainability indicators below can help you assess the interplay between the economy and the environment in your community.

### Sample objectives

- *Balance economic development and ecological restoration*
- *Promote sustainable use of natural resources*
- *Human uses are compatible with the maintenance of ecological integrity*


### WHEN IS IT “SUSTAINABLE?”

It is useful to develop specific criteria in order to assess the relative sustainability of different resource extraction practices or industries in your project area. For example, numerous national and international frameworks suggest that sustainable *forest* management must maintain:

- Biological diversity
- Soil and water resources
- Forest contribution to the global carbon cycle
- Long-term productivity
- Socioeconomic benefits


Specific measures are used to determine how well these general elements are maintained.

### Sample evaluation questions and indicators

 How ecologically sustainable is our community or economy?

To what extent does the community use non-renewable resources sustainably?

- ◆ Ecological footprint of people in the community<sup>11</sup>
  - Park visitor numbers compared to estimated human carrying capacity
  - Resource use/harvest compared to optimal sustainable yield
  - Production efficiency (resource use per good produced)
  - “Green” Net National Product (income minus natural capital consumption or depreciation) or Genuine Progress Indicator (an alternative to the GDP)<sup>12</sup>
  - Energy use, loss and balance of an economy
  - Ecological resilience of natural areas in the face of disturbance
  - Loss of primary forests compared to total primary forests remaining
  - Quality of river water entering community compared to quality leaving
  - Per-capita resource use

 Do economic or development plans take environmental concerns into account?

<sup>11</sup> There are a variety of ways to measure your footprint. For ideas, see <http://www.earthday.net/footprint/>

<sup>12</sup> For more information on GPI see: <http://www.rprogress.org/projects/gpi/>

- ◆ Percent of local governments (county, school, hospital or water district, etc.) with a strategic plan or vision that includes environmental goals
- Percent of land use plans with explicit environmental goals
- Alternative modes of transportation in development plans

❓ To what extent is the local economy based on ecological stewardship activities?

- ◆ Number of “green” jobs (ecological restoration, ecotourism, etc.)
- Annual revenue generated from “green” activities
- Percent of local revenue that meet sustainability certification or standards (certified timber, organically grown food, reputable ecotourism, etc.)
- Area used for organic farming compared to conventional farming
- Number of jobs in value-added manufacturing
- Annual revenue of value-added businesses

### Data sources

- Business and economic growth division of state/local governments
- Forestry/fishery resource extraction data/stock assessments
- Surveys, interviews and focus groups
- Environmental advocacy groups
- Chamber of Commerce

### Example

The **Marine Stewardship Council (MSC)** is a non-profit organization that promotes ecologically sustainable fisheries via a fishery certification and consumer labeling program. MSC developed an environmental standard for sustainable and well-managed fisheries and uses it as a product label to reward environmentally responsible fishery management and practices. For a fishery to become (and remain) certified it must go through an extensive certification (and reassessment) process. For example, the Alaska Department of Fish and Game (ADFG) sought to certify salmon fisheries by MSC. In 1998 an independent certifier, Scientific Certification Systems Inc. (SCS), evaluated the fisheries compliance with the MSC Standard by measuring the status of the salmon stocks, the effects of salmon fishing on the ecosystem and the comprehensiveness and robustness of the ADFG’s salmon management system. In 2000, ADFG’s Salmon fishery received certification and since then continues with annual surveillance. In addition, MSC requires recertification every 5 years. This ensures a constant assessment (and response) of whether the fishery is sustainable.



For more information see: <http://www.msc.org/> and [http://www.msc.org/html/content\\_485.htm](http://www.msc.org/html/content_485.htm)



# ORGANIZATIONAL OBJECTIVES

Use this section to help you answer questions like:

What are the characteristics of an effective organization or collaborative?

How well we are creating and sustaining our organization? Are we using a good planning and strategic decision-making process? Do people work well together? Do we have the resources and leadership we need to be effective?

## **ORGANIZATIONAL OBJECTIVES**

### **Characteristics of an effective organization**

**Clear and compelling purpose**

**Effective participation**

**Good working relationships**

**Effective decision-making and planning processes**

**Adequate resources and capacity**

**Good leadership**



## INTRODUCTION TO ORGANIZATIONAL OBJECTIVES

Your organization or collaborative has come together to address an important purpose. You may be responding to a significant challenge such as job layoffs or the decline of an endangered species. Or you may aim to preserve ecosystem health or the quality of life in your community. ***Whatever your ecological and social goals, you need to establish and maintain the processes and resources that will allow you to realize these goals.***

Setting organizational objectives can help you become an effective and efficient organization. Based both on the literature on organizational process as well as common process issues of on-the-ground community and ecosystem management projects we identify six general organizational objectives. You can think of these as “best practices” or the characteristics that will support everything else you do and allow you to respond to new challenges over time.

### WHAT IS “ORGANIZATIONAL PROCESS”?

Your organization’s process refers to how you do things like communicate with one another, make decisions, allocate resources, solve problems, motivate staff, manage conflict, learn from mistakes, or raise funds. These issues represent the nuts and bolts, gas, and steering wheel of your project. They will be important to managing any organization, and can be especially important for collaborative efforts made up of many different stakeholders or organizations. Strong group processes don’t just happen; they have to be created and adapted continuously.

### HOW TO EVALUATE *YOUR* ORGANIZATION OR COLLABORATIVE

What does it mean to have good leadership or a compelling purpose? How would you know if your group has the characteristics of an effective organization? And are all the characteristics equally important?

The pages in this section describe each of the characteristics of an effective organization and provide sample questions and indicators to help you measure progress toward them. In addition, the following tips can help you approach this important but often less tangible set of topics.

### A quick assessment, and then focus where needed

Although all of the objectives listed above are important for a functioning organization, some may be more relevant to you depending on whether you are a young or experienced group, or whether you are a small organization or a multi-stakeholder collaborative. To identify what is most relevant for your organization at this time,

- Do a quick sweep of the evaluation questions listed under each topic. You will find that you can answer some of the questions with a simple “yes” or “no.” For others you may need to consider the indicators in more detail.
- Focus on the objectives in which you think your project is currently weak. These require more attention – both in terms of figuring out how weak and why, and in tracking your improvements in this area.

Keep in mind that how you work together, manage and implement activities is not predetermined and static, but creative and dynamic. Group membership, community needs and economic conditions can change rapidly, making regular process evaluation a necessary element to respond to changing organizational needs.

#### WHY EVALUATE ORGANIZATIONAL PROCESS?

For many ecosystem and community-based projects, assessing progress toward social or ecological objectives becomes primary and less attention is given to how effectively they are managing their own organization. But a systematic or even cursory evaluation of your organization has some critical benefits. It can help you:

- Realize why you are not progressing toward ecological or social goals
- Identify and share what *is* allowing you to succeed as an organization
- Stay abreast of the changing nature of your organization and the different ways to adaptively manage your organizational resources and processes to yield the best results
- Prepare you to respond to future challenges

### Use different kinds of information to evaluate your organization

Many of the questions in this section can be asked of the people involved in the organization – what do they *perceive, think or feel* about the way the organization is managed or how people work together. This may be sufficient for your evaluation purposes. In some cases it may be useful, necessary or even easier to use measures that are *not* based on surveys, such as what people are actually doing or producing. For example, how many people attend meetings, how much money has been raised or what is the rate of staff turnover?



In sections about ecological and social topics, specific suggestions for data sources are given for each topic. Because the type of information you will use to evaluate organizational objectives is so similar across different objectives, we list them all together here.



### Data sources for assessing Organizational Objectives

- Written materials such as meeting agendas and minutes, phone logs, accounting and human resources records, attendance records or your group's financial and strategic planning documents
- Participant (staff, stakeholders, volunteers) interviews, questionnaires and self-assessments
- External sources such as community newspapers, funders, other groups or targeted phone interviews.

### Use integrative indicators of an overall effective process

There are many different aspects of your organization you could measure, and you should focus on those issues most important to your situation. There are also a few indicators that cut across many of the organizational process themes covered here. They might reflect good leadership, effective planning processes, good relationships or some combination of different organizational objectives. You can use them as overall measures of the effectiveness of your organizational process.



#### Retention rate or turnover of staff and board members

Clarity of statements about the project (clear mission statements, easily understood intent or plan, etc.)

Survey of staff or members of the collaborative: *Is it fun?*

Sustained funding

Percent of people offered a position with the organization who accept

On-the-ground ecological or social changes related to project efforts

### Consider related organizational issues

Just like your ecological and social objectives, there may be threats and assets hindering or helping progress toward your organizational and other objectives ([Organizational weaknesses](#), p. 148 and [Organizational strengths](#), p. 168) and there are a specific set of strategies you engage in to achieve your organizational objectives ([Organizational management](#), p. 202).

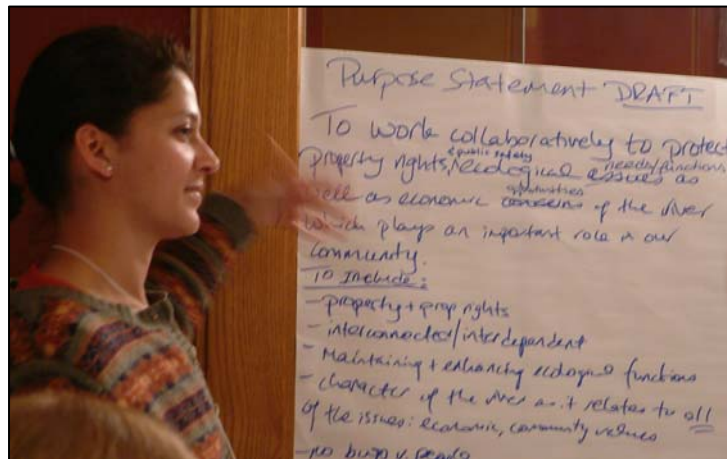
*Next: Two-page spreads on specific organizational objectives*

## CLEAR AND COMPELLING PURPOSE

No matter what kind of organization you are, you need members who are motivated to work together toward a common solution. Motivated parties share a vision, dedicate their full energies to an effort and confront challenges with the expectation of success. Motivation and effective collaboration depend on having goals that members feel are clear, compelling and attainable.

Evaluating whether your organization or collaborative has a clear and compelling purpose is important not only for young, establishing groups, but also for more mature groups that need to maintain clarity of purpose to be efficient in their efforts.


Soliciting feedback from your group members with respect to their understanding and support for the group's goals and activities will help you identify and address motivational issues before they turn into problems. At the same time, knowing whether *outsiders* view your purpose as clear and compelling can help you clarify misunderstandings or attract potential supporters




### Sample Evaluation questions & indicators

**?** Are project goals and objectives clear?  
Do participants share in a common vision or mission?

- ◆ Existence of an agreed-upon mission or vision statement and/or list of key goals of the project, program or organization
- Percent of members (board, coordinators, staff and/or volunteers, etc.) who state that they feel motivated by their mission statement
- Percent of target internal and external audiences who agree that they could clearly articulate and understand project mission statements, intent or plan, etc.
- Percent of target internal and external audiences who can correctly articulate existing project mission statements, intent or plan, etc.
- Existence of a completed strategic plan or a set of criteria for engaging in new efforts
- Existence of a logic model or situation map depicting how organization's efforts link to context and project objectives
- Existence of an agreed-upon set of measures of project success
- Existence of an organizational web site or publications that state program mission and/or goals

 Are project members motivated and energized to be involved and take action?

- ◆ Percent of members who frequently attend and participate in meetings and project activities
  - Self-rated level of motivation (from survey of board, staff, etc.)
  - Percent of participants who state that they have fun and/or enjoy their work
  - Percent of participants in a collaborative who state that there is a compelling reason to collaborate and/or that they are better off working together
  - Staff/board turnover rate

 Does the situation the parties face encourage action?

- ◆ Existence of an urgent, crisis situation that motivates collective action, such as job layoffs or species loss
  - Percent of board, staff, etc. who feel that they face an urgent situation
- Existence of a legal framework for the project such as a lawsuit settlement, rulemaking preceded by notice and comment, proposed mitigation activity
  - Percent of board, staff, etc. that feel motivated by legal obligations



### Example

The **Northeastern Nevada Stewardship Group (NNSG)** is a collaborative partnership of citizens, business groups and resource management agencies in Elko County, Nevada. Since 1998, the group has tackled emerging natural resource challenges in the community including the potential listing of the sage grouse as endangered – a situation which especially motivated diverse parties to collaborate. To clarify their current and future directions, NNSG participated in an EMI-facilitated evaluation planning process. As part of this process, group members completed an “organizational assessment” survey where they ranked on a scale of 1 (strongly disagree) to 5 (strongly agree) their views on a series of statements about the organization and its members, including questions about the clarity of their goals or purpose. This allowed the group to review the survey results and openly discuss their understanding of and commitment to the group goals and mission. This helped them identify areas of common ground and areas where they needed clarification.

For more information see:

[http://www.blm.gov/partnerships/case\\_studies/nnsgh.htm](http://www.blm.gov/partnerships/case_studies/nnsgh.htm)

and <http://nnsgh.org/>

## EFFECTIVE PARTICIPATION

Every effort must have the “right” people involved who can collectively fulfill the basic needs of an organization such as planning, fundraising and implementation. These may include people who:

- Represent or are affected by the area, resources, culture or issues at stake,
- Have time and motivation to dedicate themselves to the effort,
- Have special knowledge or skills
- Have decision-making, legal or authoritative power.



It is also important that the “right” people are not only present, but effectively involved in the short and long-term. *Continuity* of participation can be very important as high turnover can disrupt efforts. Even a few long-term active participants can effectively bridge knowledge gaps between experienced and new members of the collaborative or organization.

Asking evaluation questions about the type and continuity of people who participate in your efforts can help you create a plan to address gaps or weaknesses so that you can maintain a credible and committed team.

### Sample evaluation questions and indicators

- ? Are the “right” people or groups involved?
  - ◆ Percent of people involved who have:
    - Decision making authority
    - Expressed interest in the process or outcomes
    - Special knowledge of the issues
    - Necessary skills (fundraising, planning, accounting, etc.)
  - Percent of stakeholders / local community members who feel they are well represented by the people participating in a collaborative or organization


### TRACKING STAKEHOLDER INVOLVEMENT

“We are all here for salmon recovery, that’s the thing we are judged on and rated on to see if a watershed council is successful. But we won’t be successful with those tangible things if we don’t have success in getting volunteers interested in projects, having people coming to meetings, and leveraging support from agencies or corporations to participate. So...that’s why we track the number of stakeholders that are involved and stay involved. Without stakeholder involvement, so much will not happen.”

- Brian Wolcott,  
Walla Walla Basin Watershed Council

 To what extent are we maintaining continuity of participation or membership?  
Are we maintaining the breadth of representation needed?

- ◆ Member, board or staff turnover rates
  - Existence of a procedure to involve new parties in the effort
  - Existence of a procedure or set of materials to pass knowledge on from departing to new members
  - Number of new stakeholders involved in the effort
  - Percent of staff hired to replace departing staff that begin their jobs before the person they are replacing departs

 Are key individuals or groups committed to working together?

- ◆ Members follow through on their commitments
  - Members demonstrate their willingness to take collective action such as signing a memorandum of understanding or a contract
  - Individuals with decision-making authority attend meetings and are involved
  - Each organization dedicates a meaningful amount of staff and/or volunteer time to the effort
  - Members feel that they need to work together
  - Members feel the process opens up new opportunities



### Example

The **U.S. Environmental Protection Agency** maintains an ongoing feedback and evaluation program to measure and improve its own public involvement efforts. The website of EPA's Office of Public Involvement offers numerous public involvement questionnaires for various audiences who participate in EPA-supported initiatives including, among others: Federal Advisory Committees, public meetings, public hearings and stakeholder negotiations. Agency personnel utilize these questionnaires to evaluate the processes they lead and the feedback from public participants helps the Agency develop events and processes that are more meaningful for participants and contribute more to EPA's decision making. On the Public Involvement website, the Agency also provides a toolbox featuring key evaluation findings and recommendations which can be of assistance to Agency personnel and others who seek to engage outside individuals or organizations in decision-making.

For more information see:

[www.epa.gov/stakeholders/feedback/index.html](http://www.epa.gov/stakeholders/feedback/index.html)

## GOOD WORKING RELATIONSHIPS

How well do you work together? Every organization requires good relationships among board members, staff, volunteers, and anyone involved in the organization's efforts. Good working relationships maintain group effectiveness, efficiency and motivation. This is especially true of collaboratives, which may involve parties with diverse and conflicting viewpoints.



Good working relationships include:

- Effective and open communication
- Low levels of conflict
- A foundation of trust among coworkers or participants

Soliciting feedback on the quality of interaction between your group members will help you identify problems that undermine effective partnerships and ways to address these problems. For example, you may learn that some parties believe there is important information being concealed from them, or others may feel uncomfortable participating in group discussions. You can use this knowledge to improve relationships by designing an information-sharing system to keep communication open or ground rules for meetings to encourage equal participation.

### Sample evaluation questions and indicators


**?** How well do we work together?

- ◆ Group is producing things (written decisions, strategic plans, reports, web site, etc.)
- Meeting agendas change over time (key issues resolved, lack of stalemates)
- Peer review of quality of what group has produced
- Percent of products that are widely distributed or disseminated (web site, publications, etc. showing comfort level of how we represent ourselves)
- Clarity of statements about the project (clear mission statements, easily understood intent or plan, etc.)

**?** Is there effective communication between members? Between groups?

- ◆ Members can articulate each other's interests/concerns
- Members feel that meetings are open enabling parties to easily observe deliberations and decision-making
- Members believe they are communicating openly
- Communication ground rules are followed
- Members feel in control of the process (e.g., they are being listened to, not manipulated)



 To what extent do co-workers or members of the collaborative get along or trust each other?

Is there conflict among project members?

- ◆ Number of social events (holiday parties, picnics, etc.) for staff per year
- Percent of staff who attend social events
- Percent of paid staff who also volunteer time
- Percent of participants who agree their work with the organization is fun
- Editorials in local paper suggest conflict between parties is low
- Members say the same things publicly as they do privately

 Is conflict handled constructively?

- ◆ Existence of meeting ground rules to ensure equal participation, civil discussion, etc.
- Members do not criticize or blame others for causing problems
- Members see one another as part of the solution, not the problem
- Members feel that conflict in the group is managed constructively
- Members feel that they have developed new skills to handle conflict in the future
- Members table conflict-ridden issues until all parties are ready to address them
- Members focus on interests, not positions
- Members feel the process has enhanced trust between them

*For an additional tool to assess how well you are working together see the free online Collaboration Factors Inventory at: <http://www.wilder.org/research/topics/collab>*



### Example

The **Calapooia Watershed Council** in Western Oregon conducted a self-assessment of their group's organizational process with a survey designed by the Oregon Watershed Enhancement Board. Members were asked to consider whether they "agreed," "disagreed" or were "unsure" about a number of statements about their group's process. For example, one statement read: "I listen to other council members and respect our decision-making process." Group members completed the survey and then the group's coordinator compiled the results. At the next meeting, she highlighted a number of process issues that warranted attention, and the group then spent some time openly discussing concerns and resolutions. While the survey and discussion took time, members feel that they are a stronger group as a result of it. The self-assessment provided an important barometer for the group's coordinator to make sure group meetings and decision-making processes remained fair, efficient and effective.

For more information see:

[http://www.oregon.gov/OWEB/WSHEDS/wshed\\_council\\_forms.shtml](http://www.oregon.gov/OWEB/WSHEDS/wshed_council_forms.shtml)

## EFFECTIVE DECISION-MAKING AND PLANNING PROCESSES

To be an efficient and effective organization you need to make fair and informed decisions and strategic choices. This process supports the development, implementation and adaptation of plans to achieve your ecological and social goals.

Many groups and their leaders fail to evaluate their decision-making and planning processes, so they are sometimes caught off guard when tasks are unclear or incomplete. To know whether you need improvement in this area, you can solicit feedback from staff, board members, etc., as well as assess how and how well you accomplish things.

To assess the effectiveness of your processes you may also want to consult:

- [Ineffective or inefficient management of organization](#), p. 148
- [Develop strategic direction and adapt over time](#), p.206.

### Sample evaluation questions and indicators

**?** Does the group have a fair and effective way of making decisions?  
Do members feel the management plan was developed in an appropriate manner?

- ◆ Members feel they have a chance to speak when they want to
- Ground rules exist and are followed
- Members feel they had an equal voice in developing plans
- Members support all or a majority of aspects of the plan
- The plan is written in a way that all members understand

**?** To what extent do we use best available information to make decisions?  
Does our planning process involve the use of sound technical and scientific advice?

- ◆ Date and source of scientific material used to support decisions
- Peer review of information used to make decisions
- Members feel that decisions are based on credible information
- Number of different types or sources of information used to make decisions  
(social knowledge, community sentiment, traditional ecological knowledge, peer-reviewed journals, expert opinion, public opinion, etc.)
- Number of conferences, meetings or other informational sessions attended by organization staff, board, members
- Frequency of interactions with a scientific or technical advisory committee

**?** To what extent is our planning process efficient and effective?  
Do we have a good process for focusing our efforts?


- ◆ Participants are pleased with the strategic planning process used to create plan (feel it took a reasonable amount of time, produced a good product, included fair and open decision-making, etc.)
- Peer or external review of action/management plan
- Existence of criteria to choose among future strategic opportunities


Plan produced includes: clear and measurable objectives, action items, logic model or situation map depicting how objectives and actions are linked, responsible parties, timeframes for implementation and completion, estimated costs and how the effort will be financed, measures of progress and a plan to collect and respond to this information, etc.


Percent of action items developed at strategic planning retreats that are implemented six months after the retreat


Members/volunteers feel their time is used effectively

Members feel the frequency of meetings is appropriate

 To what extent does our planning process promote learning and adaptation?

-  Members have a system to share information such as a website, monthly update meetings, email updates and minutes
- Members feel like they belong to a “learning organization”
- Monitoring information is used in decision-making or members have a plan to use new information in decision-making
- Members have a process to resolve uncertainties such as joint learning exercises or scientific advisory boards
- Members feel comfortable with the volume and complexity of information used in decision-making
- Frequency of plan updates or course corrections

 Do we hold parties accountable to their commitments?

-  There is a legal structure for agreements to fit into such as court-enforced settlements, agency rulings or contracts
- Group commitments are subject to review and comment requirements
- Watchdog groups are welcomed to ensure compliance with agreements
- Sanctions exist for non compliance with agreements



### Example

The **McKenzie Watershed Council** seeks to ensure sustainable watershed health, functions and uses through voluntary partnerships and collaboration. The council charter document contains many of the indicators of an effective planning and decision-making process. For example, it clearly states mission, goals and tasks. It also explicitly describes their decision-making process, ground rules and criteria for strategic partnerships. They lay out a system for measuring council effectiveness in terms of a series of indicators for each goal, with specific benchmark conditions they aim to achieve by certain points in time. This includes measures of accountability, such as the number of benchmarks successfully tracked, the ability to answer database queries using GIS and the completion of annual and state of the watershed reports.

For more information see:

<http://www.mckenziewatershedcouncil.org/history.html>

## ADEQUATE RESOURCES AND CAPACITY

Do you have what you need to accomplish your goals? In setting organizational objectives it is critical to consider tangible needs such as staff time and skills, funding, space and equipment that support your group's activities. Not having the resources and capacity you need can be a real threat to achieving your goals (see [Inadequate resources](#), p.150 ) and to minimize this real or potential threat you may engage in strategies that involve [Building and sustaining organizational resources](#) (p. 202).



### Sample evaluation questions and indicators

**?** To what extent do we have a supportive and productive work environment?

Does the project have sufficient space and equipment?


- ◆ Staff/volunteer opinion of whether they have the work space and supplies they need to do their job effectively
- Participants feel the common meeting place is mutually accessible
- The group has a place to store and access materials both in print and electronically
- Members feel the group's technical equipment is adequate for the project

**?** Does the project have adequate staff with key skills?

Are we increasing our capacity?

How well are we leveraging our limited capacity?

- ◆ Skill/expertise of current staff and board compared to expected skill/expertise required to complete planned activities or tasks
- Skill/expertise of current staff and board compared to their assigned tasks
- Staff and/or board perceptions of whether there is adequate staffing and expertise to run the organization, including fundraising, planning, management and accounting
- Percent of staff that agree hiring additional administrative or technical support should be a priority
- Number of full-time paid staff vs. volunteers
- Number and quality of staff opportunities for career development and enrichment or training in new skills
- Number of board, staff or volunteers that feel they are spread too thin
- Staff retention rate
- Number of volunteers trained in needed skills
- Number of formal and informal partnerships developed to meet specific capacity needs
- Existence of designated volunteer program coordinator

 To what extent is our funding sufficient and secure?  
How diversified is our funding?

- ◆ Level and variation over time in operational and programmatic funding
- Percent of funding from different funding sources (foundations, government, corporations, membership, sales, etc.)
- Expected costs of planned activities vs. available budget
- Percent of grant proposals accepted
- Percent of projects terminated because of lack of funds



### Example

**The Conasauga River Alliance** is a diverse group of stakeholders in Tennessee and Georgia that have come together to protect private property rights and sustain a clean Conasauga River. Since its creation, the Alliance has received financial, staff and organizational support from The Nature Conservancy, the U.S. Forest Service and several other partners. Reliance on this support has led to problems with limited and erratic organizational resources. This became especially evident when in one year intense forest fires led the Forest Service to retract the Alliance's Forest Service project coordinator and funding for that year. This inadequacy of resources interrupted the Alliance's activities, including research cost share agreements with two universities, bioengineering of a riverbank and botanical surveys. In response, the Alliance is now engaged in additional strategies to secure consistent funding and specifically evaluates the sources and allocations of their funding in an Annual Report.

For more information see:

<http://www.conasaugariver.net/>

## GOOD LEADERSHIP

Behind most successful projects is a leader or set of leaders whose continuity, contagious enthusiasm or devotion and effective coordination of activities helps the group accomplish what it does. Who are your leaders and are they effective? Consider different types of leaders such as:

- Directors
- Coordinators
- Board members

You will also know you have good leadership when your group as a whole has certain characteristics or achievements, such as sustained funding or low staff turnover.




Assessing the quality of the leadership or coordination of your organization or collaborative – through confidential surveys, informal discussions or assessment of your organizational track record – is important to make sure this crucial element of your organizational process is up to par.

### Sample evaluation questions and indicators

**?** Is the project well led? Facilitated?

How effective is our leadership?

- ◆ Turnover rate of leader or coordinator
- Sustained funding for leadership position
- Staff/volunteers perception of whether their group's leader/coordinator is effective
- Staff feel that board leadership and involvement is consistent and appropriate
- Outsiders feel the organization has good leadership
- Staff feel the leader instills a sense of value, worth, confidence and fairness in all members of the organization
- Staff feel that leader makes a valuable contribution to the organization
- Staff feel that all staff are being paid fairly
- Staff feel that their leader *believes* in the program or project
- Collaborative members feel the facilitator/leaders gives them equal footing regardless of their financial situation and clout
- Frequency and regularity of informal interactions between leader and staff (office drop in, chat in hall or at coffee break, etc.)
- Frequency and regularity of formal meetings between leader and staff
- Retention rate of staff
- Turnover rate of board members
- Level and variation over time in project funding

 Does the project have strong leadership?

- ◆ Percent of participants or staff that can identify the coordinator or “glue person”
- Number of times in meetings that communication and decision-making ground rules are not followed
- Number of continuous years of leadership



### Example

The **Northeastern Nevada Stewardship Group** (NNSG) is a collaborative partnership of citizens, business groups and resource management agencies in Elko County, Nevada. Since 1998, the group has tackled emerging natural resource challenges in the community including the potential listing of the sage grouse as endangered. As part of an EMI-facilitated planning and evaluation process, group members completed an “organizational assessment” survey where members ranked on a scale of 1 (strongly disagree) to 5 (strongly agree) their views on a series of statements about the organization and its members. The survey included these three statements about leadership: 1) The people in leadership positions for this collaboration have good skills for working with other people and organizations; 2) The people who lead this group communicate well with the members; and 3) Responsibilities are shared effectively among group members. Reviewing the results, group members were able to openly discuss leadership strengths and issues that needed attention, such as how to sustain good leadership.

For more information see:

[http://www.blm.gov/partnerships/case\\_studies/nnsng.htm](http://www.blm.gov/partnerships/case_studies/nnsng.htm) and  
<http://nnsng.org/>





# THREATS

Use this section to help you answer questions like:

- What threats affect our project? What circumstances or conditions do we need to *reduce, eliminate, or control* to move toward our goals?
- To what extent are we reducing the severity or scope of threats? Is the landscape fragmented? Are waters becoming less polluted over time? How well are we controlling sprawl and crime? What is the level of conflict among stakeholders?

## THREATS

### Direct Ecological Threats

Habitat degradation, loss or fragmentation  
Invasive and overabundant species  
Water diversion (altered hydrology)  
Water pollution/contamination  
Air pollution  
Littering or site contamination  
Disruption of soil quality / fertility  
Altered fire regime

### Ineffective Management or Use of Natural Resources

Over-exploitation of natural or protected populations  
Destructive resource use/extraction  
Disruptive/destructive recreation  
Unfavorable policies, laws, or legal processes

### Social Stresses

Sprawl/unplanned development  
Demographic change  
Economic decline  
Crime, poverty or poor health

### Problematic Attitudes or Inadequate Understanding

Conflict or lack of trust  
Lack of knowledge, awareness, or concern  
Cultural barriers

### Organizational Weaknesses

Ineffective or inefficient management of organization  
Inadequate resources

## INTRODUCTION TO THREATS

**Threats** (also called stresses, stressors or pressures) are circumstances or forces that prevent the ecosystem or social system from being in the state you desire. Threats commonly faced by community and ecosystem management projects include:

- Ecological threats, such as *invasive species* that directly reduce biodiversity,
- Ineffective management or use of natural resources, such as the *over-hunting of sensitive species*, which may cause their and other species' populations to crash
- Social stresses or changes such as *development pressures*, which may alter community character and reduce natural habitat
- Problematic attitudes or inadequate understanding of key issues, such as *a lack of public environmental awareness or concern*, which undermines a movement toward environmentally responsible stewardship.
- Organizational weaknesses such as ineffective *time management* or *inadequate funding*.

Many threats are related. That is, one may be the source or result of the other. Threats are also related to assets – the people, places or opportunities that can bring you *closer* to your goals (see [Assets](#), p. 153). In fact, ***you will see a lot of overlap between threats and assets in the Sourcebook.*** Rather than reading through all the sections, you can jump straight to the threats or assets most relevant to your project.

### A THREAT, ASSET, OR BOTH?

It is possible for a circumstance to be *both* a threat and an asset. For example, a **high local passion for environmental issues is an asset when it is leveraged by your group** to support your efforts, but it can also be a threat if it prevents people from reaching effective collaborative solutions. **Government policies** can also be a threat or an asset depending on how they align with your strategies and objectives.

Whether something is a threat or asset can also *depend on whether you have it!* **Funding**, for example, is an asset if you have it and a threat if you don't. The same is true for **expertise, leadership, or protected areas.**

## HOW TO IDENTIFY AND EVALUATE YOUR PROJECT'S THREATS

To identify your project threats consider what is preventing or undermining your project's progress? What would you need to reduce or minimize to move toward your ecological or social objectives? To help you prioritize which threats to address and measure your effect on threats, also consider:

### What threats are affecting critical ecosystem or community features?

To focus on the most important threats to your community or ecosystem, consider which threats are affecting:

- Currently **high quality habitats** on which many species *depend*
- Features of the community that **people strongly value** (community character, living wage jobs, community services, clean drinking water, etc.)
- **Characteristic and/or unique features** of your project area (regionally or globally rare habitat types like old growth forest, river systems, historical landmarks)
- **Regionally and/or globally significant communities**, including biodiversity hotspots with especially high native species richness
- **Critical habitat** for key species, such as imperiled, threatened, endangered, sensitive or economically important species (including breeding grounds or spawning habitat, migration stopovers, germination sites, etc.)

### What are the direct and indirect threats?

When choosing threats to address or measure, it helps to understand that there are multiple 'layers' to a threat:

- The immediate or *direct threat* (such as increasing fragmentation of natural areas by roads) negatively impacts habitat quality and species viability.
- The indirect threat is the *source or cause* of the increase in roads. There may be many interrelated causes, such as road-building policies, which are a product of public pressure to increase access to recreational opportunities, because of a shift in the land use expectations or values of people in the community. If you can identify the root of a problem, then your efforts can be more than just band-aid solutions!



Your strategies may be aimed direct threats or their immediate or ultimate sources or some combination of these. You can assess change on many levels and the strength of the relationships among levels.

### How severe are threats?

The following criteria or descriptors of a threat (or asset) can be useful for evaluating change, but also for prioritizing which threats or assets to focus on:

**Impact:** How strong or severe is a threat's impact? Is its effect short-term, long-term or irreversible?

**Breadth:** How many different aspects of the system does it affect? Is it specific to certain objectives or does it affect your ability to achieve them all? Over what physical area does it have an impact? Is it localized or pervasive?

**Urgency:** Is the threat about to have a critical impact on the system, or will it in the future? How far in the future? Is the asset time-dependent? Would it have to be used or maintained now, or is it stable and long-term?

#### STEPS TOWARD SUCCESS

Your project may have ultimate goals of healthy, functioning ecosystems and vibrant communities and economies. Changes in the threats affecting these long-term, large-scale goals can often serve as more immediate measures of progress.

For example, you know you are on your way to achieving high quality habitats if you can show a decrease in the breadth or impact of invasive species. Similarly, you can document progress toward your ultimate goal of an ecologically sustainable economy if you have overcome the lack of support of key businesses in the community.

*Next: Two page spreads on specific project threats*

## HABITAT DEGRADATION, LOSS OR FRAGMENTATION

Ecological communities or habitats are degraded or lost if they no longer support the level of biodiversity or ecosystem function that is natural or characteristic for that area.

For example, a forest community can be *degraded* by the use of heavy machinery or off-trail biking, because these activities lead to a loss of species and/or soil and water quality. A habitat can be *lost* if it is not only degraded, but more fully changed, such as a forest being converted into monoculture farmland or a heavily-paved development.



Habitat *fragmentation* goes hand in hand with both habitat degradation and loss. Fragmentation occurs when previously continuous habitat is converted into smaller and separated pieces or fragments of habitat. It can also be the result of added infrastructure (roads, power lines, fences or dams). Fragmentation is a threat to ecological integrity not only because it reduces the total amount of available habitat (directly and by creating low-quality fragment “edge” habitat), but also because it prevents or hinders species interactions and movement. The result is often a slow to rapid loss of the species that were found in the original habitat.

Measuring changes in the extent and severity of habitat degradation, loss and fragmentation *and* the factors causing this change can be a powerful measure of project progress.

### Sample evaluation questions and indicators

**?** To what extent are we fragmenting the landscape?


At what rate are natural areas converted to other uses? What is the rate of loss of natural areas?


- ◆ Change in land use or cover, including:
  - Number of acres and rate of increase of developed land or sprawl
  - Number of acres grazed
  - Number of stream miles with vegetative cover
  - Percent of land with impervious surface (paved, compacted, etc.)
  - Percent loss of wetlands
  - Road density
- Difference in species composition (and other measures of [habitat quality](#), p. 32) between patches of interest and surrounding matrix

**?** Are we reducing the level of habitat fragmentation?

- ◆ Average patch size
- Number of patches in different size classes
- Ratio of edge to interior area

Number and size of discrete areas (such as patches of natural areas within urban or suburban regions)  
 Number and size of corridors  
 Density of roads (miles of road per acre)  
 Persistence in patches of indicator species sensitive to fragmentation, such as amphibians  
 Rate of species loss from fragments  
 Abundance of indicator species with large area requirements (such as raptors or large carnivore)  
 Abundance of indicator species characteristic of fragment edges  
 Degree of clustering of forest harvest units

 How severe are the barriers to species movement?

-  Length or density and type of barriers to dispersal (roads, fences, etc.)  
 Road density, type (paved, lanes), use, location  
 Degree of ecological dissimilarity between matrix (intervening areas) and patches (natural fragments)  
 Number and type of species moving between patches or using corridors  
 Rate of species loss from fragments



### Data sources

- GIS or land-use maps or aerial photographs (see <http://terraserver.microsoft.com/>)
- Local university research programs
- FRAGSTATS: (<http://www.umass.edu/landeco/research/fragstats/fragstats.html>)
- Radio-collar or other tracking of wide-ranging species



### Example

The **Wilderness Society** uses science, analysis and advocacy to protect and restore America's wilderness areas. Clear-cut logging, road construction and urbanization threaten one of their focal areas, the Cascade Crest region in Washington. They used GIS databases to quantify the degree of fragmentation by determining the edge density (measure of the length of habitat patch edge per unit area), mean patch size (mean size of patches of habitat within the study area) and core areas (habitat patches that are distant enough from habitat edges or other disturbances to ensure that species within remain relatively unaffected by edge effects). They compared these values in natural areas vs. areas with roads and clear cuts and were able to document a dramatic increase in edge density and substantial decreases in mean forest patch sizes and the total amount of forested core area. They use this information to influence management decisions in the Cascade Crest forests.

For more information see:

<http://www.wilderness.org/Library/Documents/CascadeCrestForests.cfm>

## INVASIVE AND OVERABUNDANT SPECIES

Invasive species are a major threat to biodiversity. By out-competing or directly preying upon native species, they can quickly dominate a previously species-rich area. Tracking invasive species can be a powerful way of assessing progress toward ecological integrity.

In addition to tracking the threat of invasives themselves, it is important to assess changes in the sources of invasive species (nurseries, ballast water, etc.) and the conditions (natural and human disturbances) that make systems more vulnerable to invasion.

**Invasive** = “A species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health” (The National Invasive Species Council). Note that *native* species can also behave like an invasive, such as *over-abundant* deer or algae populations.

**Introduced** = A species that is not native (did not evolve there) but intentionally or unintentionally brought there; also called *alien*, *non-indigenous*, or *exotic*. Introduced species are not always invasive, either because they are not deemed a threat and/or they do not spread well, such as some crops and ornamentals.

**Weed** = A plant growing where it is not wanted. May or may not be introduced. *Noxious* weed is a term used for weeds that are particularly difficult to manage.

**Pest** = An insect, weed, plant pathogen, bird, mammal or other organism that is deemed problematic, usually in high numbers. May or may not be introduced.

### Sample evaluation questions and indicators

**?** What is the extent, scope or severity of invasion?

Are we minimizing the direct impact of invasive species?

- ◆ Percent of species in a community or guild that are non-native
- Range of the invasive (how large an area it occurs in)
- Rate of increase in range
- Abundance (estimate of number of individuals or biomass per area)
- Per-capita or per-biomass effect of the invasive species in terms of changes in:
  - Behavior of native species
  - Population size or growth rate of native species
  - Native species diversity
  - Nutrient or water availability
  - Frequency or intensity of fires

### Compared to What?

You can assess the scope or intensity of an invasive threat and understand what is causing it by comparing the number or type of invasives:

- In disturbed (near trails, construction, etc.) vs. undisturbed sites
- Before vs. after different efforts to control them (fire, mowing, hand pruning, etc.)
- Over time in the same area
- Near vs. far from the assumed source of invasives (residential gardens, trails, bait dumping grounds, etc.)

Overall impact of the invasive species (range x abundance x per-capita effect)



Economic cost of the invasive in terms of damages or eradication/control  
 Abundance of an invasive species relative to a characteristic native species  
 Ratio of native to non-native plant cover

**?** To what extent are we reducing additional introductions of invasives? Are we decreasing the potential for invasives to colonize these areas?

- ◆ Percent of nursery-sold plants that are invasive
- Percent of people in community that can recognize invasive species
- Number of new invasives per year found along hiking trails or roads
- Percent of area that is vulnerable to invasion because it is disturbed (trampled, stripped of vegetation, over-fertilized, fire-suppressed, etc.)
- Percent of areas from which invasives are removed that are re-colonized by the same or other invasives

### Data sources

- Existing species range maps or species inventories
- Volunteer watch, monitoring or photo-monitoring programs
- Nursery sales records
- Weed Information Management System (<http://tncweeds.ucdavis.edu/wims.html>)
- Invasives species website databases, such as <http://www.invasivespecies.gov/>, <http://www.nps.gov/plants/alien/index.htm>, <http://www.invasivespecies.org/bonap/> or [www.issg.org/database](http://www.issg.org/database)



### Example

**Plant Conservation Alliance (PCA)** –PCA is a consortium of governmental agencies, non-governmental conservation groups and researchers that work together to prevent native plant extinction and restore native habitats. PCA is addressing the threat of invasive species through their “Weeds Gone wild: Alien Plant Invaders of Natural Areas” program. This program is a web-based project that provides information on invasives to the general public, land managers, researchers and others. By working with governmental and non-governmental organizations, as well as with volunteers, they have been monitoring the populations of invasive species across the US. They measure their success in terms of changes in the number of invasive species in a specific area over time.

For more information see: <http://www.nps.gov/plants/alien/index.htm> or <http://www.nps.gov/plants/index.htm>.

## WATER DIVERSION (ALTERED HYDROLOGY)

Water diversion is the movement or alteration of the natural path of water as it travels across a watershed, and it can result from both large and small-scale human activities.

Water diversions affect not only the storage and flow of water ([Water quantity and hydrology](#), p. 44), but also aspects of [Water quality](#) (p. 42) such as temperature or oxygen levels and all the organisms that depend on that water for survival and reproduction.



There are many forms of water diversion that may hinder progress towards a goal of “natural waterways.” These include:

- *Dams*, which can change the landscape both above and below the dam, including the frequency and distribution of flooding – a key natural disturbance in many systems;
- *Concrete banks* along rivers, which can affect water speed, turbidity and flooding.
- *Diversion for irrigation* from rivers, lakes and streams, which can affect water tables and consequently water quality and the ability of fish and other organisms to persist.
- *Conversion of wetlands*, directly or indirectly, which is also critical to many species habitats and even drinking water quality. Wetlands absorb and filter surface-water runoff from higher lands before the water reaches rivers, streams and lakes, reducing flooding and the excess additions of pollutants and nutrients into the waterway.

You can assess how well you are addressing this threat by tracking changes in the scope and extent of water diversions, what causes them and their ecosystem consequences.

### Sample evaluation questions and indicators

**?** To what extent are surface and groundwater flows being diverted?

- ◆ Number of dams per 100 miles of stream
- ◆ Percent of flows diverted
- ◆ Incidence of stream scouring due to extreme runoff
- ◆ Percent impervious surface in the watershed (pavement, etc.)
- ◆ Number of irrigation wells
- ◆ Number of river miles with concrete banks or rip-rapped
- ◆ Extent of hardened lake shoreline

**?** To what extent does the dam slow or alter the natural flow patterns?

- ◆ Frequency, duration, timing, magnitude and rate of flow changes
- ◆ Groundwater accretion to surface waters
- ◆ Net recharge and withdrawals from groundwater

? To what extent is fish passage affected?

- ◆ Number of non-passable irrigation diversions or road culverts
- Number of fish killed in turbines
- Change in behavior of fish at fish ladders
- Change in number of sensitive or endangered fish species before and after dam addition

? To what extent do flow patterns affect erosion downstream?

- ◆ Frequency of channel incision downstream of dam
- Amount of bank erosion downstream of dam

### Data sources

- USGS water gauges and maps: <http://water.usgs.gov/nsip>; <http://water.usgs.gov/waterwatch>, <http://ngmdb.usgs.gov>
- Local or regional drain commissions
- USFWS Fish passage website  
<http://fisheries.fws.gov/FWSMA/FishPassage/fpprgs/overview.htm>
- American Rivers dam removal tool kit  
[http://www.americanrivers.org/site/PageServer?pagename=AMR\\_content\\_8cf8](http://www.americanrivers.org/site/PageServer?pagename=AMR_content_8cf8)
- FERC: <http://www.ferc.gov>
- State DNR, DEQ, etc.

### Example

**Morro Bay National Estuary Program (MBNEP)** – Morro Bay in California is one of the largest remaining estuaries along the California coastline, yet the health of the estuary is threatened because the two creeks that flow into the estuary are heavily diverted for municipal and agricultural use. On-stream reservoir reduces summer surface water flows, and levees along the streams affect water quality. Sensitive species in the creek drainages, including steelhead trout and the endangered tidewater goby, have been impacted. MBNEP has addressed the issues of water diversion and developed a Comprehensive Conservation and Management Plan that details their action plans, as well as their programmatic and environmental objectives. They measure the threat of water diversion and its consequences in terms of (i) water quality and habitat changes over time; (ii) species diversity and stream ecology; (iii) percent increase in critical habitat types; (iv) changes in stream cross-sections and profiles; and (v) changes in stream classifications to more stable areas.



For more information see: <http://www.mbnep.org/conservation/> and <http://www.epa.gov/OWOW/estuaries/about3.htm>

## WATER POLLUTION/CONTAMINATION

Streams, rivers, wetlands, lakes, marine and underground water sources can be contaminated by a variety of different pollutants. These contaminants can be a major threat to biodiversity and human health (such as through drinking water recreation).

Tracking the level of water pollutants as well as the *sources* of those pollutants can help you make better strategic choices in your efforts to improve water quality. For example, you will engage in different strategies to locate and reduce point sources, such as sewage or industrial discharge, than more diffuse and unregulated non-point sources of water pollution, such as run off from agricultural fields and residential landscapes.

### TYPES OF WATER POLLUTANTS

- **Microorganisms** – fecal coliform bacteria, *Giardia*, etc.
- **Toxins** – pesticides, cadmium, copper, lead, mercury, phenol, nickel, zinc, hexavalent chromium, etc.
- **Sedimentation** – soil runoff
- **Excess nutrients** – phosphates, fertilizers, agricultural wastes, etc.
- **Thermal pollution** – hot water from industrial discharge and power plants

For more information see

<http://www.epa.gov/ebtpages/water.html>.

### Sample evaluation questions and indicators

**?** How polluted is our water? Are we reducing water pollution?

- ◆ Number and types of different contaminants in the watershed in comparison to EPA standards
- Number of fish kills in the watershed
- Number and types of fish and macroinvertebrates (% invasive, pollutant-tolerant)
- Number of complaints to municipality of poor water taste, appearance and smell
- Frequency of newspaper headlines or letters to the editor about water quality problems
- Number of reports of hypoxia and total area affected
- Frequency that water quality standards are exceeded
- Frequency of nuisance algal blooms
- Number of beach closure days
- Number of fish consumption advisories
- Amount and types of trash collected in river clean-up days
- See also [Water quality](#) (p. 42)

**?** Are we reducing the *sources* of water pollution in our watershed?

- ◆ Number of point source permits issued in the watershed
- Amount of regulation and compliance with respect to point source permits
- Number and type of contaminants found in watershed that can be attributed to the point source permits
- Miles of stream in agricultural areas that lack riparian buffers
- Total pounds of pesticides used in agriculture in county
- Number of combined sewer overflows in system

Number of sewers that drain directly into rivers  
 Number of times per year sewage treatment plants overflow into rivers  
 Number of fish farms in the watershed  
 Percent impervious surface in the watershed  
 Percent of acres in watershed that have been deforested  
 Total area of wetlands in the watershed  
 Number of households using ecologically-friendly lawn care practices  
 Number of boat waste pump-out facilities

#### SOURCES OF WATER POLLUTANTS

##### Point sources (from fixed location)

- Sewage treatment plants
- Industrial water discharges

##### Non-point sources (diffuse)

- Fertilizers, herbicides, and insecticides from agricultural and residential areas
- Pesticides on agricultural land and forests
- Oil, grease, and toxic chemicals from stormwater runoff and energy production
- Sediment from construction sites
- Salt from roads
- Acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems
- Atmospheric deposition of nitrogen and other air pollutants



#### Data sources

- USGS Biomonitoring of Environmental Status and Trends (BEST) Program datasets on environmental contaminants and their effects: <http://www.best.usgs.gov/>
- EPA data on drinking water contamination and permits to discharge waste : [http://oaspub.epa.gov/enviro/ef\\_home2.water](http://oaspub.epa.gov/enviro/ef_home2.water)
- EPA's Listing of Total Maximum Daily Loads (TMDLs): <http://www.epa.gov/OWOW/TMDL>
- Municipal wastewater treatment plants



#### Example

**The Rouge Project** (Rouge River National Wet Weather Demonstration Project) is taking a comprehensive approach to managing water quality of the Rouge River, which flows through the Detroit metropolitan area in southeastern Michigan. They identified key sources of water pollution, including run-off, raw sewage releases from combined sewer overflow (CSO) discharges and discharges from illicit connections and failed septic systems. In response, six community sewers were separated and eight communities built retention basins. These and other changes had measurable effects on pollutants and water quality. In one community, violations of the state water quality standard of 5 mg/l dissolved oxygen (DO) went from 61% in 1994 to 4% in 2000. As a result of pollution reduction, a fish advisory was also lifted in one of the lakes.

For more information, see: <http://www.rougeriver.com>

## AIR POLLUTION

A variety of pollutants threaten air quality (see also [Air quality](#), p. 46), which in turn threatens human health and aquatic and terrestrial ecosystems. While auto exhaust and the burning of fossil fuels are widely recognized to contribute to pollution, many small-scale activities also contribute to air pollution.

Evaluating the concentration of major air pollutants in your region and identifying and assessing the extent of their sources can allow you to more effectively address this threat.

### Sample evaluation questions and indicators

**?** Are air pollutants decreasing?  
Are we exceeding air quality standards?

◆ Amount of Ozone, CO, NO<sub>x</sub>, Sulfur Dioxide, Lead, Particulate Matter

Number of complaints about ambient air odor, color or visibility

Number of asthma cases

Number of air pollution days (such as ozone action days) by region per month

Number of days per year air quality standards are exceeded

Amount of area in non-attainment by pollutant (based on attaining national air quality standards)

Incidence and length of smog alerts issued

pH of rain water or lakes

**?** Are we reducing the sources of air pollution in our community?

◆ Number of automobiles in the community  
Vehicle miles traveled (VMT) estimated from traffic counts  
Number of factories  
Percent of farms using dust control, volatile waste control, etc. techniques  
Percent of factories using modern air pollution controlling filters  
Percent of households using mass transit

### COMMON AIR POLLUTANTS AND SOURCES

- **Carbon monoxide** (CO) – Vehicle exhaust, industrial processes, residential wood burning, forest fires
- **Nitrogen oxides** (NO<sub>2</sub> and NO<sub>3</sub>) – Motor vehicle exhaust, electric utilities; industrial, commercial, and residential sources that burn fuel
- **Sulfur dioxide** (SO<sub>2</sub>) – Coal-and oil power plants, industrial facilities such as: steel mills, refineries, cement manufacturing, and metal processing facilities
- **Lead** - Lead smelters, waste incinerators, industrial facilities that burn leaded-fuel, and lead-acid battery manufacturers
- **Particulate matter** (dust, dirt, soot, smoke and liquid droplets) – Factories, power plants, cars, construction activity, fires and natural windblown dust

For more information see.

<http://www.epa.gov/air/urbanair/6poll.html>

? To what extent are we addressing air pollution concerns?

Number of air quality monitoring sites

Number of personnel in the community working on air quality issues

Number and quality of air quality policies

Percent of factories in different categories (Title 5, etc.)

Number of households willing to use mass transit if it were more accessible



### Data sources

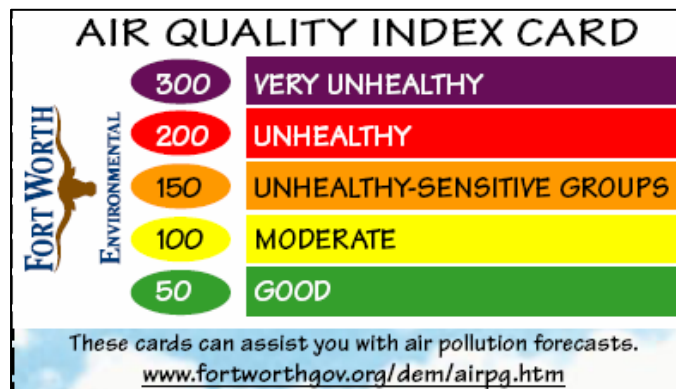
- See list in [Air quality](#), p. 46



### Example

The City of **Fort Worth Environmental Management Department** is responsible for enforcing the Clean Air Act within Fort Worth, Texas. Together with the Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) this department monitors and reports on air quality. In addition, through their web site and free programs to schools and community organizations, Fort Worth educates the public about air pollution and ways to reduce harmful emissions.

The Fort Worth/Dallas region has adopted EPA's Air Quality Index (AQI), a measure of air quality that integrates data from several critical pollutants (ground-level ozone, particulate matter and carbon monoxide). Each level of the AQI is color-coded in a way that relates air quality to human health. This allows the public to understand the impact of air quality on their health and



motivates action. The AQI is also used by public-private coalitions, such as **Air Victoria-Keep It Clean** and the **North Texas Clean Air Coalition**, as part of their efforts to educate the community on air quality and promote voluntary actions to reduce pollution.

For more information see:

<http://www.fortworthgov.org/dem/airpg.htm>, <http://www.airvictoria.org/> and [www.northtexasair.org](http://www.northtexasair.org)

## LITTERING OR SITE CONTAMINATION

Littering, from scattered garbage to illegal dumping, and site contamination by chemicals or other refuse, can seriously undermine progress towards healthy communities and ecosystems. The effects of these activities degrade not only quality of life by being an eye sore and causing human health problems, but also by making habitat unsuitable for plants and animals. This kind of land degradation may be the result of the behavior of individuals (for example, illegal trash dumping or littering) or businesses (chemical contamination of a site).

### Sample evaluation questions and indicators

**?** To what extent is land degradation a problem in our community?

Is site littering or contamination decreasing?

- ◆ Number of acres of degraded land or brownfields compared to five years ago
- Number of soil contamination incidents requiring remediation
- Number of abandoned urban parks
- Number of acres of farmland that is no longer suitable for farming
- Number of areas of scenic or natural beauty that have been converted to other uses in the past year
- Weight or volume of trash at a site
- Type of trash (beer cans vs. candy wrappers)

### LITTER: AN INTEGRATIVE INDICATOR

Tracking changes in littering/dumping behaviors not only informs you about progress towards cleaner, healthier communities, it also is an excellent indication of the level of environmental awareness, attitudes and responsible stewardship behavior in the community. The amount of trash along a project greenway, for example, can serve as indicator of the effectiveness of interpretive panels educating visitors about the ecological importance or value of that site.

**?** How well are we reducing the source of litter or contamination?

- ◆ Laws or policies related to appropriate waste removal
- Presence of signs/fees etc. enforcing laws against littering
- Number of household involved in curbside recycling
- Number of households involved in composting
- Average amount of litter generated per household over time
- Amount of non-recyclable bottles/jars/containers sold at local markets
- The number of community clean-up days
- The number of highway miles adopted by local businesses (to maintain)
- The number of public refuse/recycling containers
- The frequency with which public refuse/recycling containers get emptied
- Litter Index and Litter/Solid Waste surveys (available at [www.kab.org](http://www.kab.org))



**?** Are there incentives for developers/communities to clean-up superfund and/or brownfields sites?

- ◆ Number of federal/state/local tax incentives related to brown fields or hazardous waste sites
- Number of federal/state/local grants that are available for clean-up
- Number of voluntary versus mandated clean-ups

### Data sources

- Visual surveys
- State and local government agencies
- Resident surveys, interviews and focus groups
- Private trash collection companies
- Keep America Beautiful – Litter Index and Litter/Solid Waste Survey data
- *EnviroMapper for Superfund* tool to map National Priorities List (NPL) sites:  
<http://www.epa.gov/enviro/sf/>

### Example

**Keep Houston Beautiful** developed Houston’s Clean Neighborhoods Program to reduce litter and motivate neighborhoods to initiate cleanup and community improvement projects. As part of the project they developed a clean neighborhood handbook (a self-help tool for community organizers), and conducted leadership workshops to encourage citizen participation. They measured amounts of litter (using the Keep America Beautiful’s “Litter Index”) and amount of litter awareness within the community (using a public opinion survey). They found that the knowledge of litter-control activities increased following the program, and that the “Litter Index” data showed improvements in the six pilot neighborhoods, especially for streets, rights-of-ways and parking lots. In addition community improvement projects removed 1,300 cubic yards of litter; cleaned 434 city blocks, 264 bus stops, nine parks; collected 1,264 tires; reclaimed 27 illegal dump sites; and planted trees, flowers and shrubs throughout the neighborhoods.



For more information see: <http://www.houstonbeautiful.org/index.htm>

## DISRUPTION OF SOIL QUALITY / FERTILITY

Soil is the substrate that supports and influences the growth and biodiversity of plants and animals. Without healthy soil, plants do not receive water and nutrients and microorganisms do not recycle dead organic materials back into basic nutrients. Healthy soils filter and protect water and air quality, as well as support human health.

**“The nation that destroys its soil destroys itself”**

Franklin Delano Roosevelt  
February 26<sup>th</sup>, 1937

What causes a disruption of soil quality? Anything that changes the structure or living organisms of the soil, such as:

- Certain agricultural practices, including tilling, the use of heavy machinery, over-fertilizing, under-rotating, etc.
- Intense grazing
- Destructive natural resource extraction, such as strip mining, clear cut logging, etc.
- Heavy trail use
- Stripping an area of vegetation
- Invasive species, such as non-native earthworms and nitrogen-fixing plants

To assess the extent of soil quality disruption you can track changes in the soil itself (see also [Soil structure, composition and fertility](#), p.48) or in the practices causing soil compaction, erosion, fertility loss, etc.

### Sample evaluation questions and indicators<sup>13</sup>

**?** What is the severity of soil erosion and/or disruption of soil function?

- ◆ Distance from designated point to stream or river bank
- Depth of channels or gullies
- Sedimentation in streams
- Topsoil depth
- Soil temperature, moisture, pH, water holding capacity
- Duff layer depth (decomposing organic matter on soil surface)
- Percent ground cover
- Change in composition or appearance of vegetation
- Amount of microbial biomass
- Amount of soil organic matter
- Amount of respiration
- Rate of decomposition of plant residues

#### COMPARED TO WHAT?


In addition to looking at soil characteristics over time, you could compare:

- Different agricultural practices (no till vs. contour plowing vs. strip cropping vs. terracing, organic vs. conventional, mono-cultures vs. poly-cultures, etc.)
- Different forestry management practices (clear-cutting vs. selective logging, skidders vs. no-skidders, monocultures vs. poly-cultures, etc.)
- Different grazing practices (different grazing intensity, stream buffers vs. no stream buffers, etc.)

<sup>13</sup> Many of these indicators were adapted from USDA Natural Resources Conservation Services. For more information see: <http://soils.usda.gov/sqi/>

 What is the extent of soil compaction?

- ◆ Soil bulk density (mass per volume)  
Amount of area use by heavy machinery (from construction, logging, military activities, etc.)  
The amount of foot/bike traffic using trails

 What is the extent of nutrient loading on the soil?

- ◆ The amount fertilizer used within the project area  
The amount or percent of fertilizer used that is found in water runoff  
The types of nutrients most commonly found in water runoff  
The amount of volatile chemicals released into air after fertilization

 What is the extent of nutrient loss from over-harvesting?

- ◆ Change in the amount of nutrients in the soil after a harvesting episode  
Change in leaching of nutrients (runoff) after a harvesting episode

### WHAT DO EARTHWORMS INDICATE?

In agriculture and gardens, where earthworms cycle nutrients and aerate the soil, they are seen as a direct measure of soil fertility. In northern temperate forests, however, earthworms (almost all exotic species in this area) seriously disrupt soil structure, microbes and plant communities.

The extent of earthworm impact on forests can be measured by taking photos of the forest floor. You could also measure the sources of invasion: release of fishing bait, construction of forest roads, and relocation of soil, compost, etc. from an invaded area to a non-invaded area.



#### Data sources

- See [Soil structure composition and function](#) (p.48)



#### Example

**Armstrong Redwoods Habitat Protection and Restoration Project** – Armstrong Redwoods State Reserve was being “loved to death” by the adverse effects of too many visitors using the reserve. The Restoration project aimed to restore soil health so that redwood seedlings would be able to germinate, survive and grow into adult trees. The restoration project first undertook a baseline study of the soil compaction near trail areas, then decided to mitigate the effects of soil compaction on trails by covering the soil with KORMAT – a plastic material that absorbs impact and pressure from foot traffic. They are measuring the success of this project by retesting the soil compaction of trails with and without KORMAT after two years. They hope to restore soil structure and the mycorrhizal fungi necessary for redwood seedling survival.

For more information see [http://www.parks.ca.gov/default.asp?page\\_id=22249](http://www.parks.ca.gov/default.asp?page_id=22249).

## ALTERED FIRE REGIME

Fire can be a key ecological process maintaining biodiversity and ecosystem function (see [Fire and other key disturbance and succession processes](#), p. 52). Many terrestrial ecosystems benefit from or even depend on a certain frequency and intensity of fire for natural levels of reproduction and species diversity.



The suppression of fire in these systems leads to:

- the loss of many fire-dependent species,
- overall altered species composition, including the dominance of invasive species and
- increase in the fuel loads or burnable plant material within these systems, which can lead to ecologically and economically dangerous and costly fires.

As our understanding of the important role of fire in many systems is changing, a common strategy to reduce the threats associated with an altered fire regime is to re-instate small-scale fires via controlled burns. Controlled burns have been found to decrease dangerous fuel loads, aid in the recruitment of fire-dependent species and reduce invasive species.

### Sample evaluation questions and indicators

**?** To what extent has the fire regime been altered?  
How far from its natural fire regime is this system?

- ◆ Frequency, extent, intensity, seasonality, etc. of fires over the past 10/ 20/ 50/ 200 years

Number of species that depend on fire for their recruitment in burned vs. unburned areas

Fuel loads

Abundance of invasive species

Measures of habitat composition and structure in fire-suppressed vs. wilderness areas or before and after a fire (e.g. species, density, size &/or age of trees, crown bulk density, patch or gap size & shape, soil microbial diversity, height of duff layer) – See other [Habitat quality](#) measures, p. 32

**?** How is plant harvesting affecting the fire regime?  
Is grazing affecting the fire regime in grassland ecosystems?

- ◆ The amount of timber (fuel) being removed from the ecosystem
- Number of saplings/intermediate trees or proportion of trees in different size classes before vs. after thinning, logging or burning
- The amount of plant material in a grazed vs. un-grazed prairie

### PRIORITIZE

While fire is known to be integral to the survival of many species, some ecosystems *depend* on fire for their maintenance, such as:

- Tallgrass Prairies in the Midwest
- Chaparral (Brushland) in the southwest
- Ponderosa Pine forests in the West
- Jack Pine forests in the Great Lakes area
- Douglas Fir forests in the Pacific North West
- Longleaf Pine forests in the Southeast

**?** Is local knowledge about fires increasing? What is the public perception of fire?  
Do fire practices reflect new knowledge?  
To what extent do fire-suppression policies affect your project area?

- ◆ Number of educators and land managers that are knowledgeable about the natural role of fire in their ecosystems
- Number of individuals who have had courses on fire training
- Proportion of fires that are suppressed
- Number of stakeholders who help design the fire policies
- Number of stakeholders who benefit from the policies
- Number of stakeholders with management plans that include fuels treatment
- Number of landscapes committed to restoring fire-adapted ecosystems
- Number of partner groups working to reduce fire risks

### Data sources

- USDA Forest Service Fire Effects Information System (database of effects of fire and fire regimes for organisms throughout the U.S.): <http://www.fs.fed.us/database/feis/>
- Aerial surveys/GIS maps/Landsat images showing changes in compositional cover

#### KEEP IT SIMPLE

To assess the effect of fire on the duff or litter depth, put a nail in the ground to the height of the layer before a fire and measure the height relative to that nail after the fire.

### Example

**Restoring Fire-Adapted Ecosystems** is a collaborative project involving the US Forest Service, National Park Service, Bureau of Land Management, Fish and Wildlife Service, Bureau of Indian Affairs and The Nature Conservancy. The partnership focuses on: 1) increasing restoration efforts among different landowners; 2) establishing a fire learning network that uses past experience and ideas to help community-based projects implement fire management; 3) enhancing fire education; and 4) increasing fire management training. They are measuring success by tallying: a) the number of acres undergoing multi-stakeholder, collaborative planning for fuels treatment; b) the number of landscapes committed to restoring fire-adapted ecosystems; c) the number of partner groups that were working together to reduce fire risks to people and natural resources; d) the number of individuals who completed fire training; and e) the number of fire educators and managers that were made aware “of the importance of including the natural role of fire in community education messages.”

For more information see: <http://www.tncfire.org>.

For an example of a group measuring fuel loads see [Fire and other key disturbances and processes](#) (p. 52).

## OVER-EXPLOITATION OF NATURAL OR PROTECTED POPULATIONS

Over exploitation occurs when organisms are removed from a natural population faster than they can replenish themselves. Over exploitation can be the result of:

- Increased efficiency or intensity of harvesting
- Poaching or illegal harvesting
- Unchecked market demand

Measuring changes in the population sizes of populations and in their harvesting and recruitments rates, as well comparing their demand to the natural supply, can help you asses whether a population that is harvested at some level is at risk of over-exploitation.

### Sample evaluation questions and indicators

**?** To what extent are specific populations being over-harvested/over-exploited?

- ◆ Population size (see [Population demography and dynamics](#), p. 36)
  - Rate of population decrease
  - Rate at which populations are being harvested
  - Recruitment rate of new individuals into the population
  - Changes in the birth rate over time (increasing or decreasing)
  - Changes in the harvest rate over time (increasing or decreasing)
  - Changes in the birth rate relative to the harvesting rate
  - Number of reproductive females
  - Ratio of juveniles to adults
  - Spatial distribution of population
  - Genetic diversity of population (see [Genetics](#), p. 38)

**?** To what extent are the causes of over-exploitation decreasing? How effectively are we reducing the conditions leading to over-exploitation?

- ◆ Percent of populations for which an Optimal or Maximum Sustainable Yield has been determined
  - Efficiency of harvesting methods relative to natural recruitment rates
  - Changes in protective laws
  - The number of people from government organizations tracking the changes in the population
  - Amount of law enforcement
  - Types of penalties
  - Number or membership of citizen action or non-profit groups working to protect or restore over -exploited species



### Data sources

- Trawl surveys, catch per unit effort surveys
- Stock assessments (US: National Marine Fishery Service, Canada: Department of Fisheries and Oceans)
- Harvesting or hunting records
- Market sales of over-exploited species



### Example

The **Canadian Science Advisory Secretariat (CSAS)** produces stock status reports (by region and species) for the Department of Fisheries and Oceans (DFO). From these reports, DFO determines whether a fishery should remain open or closed, the health of a fishery and at what level to set the total allowable catch (TAC). For example, in the Northern Gulf of St. Lawrence cod fishery in 2002, CSAS coordinated data from trawl surveys, abundance indices of catch rates from sentinel fixed-gear fisheries and total population estimates (from sequential population analyses). From these data they were able to determine that the amount of cod being harvested was within the TAC catch (7,000 tons), but the abundance and spawning stock biomass of cod remained low. Spatially collected data also told them that cod in this fishery are concentrated inshore. Overall they found that with no change in TAC, the spawning stock biomass was estimated to decline (which would be below the conservation limit reference points for cod). As a result of this report, DFO worked with natural resource managers and closed the Northern Gulf of St. Lawrence cod fishery (in moratorium) in 2003 and lowered the TAC to 3,500 tons in 2004.

For more information see:

[http://www.dfo-mpo.gc.ca/CSAS/CSAS/status/2003/SSR2003\\_017\\_E.pdf](http://www.dfo-mpo.gc.ca/CSAS/CSAS/status/2003/SSR2003_017_E.pdf) and  
[http://www.dfo-mpo.gc.ca/csas/csas/Us-Nous/Roles/roles\\_e.htm](http://www.dfo-mpo.gc.ca/csas/csas/Us-Nous/Roles/roles_e.htm)

## DESTRUCTIVE RESOURCE USE/EXTRACTION

The use or extraction of a resource can be considered destructive if it severely disrupts natural processes or species. This may *cause* more specific threats discussed in the previous pages, such as over-exploitation of individual species, compaction of the soil or fragmentation of the landscape.



This section gives measures related to some common destructive resource uses or extraction activities so that you can track what is often the *source* of other threats to the ecosystem. For use related to [recreation](#), see p. 130.

### EXAMPLES OF DESTRUCTIVE RESOURCE USE/EXTRACTION

**Over-grazing or over-browsing** – can happen when animals feed excessively in a particular area, often completely consuming the vegetation, leading to soil erosion and significant threats to native species (see also <http://www.sierraclub.org/grazing/>). Examples include some livestock operations and over-browsing of hyper-abundant deer populations.

**Clear-cut logging** – when all trees (usually > 1-2 inches in diameter) are harvested from an area, some simply to access to economically valuable species, reducing forest habitats and biodiversity.

**Destructive mining** – when a large area of the land and vegetation covering a natural resource is stripped by bulldozers, power shovels, or stripping wheels, resulting in deep pits and “valley fills.” This can alter the flow of water, soil and nutrients, reducing habitat quality for many organisms, and in some cases, such as coal mining, lead to **acid drainage**.

**Cyanide bomb fishing** – use of poison (potassium cyanide) to stun and capture valuable tropical reef fish for aquariums and for “live fish” entrees at restaurants can damage coral reef habitat.


**Bottom-trawl fishing** – large stern trawlers drag nets weighted with large, heavy, metal doors across the bottom of the ocean floor which alters the structure of sensitive benthic habitats.

### Sample evaluation questions and indicators

**?** To what extent are the natural resource harvesting methods in our area destructive?

- ◆ Amount of sedimentation in rivers and streams near mining/clearcut areas
- Number of fish kills downstream from mining/clearcut events
- Area of bare ground before and after tree harvest
- Number of fish caught with ruptured bladders
- Number of dead coral polyps in fished areas
- Amount of by-catch or by-kill (non-target marine species harvest)
- Number and type of native plant species in grazed versus ungrazed areas
- Extent of soil erosion and/or compaction in grazed or logged areas (see [Disruption of soil](#) p. 122)



 How pervasive is destructive resource use? Are we decreasing the area affected by destructive resource use?

- ◆ Number of strip mines
  - Amount of clear cuts in comparison to other more sustainable harvesting methods (i.e. selective logging, shelterwood, etc.)
  - Percent of target area previously subject to destructive resource use that is now using Best Management Practices
  - Area of coral reef destroyed
  - Area of benthic marine habitat trawled
  - Number of trawlers per area
  - Area of bare earth exposed after mining
  - Percent of total acres grazed that are identified as destructive

### Data sources

- Landsat data – aerial photography
- USGS soil surveys
- Water Quality monitoring stations
- Coral reef surveys

### Example

**Northwest Environment Watch (NEW)** is a not-for-profit research and communication center that monitors the Northwest's progress toward a sustainable economy and way of life with the Cascadia Scorecard, an index of seven key trends critical to the future of the Northwest. As a Scorecard measure of how extensively or destructively humans are using the forests of the Northwest, NEW tracks the number of acres of clearcuts over a 30-year period using imagery from the NASA Landsat system. Cascadia Scorecard 2004 showed that in all study areas, the rate of clear-cutting decreased over time, but has rebounded modestly in recent years. The moderate increase coincided with booms in demand for timber products and changes in British Columbia's logging rules which accelerated cutting on the coast. A comparison of forest clearing on state and provincial lands also provided insight into how governments of British Columbia, Oregon and Washington differ in the way they manage forests held in public trust. NEW publishes the Scorecard as a resource for citizens, media and governments.

For more information and animated maps see:  
<http://www.northwestwatch.org/scorecard/forests.asp>

## DISRUPTIVE/DESTRUCTIVE RECREATION

Recreation and tourism in parks and natural areas is a form of resource consumption that ideally has low ecological impact. In many cases, however, terrestrial and marine ecosystems can be “loved to death” by the people who visit them, or can be visited by more people than the area can support. This can adversely affect many aspects of ecosystem health, from the species population viability to soil function.



Forms of destructive or disruptive recreation or tourism include:

- Hikers, bikers and/or drivers of off-road vehicles (ORVs) going off designated trails
- Visitors using sensitive breeding habitats of animals and plants.
- Over-use or inappropriate use of personal watercrafts or snowmobiles, which can lead to noise, air and water pollution. (Many jet skis have two-stroke engines that can discharge nearly a third of their fuel directly into the water.)

### Sample evaluation questions and indicators

**?** To what extent is destructive recreation occurring in our study area? Is there trail erosion occurring? Are hikers/bikers/ORV drivers remaining on the trail system?


- ◆ Amount of soil compaction on a trail compared to off a trail
- Width of trail over time (are the trails becoming wider?)
- Amount of soil erosion associated with the trail system
- Amount of seedling/herbaceous plant re-growth within 5-15 m of trail
- Number of new trails formed by hikers/bikers/ORV drivers

**?** Are sensitive breeding areas being protected from recreational users?

- ◆ Distance of breeding area from trail
- Amount of footprints/bike tracks/ORV tracks in sensitive breeding area
- Number of signs informing recreational users of sensitive breeding areas (i.e., Do not enter oak tree regeneration area, Do not anchor boats near the reeds in the southwest part of the lake – duck breeding area...)
- Amount of change in the population numbers of the sensitive species

**?** Is pollution from recreational users decreasing?

- ◆ Amount of hydrocarbons in the water
- Amount of trash found on trails
- Number of hours in the day in which there is no noise from personal watercraft
- Amount of air pollutants from snow mobiles

 Are the laws governing the amount of usage/pollution in the lake being enforced?

- ◆ Number of park personnel on site
- Number of coast guard boats patrolling the waterways
- Number of small water craft permits allowed on the waterway in comparison to the number actually on the water

### Data sources

- Department of Fish and Wildlife
- Local, State and federal visitation and recreation records and other research – see <http://www.recreation.gov/> and <http://www.nature.nps.gov/scienceresearch/>
- Water/Air Quality testing records– city, county, state, EPA, etc.
- Local university research

### Example

The **National Park Service** at Yellowstone National Park partnered with a group of researchers to determine the ecological impact of snowmobile use on air quality within Yellowstone. To measure the threat of snowmobile recreation on air quality, the researchers set up air quality monitoring stations throughout the park and measured the amounts of 85 volatile organic compounds, carbon monoxide and methane. They found that the most abundant pollutants were ethene, ethyne, toluene, benzene, xylenes, trimethylbenzenes, ethane, propane, i-butane, n-butane and i-pentane. From these data on pollutants, they were able to fingerprint the source of air pollution within the park – 2-stroke snowmobile engines. NPS used these data as support for their winter recreation management policy which aimed to reduce the threat of destructive recreation by limiting the number and types (allowing only snowmobiles with best available technologies) of snowmobiles into the park.

For more information see: <http://www.nps.gov/yell/> and [http://www.nps.gov/yell/technical/planning/winteruse/plan/sive\\_report.pdf](http://www.nps.gov/yell/technical/planning/winteruse/plan/sive_report.pdf)

## UNFAVORABLE POLICIES, LAWS OR LEGAL PROCESSES

Local, state and federal laws and policies and their implementation may present obstacles to the achievement of your project’s objectives. For example:

- Your project’s goal of preserving open space may be threatened by *zoning* or other regulations that allow maximum build-out of buildable property.
- Poor enforcement of pollution laws may create an incentive for illegal waste-dumping rather than proper disposal.
- Policymakers and the political decision-making process may be inaccessible to local residents, or a lack of transparency in the process could leave residents feeling disempowered and confused about how decisions affecting their lives are made and where they might be able to have influence.

Start by talking with individuals to assess their ideas on policies or legal processes that seem to be obstacles to achieving project goals.

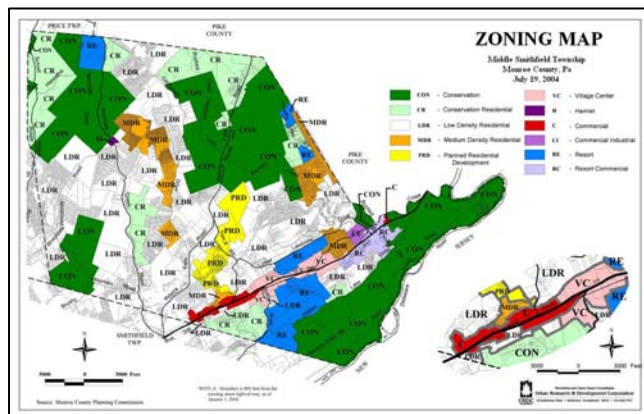
### Sample evaluation questions and indicators


**?** Do current zoning laws and ordinances promote conservation of green or open space?

- ◆ Results of build-out analysis (see [Sprawl/unplanned development](#), p. 134)
  - Number of requests to fill wetlands in the past year
  - Number of wetlands remediated
  - Increase in acreage zoned for conservation purposes
  - Number of new conservation easements on private property
  - Number of acres of new park land/land under some form of protection

**?** To what extent do current laws and policies create disincentives for conservation practices and behavior?

- ◆ Number of counties/cities where the cost of trash removal is not based on amount of trash generated
- Acres of wetlands that are zoned for commercial or residential development
- Number of tax subsidies that are available to developing vs. conserving land
- The number of laws discouraging brownfield redevelopment (i.e., litigation loopholes that deter the private sector)
- Number of fishing and hunting licenses granted for over-abundant game species (i.e., white-tailed deer, Canadian geese, etc.)



 How accessible and transparent is the local decision-making process?  
Are we reducing the threat of a disempowered public?

- ◆ Number of meetings with local officials that were requested and granted
- Number of responses from elected officials to letters sent by individuals/organizations involved in your project
- Number of public hearings/town hall meetings in past year
- Diversity of media or locations (newspapers, radio, television, bulletin boards) where announcements of upcoming county commission, state legislative or city planning meetings or hearings are placed

### Data sources

- State and local government agencies
- Correspondence with local government officials
- Content analysis of local media sources
- U.S. Senate Committee hearings (see <http://www.capitolhearings.org/>)
- Surveys on people's experiences in attempting to access the system
- Media outlets, local government websites and written requests to the government agencies (to assess accessibility and transparency)

### Example

The **National Resource Defense Council** (NRDC) is an environmental action organization that uses law, science and member support to protect wildlife, wild places and healthy environments. As part of their work on creating sustainable communities they promote federal policies that support smart growth and amend existing laws and policies that support or subsidize sprawl or unplanned growth. To assess changes in the threat of unfavorable policies, they track a range of policy issues surrounding smart growth (such as: tax policy, transportation policy, federal facilities location, inner-city investment to promote smart growth, etc.). In response to this information they increase their efforts to add environmental sections within policies (such as the environmental programs and safeguards in the Transportation Equity Act for the 21st Century) and to work with policy-makers to develop and implement new laws consistent with smart-growth objectives.

For more information see:

<http://www.nrdc.org/cities/smartGrowth/>

## SPRAWL/UNPLANNED DEVELOPMENT

Although most people would be able to point to examples of what they see as “sprawl,” this uncontrolled expansion of development out from city centers can be difficult to precisely define and measure. Sprawl or unplanned development is associated with:

- Rapid spread of a city into rural areas
- Loss of open space
- Proliferation of low-density development
- Conversion of farmland to other uses

The *sources* of sprawl and other kinds of unplanned development are numerous. They could stem from other threats, including:

- Demographic change (particularly population increases)
- Degraded urban landscapes
- Government policies and laws that fail to restrict unplanned growth or policies that support sprawl-like development

Taking a historic look at how development patterns have changed in your area can help you assess to what extent sprawl poses a threat to your project’s objective. A look into the future can also be valuable as you consider new strategies. The build-out analysis described below can help you envision future scenarios.

### Sample evaluation questions and indicators

**?** To what extent is sprawl increasing in our community?  
Are there land planning policies that encourage sprawl?

- ◆ Per household land consumption (PHLC) – see example below
  - Acres of farmland converted to other uses in the past year
  - Number of new shopping centers/residential developments constructed on previously open space
  - Number of policies that give tax breaks for developing old farmland
  - Number of policies that require a certain percentage of land set aside for open space
  - Number and type of fines for littering and dumping for individuals (and/or businesses)
  - Average lot size of new homes
  - Acres of open space
  - Results of build-out analysis

See also measures related to [Habitat degradation, loss, or fragmentation](#), p.110.



### Data sources

- Aerial photography
- Current and historical local maps
- County planning office
- State and local government agencies
- Realtor Boards
- The U.S. Census Bureau: <http://www.census.gov/>



### Example

The EPA's **Green Communities Program (GCP)** provides technical assistance and training for communities interested in creating more livable communities. GCP has identified that suburban sprawl and unplanned development is a major land use concern for many communities. GCP also helps communities *quantify changing development patterns* (i.e., amount of sprawl) by using per household land consumption (PHLC) and build-out analyses. PHLC is calculated by dividing the total area of land by the number of households that reside in the developed area. The lower PHLC number indicates more efficient land development and the higher PHLC number indicates lower development densities and less efficient use of developable land (sprawl). Build-out analyses use the zoning categories to predict how many houses, offices and shops could be built, where they will be located and where open space and farmland will be preserved. Both of these tools have helped numerous communities (Monroe and Montgomery County, PA; Muddy Creek, OR; Camp Pendleton, CA; etc.) assess the threat of sprawl and unplanned development to their community.



For more information see: <http://www.epa.gov/greenkit/>

## DEMOGRAPHIC CHANGE

The size and characteristics of communities are continuously in flux and these changes can alter valued dimensions of a community's culture, character and economy. These changes can be introduced by:

- an *influx* of new people that can bring differing values, interests, knowledge and politics to an area and/or
- an *outflow* of residents caused by a lack of jobs, housing, educational opportunities or other needs in a community.

Each indicates how attractive your community is to residents, businesses and others.

Understanding the ways in which your community is growing, shrinking, aging and altering its make-up can help you select strategies that will address the challenges posed by these changes and to capitalize on the opportunities they may represent. You may also want to track possible or known *causes* of these changes to assess whether you are addressing the root of the problem.

### A THREAT, ASSET, OR BOTH?

Whether demographic change is a threat, asset or both depends on the nature of change, which you can track.

Demographic change can be viewed an impediment to project goals if, for example, it undermines community cohesion or threatens economic stability.

It can also, however, be an asset if it leads to a new workforce or support for new policies thereby strengthening your ability to achieve economic, social or ecological goals.

### Sample evaluation questions and indicators

- ?** Is our community growing in size?  
 Is our community aging? Getting younger?  
 What are the migration trends associated with our community?  
 How is our community's cultural/ethnic make-up evolving?

- ◆ Percent of people of different ages, ethnicities and/or socioeconomic status
- Primary school enrollment
- Occupancy of assisted living facilities
- Number and type of cultural events
- Number of youth staying to find jobs in the community
- Number of new houses built
- Average income
- Number and types of cultural centers/churches in the community

- ?** Are we reducing/increasing the causes of or reasons for demographic change?

- ◆ Number of children pursuing similar employment as their parents
- Amount of financial help available for mid-career re-training
- Changes in housing costs
- Changes in cost of living
- Amount of public transportation



See also indicators in [Diverse and stable industries](#) (p.60) [Increased local investment, development and growth](#) (p.62), [Living wage jobs](#) (p.64), [Quality of life](#) (p.70), [Services](#) (p.76) and [Education](#) (p.80)



### Data sources

- U.S. Census Bureau demographic data at <http://www.census.gov/>
- Other federal government agency statistics at FedStats <http://www.fedstats.gov/>
- State and County QuickFacts: <http://quickfacts.census.gov/qfd/>
- State demography offices; most states have an office that collects and analyzes population data at state and local levels. For example, see Minnesota's State Demographic Center at <http://www.demography.state.mn.us/>
- Survey of realtors about buyers and sellers



### Example

To stimulate informed discussions on conservation issues the **Sonoran Institute's** Socioeconomic Program produces customized reports on local economies and the role of public lands. For example, they produced a report (*Working Around the White Clouds*) that provided data on the changing demographic and economic conditions of the 5 different cities/counties in the region surrounding Idaho's Boulder, White Cloud and Pioneer mountains. Using data from the US Bureau of the Census (decennial census of population and housing) they measured population growth in each of the five areas. From these data they determined that population growth is, on average, increasing. However, the increases are not uniform across the landscape – vibrant urban centers and attractive rural communities are growing at the fastest rate. Communities can use this information to assess any threats or benefits these changes might have for their goals, and thereby plan development and conservation in these areas accordingly.

For more information see:

[http://www.sonoran.org/programs/socioeconomics/si\\_se\\_program\\_main.html](http://www.sonoran.org/programs/socioeconomics/si_se_program_main.html) and <http://www.sonoran.org/programs/data/Working%20Around%20the%20White%20Clouds.pdf>

## ECONOMIC DECLINE

Economic decline can alter opportunities and the character of economic life in the community. It may be associated with:

- A decrease in average and median family income and local business earnings
- An increase in wealth disparities
- An increase in unemployment
- A decline in the number and diversity of businesses
- A decline in the quality and availability of jobs



These inter-related changes can have numerous causes or *sources*, including:

- Governmental policies that affect access to a traditional resource base
- Depletion of resources
- Technological change
- Inadequate economic diversity or stability

Just noticing this information over time, even if you are not formally tracking it, can alert your community to important changes that need to be addressed and help you focus on how best to respond.

### Sample evaluation questions and indicators

- ?** To what extent is average family income declining?  
To what extent are disparities in wealth growing?

- ◆ Changes in household incomes (mean, median, range)  
Equity measured as income and wealth distribution

- ?** To what extent are employment opportunities diminishing?


- ◆ Employment rate  
Net job decline  
Percent of residents who want to work full time who actually work full time  
For additional employment indicators, see [Living Wage Jobs](#) (p.64)

- ?** To what extent is business composition and vitality changing?

- ◆ Total number of businesses in the community (compared to five years ago)  
Rate of new businesses opening (number per year)  
Number of bankruptcies in past year  
Office vacancy rate compared to state or national average  
Capital assets  
Annual earnings

#### COMPARED TO WHAT?

If historic or baseline data is not available, then comparing your community's data to similar communities nearby or to the state or national average could also be useful in assessing the extent of this threat.

 To what extent are property values changing?

- ◆ Average residential property value compared to five years ago
- ◆ Average commercial property value compared to five years ago
- ◆ Property tax earnings compared to five years ago

### Data sources

- The U.S. Census Bureau: <http://www.census.gov/>
- Other federal government agency statistics at FedStats <http://www.fedstats.gov/>
- State and County QuickFacts: <http://quickfacts.census.gov/qfd/>
- State and local government agencies
- Local, state or U.S Chamber of Commerce: <http://www.uschamber.com>
- Survey of realtors about housing prices, investment data, housing trends, etc

### Example

The town of Errol, NH historically has depended upon the forest products industry for its economic livelihood. By the early 1990s, however, the forest industry had become so mechanized that job opportunities for many residents began to disappear and the community's economic future became uncertain. In 1991, around the same time that the local paper company was folding, the U.S. Fish and Wildlife Service designated Lake Umbagog, an area adjacent to Errol, as the Umbagog National Wildlife Refuge.

In response to this noticeable economic decline, business owners in Errol joined together with businesses in other nearby communities to create the **Umbagog Area Chamber of Commerce**. Among other initiatives, the Chamber launched a tourism and recreation marketing campaign, promoting Errol as a four-season recreation area. As a result, twenty-three new businesses have started since the Refuge was established, and a total of seven campgrounds and two state parks have opened as well. As of late 2000, Chamber members estimate that approximately \$100,000 per year was being spent in the area as a result of the Refuge, with a noticeable increase in the number of annual visitors to Errol, particularly those engaging in canoe and kayak trips.

For more information, see [http://www.northernforest.org/tech\\_success.htm](http://www.northernforest.org/tech_success.htm).

## CRIME, POVERTY OR POOR HEALTH

Declining safety, security or health, as well as conflict between various groups in the community, can be very direct impediments to achieving a high [quality of life](#) (p.70). These threats may manifest themselves as:

- high levels of domestic abuse
- alcohol or drug abuse
- depression
- homelessness

These and related problems may be the result of rapid or severe changes in the community, such as [economic decline](#) (p. 138) and/or [demographic change](#) (p. 136), which in turn lead to unemployment or a decline in social services.

Tracking the indicators below can inform you of overall progress toward a community free from these problems. You can also look at how the level of these problems relates to your efforts to curb their causes, such as a lack of social services.

### Sample evaluation questions and indicators

**?** How safe is our community? Is safety increasing or decreasing?  
Do people feel safe in parks and schoolyards?

- ◆ Number of violent crimes in the community in the past year
- Accidental death rate
- Number of EMS calls per month
- Number of fire department calls per month
- Number of domestic disturbance calls to police department
- Number of calls to local “graffiti removal team”
- Juvenile felony arrest rates
- Responses to survey, interview and/or focus group questions

**?** To what extent is poverty being alleviated in our community?

- ◆ Ratio of children living in poverty
- Proportion of households classified as low income
- Number of public assistance claims
- Ratio of public school children eligible for free or reduced lunch

**?** To what extent is homelessness a problem in our community?

- ◆ Number of homeless adults and children
- Occupancy rates of homeless shelters

**?** To what extent is alcohol/drug abuse a problem in our community?

- ◆ Number of arrests involving alcohol/drug abuse in the past year
- Number patients treated for alcohol/drug abuse in local treatment centers

 Is poor health or depression a problem in our community?

- ◆ Number of depression cases diagnosed/treated in local mental health facilities
- Levels of community interaction and engagement (see [Relationships and social networks](#), p. 72 and [Participation and engagement](#), p. 74)
- Percent of mothers who did not receive prenatal care within first 3 months of pregnancy
- Number per 1,000 people infected with a communicable disease (Chlamydia, Hepatitis C, TB, AIDS, etc.)
- Percent of county residents not covered by health insurance compared to state and national data
- Percent of residents classified as overweight or obese

### Data sources

- Police or sheriff's department
- County Public Health Department
- social service agencies
- Surveys, interviews and focus groups
- Content analysis of local newspapers
- FedStats on crime and justices: <http://www.fedstats.gov/programs/crime.html>

### Example

The **Toronto Community Foundation** created a program called Vital Signs, a community report card that measures “issues that are important to Toronto and Torontonians.” One issue of great concern to the Foundation is homelessness, which has been on the rise in the Toronto area over the past ten years. Utilizing data from the city’s Community Services and Housing Department, the group examined this threat more thoroughly. They discovered that the number of children staying in shelters had increased 120% over a ten-year period, two parent families are the fastest group of shelter users in the area, and 17% of people using the shelter system had been in the system for more than a year.

These and other details enabled them to think strategically about how to design long-term strategies to confront the threat of homelessness. In addition to strategies to reduce poverty and create additional affordable housing, their investigation supports a shift from strategies that focus on emergency responses to those that support prevention responses. It also allows them to identify and target activities toward groups that are considered at high risk of becoming homeless.

For more information, see: <http://www.torontovitalsigns.com/>

## CONFLICT OR LACK OF TRUST

One of the more common problems ecosystem or community-based projects face is conflict in the community or region about how natural or other resources should be managed. This conflict, which is tightly associated with a lack of trust among the different people involved, is important to track because its decline is a real and often first sign of progress towards goals.

If you are concerned with conflict *within* your organization or collaborative, see also [Good working relationships](#) (p.96).



### Sample evaluation questions and indicators

**?** To what extent is conflict a problem in our community?  
Has conflict eased since the start of the project?

- ◆ Number of crimes in the past year that could be classified as “hate crimes”
- Number of newspaper articles or letters to the editor that indicate tension between groups in the community
- Diversity of stakeholders attending meetings
- Level of perceived conflict at meetings (on a 1-5 scale)
- Number of times in a meeting people criticize or blame others for causing problems
- Surveys of environmentalists or landowners about perceived level of conflict between them
- Anecdotes of positive or negative interactions among people

**?** Is trust increasing?

- ◆ Number of formal (MOU's, joint plans) or informal agreements signed
- Number of phone calls from previous adversaries asking for advice or information
- Overall levels of community [Participation and Engagement](#) (p. 74).
- Survey of people to see if they see others as part of the solution, not the problem
- Key leaders say the same things publicly as they do privately



### Data sources

- Surveys, interviews and focus groups
- Content analysis of local newspapers
- Content analysis of websites and statements of elected officials
- State and local government agencies

#### USING THE MEDIA TO ASSESS CONFLICT

Measuring levels of conflict or trust requires some creativity and a good knowledge of what is appropriate in your situation. For example, the number of headlines/articles in a local paper or other publication may or may not accurately reflect conflict in your community. Consider:

- Is the editor unbiased?
- Does the paper generally have a strong agenda?
- Is the conflict you are interested in measuring intense enough to warrant an editorial?  
Minor, but important, conflicts may not reach the papers.



### Example

Anecdotes can be a powerful measure of changes in the level of trust among groups formerly in conflict. The environmental group **Headwaters**, based in Ashland, Oregon, was working towards more restrictive use of herbicides in the Talent Irrigation District. Irrigators used the chemicals to clear the water of vegetation or “frog moss” which clogged their irrigation canals. A staff member at Headwaters recounts that at the height of conflict an irate irrigator dumped a bucket of frog moss on her desk in show of their displeasure with Headwater’s initiatives. After years of efforts towards collaboration, the same staff member report that not only are they “now at the point where we are trying to implement joint restoration projects;” she also no longer gets frog moss on her desk.

For more information see: <http://www.headwaters.org/index.php>

## LACK OF KNOWLEDGE, AWARENESS OR CONCERN

For many ecosystem and community-based projects, a lack of understanding of key issues by the general public, decision-makers or policymakers can threaten progress toward the project's goals. Threats associated with a lack of awareness include:

- A lack of understanding or awareness of relevant ecological or environmental issues, such as where storm drains empty, the effects of invasive species or the ecology of forest fires, which can lead to poor stewardship behaviors or ineffective management practices.
- Misinformation or incomplete understanding about the point of view, values or perspective of other stakeholders, which contributes to conflict and a resistance to collaborate
- A lack of concern for local or regional laws, policies or decision-making, which leads to a disconnect between citizens and the use or management of the resources in their area or to mistrust between decision-makers and residents

Taking the time to measure the extent of different people's knowledge, awareness or concern of key issues or skills can help you assess whether, for example, your [Education and outreach](#) efforts (p. 197) are effective. But this assessment can *also* help you identify potential project *assets*, such as a group of engaged and active citizens with high levels of environmental awareness and stewardship, who are eager to support your projects' efforts.

### Sample evaluation questions and indicators

*Though most of the questions below deal with knowledge, awareness or concern of environmental issues, you could assess this threat for any specific issues key to your group's goals.*

- ?** To what extent is the community aware of or concerned with environmental issues?
- ◆ Responses to polls, surveys, interviews or focus groups where respondents rate their knowledge or level of concern for different issues or articulate their perception of the point of view of certain organizations or agencies
  - Accuracy of local newspaper coverage of local environmental issues
  - Frequency of local newspaper coverage of local environmental issues
  - Number of times that federal and state authorities reference local environmental and/or natural-resource management plans as part of their decision-making process (from meeting minutes or funding proposals)
- ?** To what extent is the community engaging in behaviors that suggest that they are aware and concerned?
- ◆ Participation (attendance) in environmental or social activities/events sponsored by local groups (bird counts, tree plantings, community heritage events, river clean-up or other work days, field trips, etc.)
  - Voter turn-out rates
  - Number of pounds of trash recycled
  - Number of pounds of compost collected



Number of community associations (listed in the phone book or in a county organization guide from a university extension or EPA office) that are interested in environmental or social issues (e.g. Trees Forever, Ducks Unlimited, Sierra Club)

Compliance with local ordinances/restrictions on lawn-watering, car washing, etc.

Nursery sales of native plants (vs. invasive ornamentals)

See also [Environmentally Responsible Stewardship](#) (p. 82)

Number of newspaper articles or letters to the editor that indicate tension or lack of understanding between groups in the community

See also [Conflict or lack of trust](#) (p. 142)

**?** To what extent is the community engaging behaviors that indicate that they are *not* aware or not concerned about environmental or social issues?

- ◆ Amount of littering
- Vandalism at interpretive sites
- Illegal poaching or harvesting
- Off-trail hiking, biking or vehicle use

### Data sources

- Content analysis of websites and statements of elected officials
- Surveys, interviews and focus groups
- Content analysis of local newspapers
- State and local government agencies

### Example

The **Swan River Trust** was set up in 1989 to raise awareness about issues affecting the Swan and Canning Rivers in Perth, Australia and to increase community involvement in river and catchment restoration projects. In order to gauge the public understanding on the importance of protecting and managing the river system, the Trust carried out a telephone survey in 2001 designed to assess awareness of the Trust and its role, perceptions of the state of the river and people's satisfaction with how the river was being managed. Results from the survey indicated that most people contacted were aware of the Swan River Trust (87%), and that the major areas of concern from the respondents were algal blooms and water cleanliness. The Trust used these data as a basis for prioritizing new projects as well as for assessing whether the Trust was successful in making the people in the community aware of issues surrounding the Swan and Canning rivers.



For more information see: <http://www.wrc.wa.gov.au/srt/index.html> and [http://www.wrc.wa.gov.au/srt/publications/AnnualReport2001/pdf/13\\_Education.pdf](http://www.wrc.wa.gov.au/srt/publications/AnnualReport2001/pdf/13_Education.pdf)

## INSTITUTIONAL OR CULTURAL BARRIERS

One of the most challenging threats towards achieving your goals may be that the people, organizations or agencies you work with have a way of knowing, way of doing business or an ethnic or organizational culture that is different or in conflict with your goals or activities. The result is commonly stated threats such as:

- Resistance to change, new ideas seen as a threat or lack of willingness to take risks
- Resistance to cooperate/collaborate or notion of dividing vs. expanding the pie
- Discomfort with horizontal dialogue vs. vertical communication
- Turf wars or a lack of integrated community or regional effort (the opposite of the asset of [Community cohesion](#), p. 160)

Although this often overlaps with the threat of [Conflict or lack of trust](#) (p. 142), it can be distinct. That is, parties may actually agree on goals, but there are barriers related to communication or implementation. Tracking these barriers can be an important way of identifying them, as well as assessing whether your strategies to deal with these threats are effectively improving the ability of parties to collaborate or achieve new initiatives.


### Sample evaluation questions and indicators

**?** To what extent are existing institutions, procedures or perspectives a barrier to change or to collaborative or landscape-scale decision-making?


- ◆ Percent of agency/organization personnel (both leaders and subordinates) who through verbal/written statements or actions endorse an ecosystem-based or collaborative approach to resource management
- Number of lines/steps of authority one needs to work through within an agency/organization structure to obtain a decision to support an initiative
- Opinion (based on survey) of agency/organization personnel about whether they share common goals
- Number of agency/organization personnel who seem threatened or raise job security issues when alternative management approaches are proposed
- Number of agency/organization personnel who refuse to participate in, attend meetings about or listen to information on new initiatives
- Extent to which agency/organization personnel are willing to share information about their work (frequency of open community meetings, depth of content on website, presentations to the media, etc.)

**?** How effectively are we overcoming institutional barriers?

- ◆ Agency/organization personnel participation rates in joint learning exercises, community dialogues, collaborative initiative meetings, etc.
- Degree of interagency cooperation as demonstrated through MOUs, joint project initiatives, shared funding of projects, etc.
- Number of novel partnerships (e.g. with universities, local conservation or civic organizations, businesses) or conservation initiatives
- Percent of potential or actual partners that feel that agency/organization personnel are knowledgeable of their concerns

 What is the nature and magnitude of the cultural barriers we face?

- ◆ Extent to which community members or organization/agency personnel refer to “us” *vs.* “them” in interviews or focus groups
- Degree of animosity “long-timers” feel toward “new-comers” to an area
- Number of participants in a decision-making process that have complaints related to language barriers, culturally-biased presentation style, etc.

 How effectively are we addressing cultural barriers?

- ◆ Presence of a regular community meeting place and time to openly discuss issues within the community
- Percent of agency or organization presentations and publications that are translated into the languages used in the community
- Opinion of participants in an input or decision-making process about whether the processes, materials or activities used fit their way of thinking or conversing (such as linear *vs.* circular/webbed thought processes, powerpoint presentations *vs.* informal conversations, etc.)

### Data sources

- Interviews, surveys and focus groups with leaders and subordinates in agencies, organizations and with community members
- Anecdotal stories from the field

### Example

The **Joint Venture of the Lincoln Institute of Land Policy and the Sonoran Institute** aims to improve the administration and conservation of State Trust Lands. These lands are used primarily to generate revenue for public schools and much of this revenue is earned from consumptive uses such as residential development or mining and timber sales. Joint Venture Partners aim to change these traditional forms of revenue generation by promoting successful approaches to land stewardship that yield revenues but also conserve lands. This work involves overcoming institutional and cultural barriers within land management agencies where many personnel have relied on extractive programs for decades. To track how well they are overcoming such barriers, the Partners plan to measure how well they are communicating new management approaches on these lands and track the actual number of conservation initiatives being implemented.

For more information see:

[www.sonoran.org/programs/si\\_stl\\_program\\_main.html](http://www.sonoran.org/programs/si_stl_program_main.html).

## INEFFECTIVE OR INEFFICIENT ORGANIZATIONAL MANAGEMENT

One of the biggest threats to progress may come not from an external source – invasive species or urban sprawl – but from a weakness in how your organization or collaborative is managed. This includes problems such as

- ineffective time management,
- lack of focus,
- ineffective coordination of multiple simultaneous efforts or
- the lack of sustained leadership.

Your group can track changes in these issues to assess whether strategies to improve [organizational management](#) (p.202) are effective and to address problems before they significantly undermine your efforts to improve ecosystems and communities.

Many of the indicators below could be collected by assessing the opinion or perceptions of people within the organization or collaborative through regular confidential surveys.

### Sample evaluation questions and indicators

**?** How well are we maintaining project focus?

To what extent do our activities or investments match our mission?

Do we have an effective process for making strategic choices?

- ◆ Members (board, coordinators, staff and/or volunteers, etc.) share a vision and/or mission statement that motivates the parties
- Members share clear, consistent and measurable objectives
- Percent of activities that clearly fall under mission statement
- Percent of target internal and external audiences who agree that they can clearly understand project mission statements, intent or plan, etc.
- Existence of a strategic plan or a set of criteria for engaging in new efforts
- Existence of a logic model or situation map depicting how organization's efforts link to context and project objectives
- Existence of an agreed-upon set of measures of project success

**?** To what extent is the organization or collaborative effort run efficiently?

How well are we coordinating activities and avoiding duplication of efforts?

- ◆ Existence of clearly defined roles and responsibilities related to a strategic plan (such as job descriptions, committee task outlines, staff responsibilities, etc.)
- Frequency of meetings, retreats or calls among participants or staff
- Percent of activities completed within planned timeframe
- Percent of activities completed by assigned party
- Number of volunteer and/or staff hours spent on an activity relative to its agreed-upon importance
- Members'/volunteers' opinion of whether their efforts are not redundant or their time is used effectively

Deliverables produced per year (written decisions, strategic plans, reports, web site, MOUs, on-the-ground changes, etc.)  
 Percent of action items developed at a retreat that are implemented six months after the retreat  
 Existence of designated volunteer program coordinator  
 Extent to which meeting agendas change over time (key issues resolved, lack of stalemates)

 Is the project well led or facilitated? Do we have effective leadership?

- ◆ Turnover rate of leader or coordinator or board members
- Sustained funding for leadership position
- Staff/volunteers perception of whether leader/coordinator is effective
- Staff/volunteers perception of whether board leadership and involvement is consistent and appropriate
- Frequency of formal and informal meetings among leader/coordinator, board and staff
- Level and variation over time in project funding
- Retention rate of staff
- Existence and use of ground rules with respect to communication and decision-making



### Data sources

- Surveys, interviews and focus groups
- Observations and minutes from meetings
- Phone call logs



### Example

The **Calapooia Watershed Council** in Western Oregon conducted a self-assessment of their group's organizational process with a survey designed by the Oregon Watershed Enhancement Board. Members were asked to consider whether they "agreed," "disagreed" or were "unsure" about a number of statements about their group's process. For example, one statement read: "I listen to other council members and respect our decision-making process." Group members completed the survey and then the group's coordinator compiled the results. At the next meeting, she highlighted a number of process issues that warranted attention, and the group then spent some time openly discussing concerns and resolutions. While the survey and discussion took time, members feel that they are a stronger group as a result of it. The self-assessment provided an important barometer for the group's coordinator to make sure group meetings and decision-making processes remained fair, efficient and effective.

For more information see:

[http://www.oregon.gov/OWEB/WSHEDS/wshed\\_council\\_forms.shtml](http://www.oregon.gov/OWEB/WSHEDS/wshed_council_forms.shtml)

## INADEQUATE RESOURCES

One of the most commonly stated project threats is the lack of adequate funding, staff or expertise to accomplish desired goals. The flip side, of course, is that having adequate resources can be one of your project's most critical assets.

Having a good sense of the level of your resources can allow you to respond accordingly - not biting off more than you can chew, leveraging what you have and working to build the capacity of your organization or collaborative where you most need it.

### Sample evaluation questions and indicators

- ?** Do we have sufficient funds?
  - To what extent is our funding secure?
  - How diversified is our funding?
  - How effectively are we increasing our funding?
    - ◆** Level and variation over time in operational and programmatic funding
    - Percent of funding from different funding sources (foundations, government, corporations, membership, sales, etc.)
    - Expected costs of planned activities vs. available budget
    - Percent of grant proposals accepted
    - Percent of projects terminated or interrupted because of lack of funds
  
- ?** Does the project have adequate staff with key skills?
  - Are we exceeding our capacity?
  - How well are we leveraging our limited capacity?
    - ◆** Skill/expertise of current staff and board compared to expected skill/expertise required to complete planned activities or tasks
    - Skill/expertise of current staff and board compared to their assigned tasks
    - Staff and/or board perceptions of whether there is adequate staffing and expertise to run the organization, including fundraising, planning, management and accounting
    - Number of full-time paid staff
    - Percent of collaborative members that are volunteer
    - Number and quality of staff opportunities for career development and enrichment or training in new skills
    - Number of board, staff or volunteers that feel they are spread too thin
    - Staff retention rate
    - Number of volunteers trained in needed skills
    - Number of formal and informal partnerships developed to meet specific capacity needs
    - Existence of designated volunteer program coordinator



### Data sources

- Surveys, interviews and focus groups
- Annual budgets
- Employment and volunteer time records
- Resumes of staff, board, volunteers



### Example

**The Conasauga River Alliance** is a diverse group of stakeholders in Tennessee and Georgia that have come together to protect private property rights and sustain a clean Conasauga River. Since its creation, the Alliance has received financial, staff and organizational support from The Nature Conservancy, the U.S. Forest Service and several other partners. Reliance on this support has led to problems with limited and erratic organizational resources. This became especially evident when in one year intense forest fires led the Forest Service to retract the Alliance's Forest Service project coordinator and funding for that year. This inadequacy of resources interrupted the Alliance's activities, including research cost share agreements with two universities, bioengineering of a riverbank and botanical surveys. In response, the Alliance is now engaged in additional strategies to secure consistent funding and specifically evaluates the sources and allocations of their funding in an Annual Report.

For more information see:

<http://www.conasaugariver.net/>





# ASSETS

Use this section to help you answer questions like:

**What opportunities, resources or past achievements could we leverage to move toward our goals?**

**What is the state of our assets and how well are we maintaining or building on them? Are there good incentives for conservation on private land? How effectively are we using available expertise and information? How strong are our partnerships?**

## ASSETS

### Natural resources

Existing high quality ecosystems, habitats or populations  
Highly valued natural areas or species

### Social assets

Community cohesion  
Available expertise and information

### Political support

Favorable policies, laws, and economic incentive programs  
Support of key people or organizations

### Organizational strengths

Good track record or reputation  
Dedicated and capable people  
Established and potential partnerships

## INTRODUCTION TO ASSETS

**Assets** are often less obvious than threats, but can be equally important to project success. They are any people, places or opportunities that can bring you closer to your goals. Common assets of on-the ground community and ecosystem management projects include:

- Ecological or natural assets, such as an *existing high quality protected area* that can improve adjacent habitat by increasing overall connected area and serving a seed source,
- Human or social capital, such as a *large volunteer base* that can be used to complete restoration activities,
- Political support for new management efforts or your organization in particular, such a *favorable policies or laws* that provide an incentive for good management or *support of key local government leaders* that can make it easier to implement certain programs and achieve positive change on the ground.

### HOW TO IDENTIFY AND EVALUATE YOUR PROJECT'S ASSETS

Identifying and tracking assets can help you assess whether you are maintaining or increasing the things that you might rely on for project success. It can also bring to light whether you need to be putting in more effort to leverage existing assets.

Many things can be considered assets. Focus on the *priority* assets, such as:

- What resources, people or events are irreplaceable and critical to project success?
- Which assets are specific to certain objectives or projects and which affect your overall ability or progress?
- Who are your biggest supporters?
- What are the flip sides of your project threats?
- What people or resources do you consult or use on a daily basis?
- Which assets are time-dependent? That is, would it have to be used or maintained now, or is it stable and long-term?
- What small or large past successes can you build upon?

*Even if you don't measure changes in assets, recognizing them can be key to your strategic use of limited resources.*

*Next: Two page spreads on specific project assets*

## EXISTING HIGH QUALITY ECOSYSTEMS, HABITATS OR POPULATIONS

For many communities, having high quality ecosystems, habitats or populations nearby can be considered an ecological asset. Such habitats/populations can be used to further enhance other communities or populations. For example:



- A high quality forest ecosystem, joined with neighboring restored or acquired patches, could increase protected area and decrease overall levels of fragmentation
- A high quality prairie could serve as a seed source for restoring other sites
- Protected or more pristine ecosystems can be used as a benchmark against which you can compare other restoration projects

To evaluate this kind of asset you could:

- Identify the high quality habitats, populations or waterways in your community
- Measure how much of it is there and how well it is being protected or managed
- Measure how well it is being used to help restore other ecosystems, habitats and/or populations

### Sample evaluation questions and indicators

- ?** To what extent are there high quality ecosystems/habitats/populations within the community?  
How well are the high quality ecosystems/habitats/populations being protected and/or managed?

- ◆ Area of high quality habitat  
Quality of that area (see [Habitat Quality](#) p. 34)  
Use or protected state of high quality habitat  
Amount of government/private money being spent on maintaining or managing that habitat

- ?** To what extent are high quality ecosystems/habitats/populations being used as an asset?

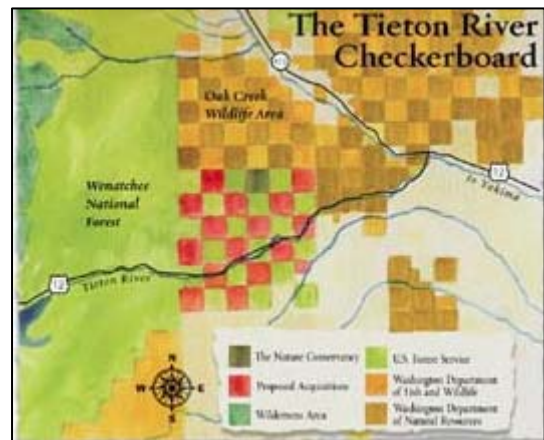
- ◆ Acres of land purchased or acquired adjacent to the high quality area  
Number of corridors created linking high quality habitats to other habitats  
Number of species from the high quality habitat that are being used in captive breeding, reintroduction or revegetation programs  
Number of management plans that reference the high quality ecosystem as a target condition for currently degraded areas

## Data sources

- GIS maps, aerial photographs, LANDSAT images
- Field surveys and natural history research projects
- Natural Heritage, Natural Areas and Audubon inventories
- Local university research programs cataloging presence/absence of species
- Local zoos/aquariums/nurseries that have captive breeding/propagation data for local species

## Example

The Nature Conservancy, with support from the Rocky Mountain Elk Foundation and several other partners has been trying to protect about 10,000 acres in the Tieton River Canyon, Washington. They have been successful at protecting the river canyon by using two high quality adjacent habitats as assets. The Tieton River Canyon project area is entirely within the boundary of the Wenatchee National Forest and adjacent to the state-owned Oak Creek Wildlife Area. If the Tieton River Canyon is protected, these two protected areas will result in a contiguous protected landscape of more than 20,000 acres. In addition, The Nature Conservancy is using these publicly protected lands to help them protect the area in the future. The Conservancy plans to transfer portions of the property to the Wenatchee National Forest and the state Department of Fish and Wildlife. Ultimately, the Nature Conservancy measures whether they successfully used high quality land as an asset by determining the amount of additional land put under protective status that is adjacent, or connected to, the two existing protected habitats.



For more information see:

<http://nature.org/wherewework/northamerica/states/washington/preserves/art10426.html>

## HIGHLY VALUED NATURAL AREAS OR SPECIES

Even degraded ecosystems or species can be an asset when they have strong *aesthetic, economic, recreational, historic* or other value for people. These valued natural areas and/or species can be used to leverage financial, political and emotional support from within the community. For example, protection and restoration efforts can be supported by:

- Hunting and fishing clubs that are interested in the health of species such as water fowl, trout, salmon, etc.
- Local residents with a strong sense of pride or history attached to natural features or scenic overlooks,
- People who get passionate about endangered species that are charismatic (eagles, wolves, panthers, etc...), fuzzy (island fox, panda, koala, etc.) or pretty (butterflies, birds orchids, etc.).

Identifying what natural features, places or species can or do illicit people's interest, concern or passion can be a key asset for your project. Consider tracking how peoples' connection to that natural asset changes and how well you are leveraging it.



### Sample evaluation questions and indicators

**?** To what extent do people value particular places or species in the area?

- ◆ Number of stories, articles, photographic books, etc. written about a place or organism
- Rating of place or organism based on public survey
- Number of community interest groups that are based on valued species or place (Salmon Support Alliance, Dana River Coalition, Thompson's Hill Action Group, etc.)

**?** How well is the valued habitat/species being protected?

- ◆ Acres of valued place
- Protection status of the natural asset (zoned for development? federal/state park?)
- Number of individuals of the valued species over time
- Extent of valued habitat edge that is adjacent to development, industry, etc.
- Amount of recreational and/or industrial use of the habitat
- The amount of government/private money being spent on habitat or species maintenance

? To what extent are valued habitat/species being used as an asset?

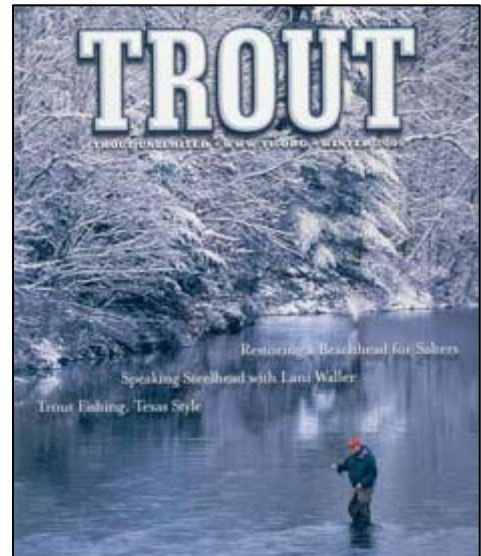
- ◆ Acres of land purchased surrounding a valued area
- Area of habitat protected which harbors a valued species
- Frequency of reference to the valued place or species in project media campaigns
- Number of different community groups partnering together to work to save a species/habitat
- Number of people donating money to support conservation of the habitat/species
- Amount of money collected from valued place/organism campaign
- Number of management plans that protect the valued habitat/species for recreational (e.g., hunting, fishing, hiking, etc.) purposes

### Data sources

- Park, trail, natural area use
- Interviews, surveys and focus groups
- Newspaper articles
- Funded research programs of the NDR, FWS, etc.

### Example

**Trout Unlimited (TU)** was founded in 1969 by 16 fishermen united by their love of trout fishing, and their growing concern over the quality of waterways in Michigan. Today, TU aims to conserve, protect and restore North America's trout and salmon fisheries and their watersheds. Since people value the trout and salmon fisheries, TU uses these species as an asset to mobilize volunteers and increase their membership (125,000 volunteers/members in 500 chapters nationwide). Volunteers are the backbone of TU – they lobby politicians, help with fundraising, promote positive public relations with communities and aid in restoration projects. TU measures the success of using valued species as an asset by documenting the number of newspaper articles that report on TU and recognize how their members are committed to restoring the trout and salmon fisheries in North America. For example, in TU's annual report for 2004, TU noted that their conservation efforts attracted media attention across the US, “from the Cleveland Banner and Denver Post to the New York Times and USA Today”.



For more information see: <http://www.tu.org>

## COMMUNITY COHESION

A community in which residents identify with one another and *have the ability to work together* can be a tremendous asset to ecosystem and community-based project success. Cohesion can be the product of:

- shared values,
- shared experiences, including past experiences of working together,
- common racial, ethnic or religious heritage and
- opportunities for community interaction and dialogue.



“Cohesion” is a rather abstract notion that can be difficult to measure. Examining historic and contemporary interactions within your community is a good place to start to get a sense of the ability of residents to work together. Surveys, interviews and focus groups that address community concerns and values can also give you a sense of the extent to which residents identify as a unified community.

### Sample evaluation questions and indicators

- ?** To what extent does the community have a history of working together to address issues of common concern to the community?
- ◆ Number of community initiatives in the past 20 years
  - Number of hours residents volunteered in the past year
  - Donations to local charities
- ?** To what extent do forums for community dialogue and interaction exist?
- ◆ Number of individuals who submitted letters to the editor of the local newspaper in the past year
  - Number of community/town hall meetings on various topics over the past year
  - Number of local radio call-in shows
- ?** To what extent does the community have shared values and identity?
- ◆ Vote margins for elected officials and referenda
  - Participation in community festivals that celebrate a particular identity or heritage
  - Responses to surveys, interviews and focus groups about feelings of kinship, attachment to geographic place, how people value the land (intrinsic, economic, etc.), etc.





### Data sources

- Surveys, interviews and focus groups
- Content analysis of local newspapers and other media sources
- Local newspaper and other media sources
- Historic documents (newspaper archives, historic society documents)



### Example

The **International Institute for Sustainable Development (IISD)** is a non-profit that promotes change towards sustainable development. In 2000, IISD partnered with Skownan First Nation to help the community incorporate Aboriginal values into land-use and resource management decisions. To accomplish their goals, IISD and Skownan First Nation focused on the asset of Skownan First Nation's cohesion. IISD used a series of interviews and community workshops to determine the extent to which the community shared values and how they worked together with respect to their forested landscape. IISD determined that the Skownan First Nation was spiritually and economically attached to their forest and received monetary value from trapping, subsistence value from hunting, medicinal value from gathering herbs and spiritual and cultural value from living in a forested landscape. By recognizing what linked their community to each other and the land, they were better able to express their values and desires for forest protection to decision-makers in the provincial government, resource industry and to other stakeholders.



For more information see: <http://www.iisd.org/ai/waterhen.htm>

## AVAILABLE EXPERTISE AND INFORMATION

Achieving your goals has a lot to do with making good decisions based on sound information. It can be a huge asset to your project to have existing sources of knowledge, expertise or information such as:


- Local Ecological Knowledge (LEK) of long-term residents
- Research, knowledge or databases from local schools and universities
- Industries with knowledge of natural resource distribution and management
- Other organizations with similar goals, working on similar problems or concerned with the same natural resources or ecosystems
- Completed species inventories, watershed assessments, community profiles, market analyses, etc.
- Any form of baseline data, collected prior to or early on in your activities
- County, state or national databases or censuses with information relevant to your system
- Existing monitoring programs




In addition to *identifying* these assets, you will want to track whether you are *enhancing* them (maybe by making them more available, accessible or organized; forming partnerships or collaborations with key people, etc.) and how well you are *using* them to inform your strategic planning and decision making.

### Sample evaluation questions and indicators

- ?** To what extent have we identified available sources of expertise and information?
- ◆ Available information or expertise list is part of strategic planning documents
    - Number of hours or dollars spent researching available information or expertise relevant to project needs
    - Number of regional conferences/workshops held or attended to share information across agencies and organizations
    - Number of long-term residents interviewed
    - Number of hours spent walking the land with local residents and researchers
- ?** How well are we maintaining or enhancing available information?
- ◆ Existence of a data management system
    - Accessibility of available information
    - Participation in data sharing coalitions
    - Number of fact sheets, publications or reports created to disseminate available knowledge
- See also [Gathering and managing information](#), p. 204.

 Are we building upon existing expertise?

- ◆ Number and quality of training or career development opportunities for staff (including informal opportunities for interaction with local residents, researchers, etc.)  
Percent of staff who participate in training or career development

 How effectively are we using available expertise and information?

- ◆ Number of partnerships with local schools and universities  
Percent of data collection protocols that are also used regionally/nationally  
Peer review of extent to which local knowledge is being used in management  
Number of partnerships with local industries  
Number of projects involving other conservation organizations  
Percent of projects that use data collected/organized/analyzed by individuals outside of the organization  
Number of reports comparing current information to available baseline or historical information



### Data sources

- Surveys, interviews and focus groups with long-term residents/elders
- University, organization or agency websites
- Management plans



### Example

The **Living Oceans Society** aims to conserve marine biological diversity in order to ensure healthy oceans and coastal communities. To do this they engage in a variety of research and public education activities, including analyzing stock assessments, communicating marine threats and issues to the public and making recommendations for decision-makers. A key asset to their work is the long-term knowledge and experience of commercial and recreational fishermen. To more systematically assess that expertise they are conducting a Local Ecological Knowledge survey that includes one-on-one interviews with fishermen and other experts. Assessing this knowledge will increase overall understanding of the ecosystem as well as help identify proposed marine protected areas that do not conflict with important fishing areas. Furthermore, the assessment itself promotes the participation and engagement of these stakeholders in local decision-making processes.

For more information and guidance on conducting interviews see:

<http://www.livingoceans.org/oceans%20updates/June2004.htm>

[http://www.livingoceans.org/documents/LOS\\_Interviewer\\_Handbook\\_version2-2.pdf](http://www.livingoceans.org/documents/LOS_Interviewer_Handbook_version2-2.pdf)

## FAVORABLE POLICIES, LAWS AND INCENTIVE PROGRAMS

Local, state and federal laws and policies and their implementation may present obstacles to the achievement of your project's objectives (see [Unfavorable policies, laws or legal processes](#) p. 132). At the same time, there may be regulations or economic incentive-based programs that can be utilized more effectively to achieve your project's goals, such as:

- Open avenues for participation in decision-making process
- Federal or state policies that involve funding for ecosystem management planning, implementation or monitoring
- Programs that reward conservation or best management practices, especially important on private and "working" lands (such as Safe Harbor agreements, Private Stewardship Grants Program, Landowner Incentive Program, Conservation Security Program, etc.)
- Zoning laws that support smart growth
- Economic cost-benefit analyses that support arguments for engaging in better stewardship behaviors
- Opportunities to integrate economic and environmental benefits (such as Ecotourism and Fee-hunting of overabundant species)

Identifying these assets and tracking how well your project is using them effectively can be a very valuable measure of progress. Start by figuring out what's "on the books" and relevant to your project. Discuss which policies or economic arguments might help your project overcome current obstacles to achieving your goals.

### Sample evaluation questions and indicators

**?** Do current zoning laws and ordinances promote conservation?

- ◆ Results of build-out analysis (see [Sprawl/unplanned development](#) p. 134)
  - Number of requests to fill wetlands in the past year
  - Number of wetlands remediated
  - Increase in acreage zoned for conservation purposes
  - Number of new conservation easements on private property
  - Number of acres of new park land or land under some form of protection
  - Voting results for local referendums on conservation issues

**?** To what extent do current laws and policies create incentives for conservation?

- ◆ Profit difference between ecologically sensitive and conventional practices
  - Number of local, state, federal grants for smart-growth, brownfield development projects, etc.
  - Number of DNR programs that combine fee-hunting with controlling overabundant species

**?** How effectively are we leveraging favorable programs or policies?

Number of landowners familiar with programs or incentives

Number of Safe Harbor agreements

Number of landowners involved in Landowner Incentive Programs

Number of people/acres registered with Conservation Security Programs

Number of acres enrolled in conservation programs



### Data sources

- State and local government agencies, for example see NRCS (USDA National Resources Conservation Service) list of conservation programs: <http://www.nrcs.usda.gov/programs/>
- Correspondence with local government officials
- Economic cost-benefit analysis of best management practices



### Example

The **Fish Creek Watershed project (FCWP)** is a multi-partner effort, including The Nature Conservancy, across Indiana and Ohio designed to reduce soil erosion – a primary threat to the nationally significant ecological diversity of Fish Creek, especially fish and mussel species. One

component of this project involves leveraging both economic incentives and existing federal initiatives to promote soil protection practices among agricultural landowners. For example, using the Max Program, a system to record field operations and inputs, project members have been able to demonstrate that landowners who engage in ecologically beneficial no-till agricultural practices also benefit economically. Despite lower yields, no-till input costs are consistently lower than conventional tillage, and over time no-till increases the profit per acre in corn and soybeans. The FCWP also promotes planting permanent vegetation in critically eroding areas by encouraging landowners to enroll in a Critical Area Treatment (CAT) program, which includes an economic incentive, or in the federal Conservation Reserve Program (CRP).



The FCWP assesses how well they are using incentive programs by tracking the number of landowners contacted or educated about programs, the number participating in programs or with signed agreements, the number of acres positively affected (in conservation tillage or with planted grasses or trees) and estimated tons of soil being saved annually because of the programs. They can use this information to document success and engage additional landowners.

For more information on FCWP see:

<http://www.glc.org/basin/project.html?id=77> and

<http://www.glc.org/basin/stateproj.html?st=in>

and on Max Program see:

<http://www.ctic.purdue.edu/Core4/MAX/1996/Page3.html>

## SUPPORT OF KEY PEOPLE OR ORGANIZATIONS

Within your community, county or watershed there are likely some key people who because of their political position, charisma, capacity or popularity, can be critical to the success or failure of your project. Determining who these people are and whether you have and/or leverage their support is an important part of evaluating and thereby improving your organizational assets.

Key people or organizations for your project might include:

- Federal, state and local elected officials (governor, senator, member of congress, mayor, etc.)
- Environmentally aware, concerned and/or motivated citizens
- Existing long-term volunteers
- National organization with similar goals
- Leaders of organizations previously/currently in conflict with your organization
- Local organizations or groups with high community membership
- Religious leaders
- CEO's or leaders of dominant area businesses or industries
- Popular artist, singer, writer, movie star

These people may provide political power, financial support or advertisement that leads to more support and capacity for your organization.


### Sample evaluation questions and indicators

**?** To what extent do we have the support of key community leaders or key organizations in the area?

- ◆ Number and origin of public statements of support in the last year
- Number of times key community leaders attend program events
- Dollar amount of contributions from key people
- Percent of invited 'VIP's who attend events or meetings
- Frequency of access to key leaders (meetings, phone calls)
- Level of familiarity with your project's goals and activities by key people (based on poll)
- Number of continuous years of support of key people

**?** How well are we maintaining that support?

- ◆ Number and distribution of materials that recognize or show appreciation for key supporters (including volunteers)
- Number of events, buildings, restored sites or awards named in honor of key supporters
- Number of 'VIP's invited to project events
- Frequency of interaction (phone calls, meetings, etc.) with key supporters

 How well are we using or leveraging the support of key people or organizations?

- ◆ Percent of annual events that feature key community leaders
- Number and type of policy changes related to contact with key leaders (see also [Favorable laws, policies and economic incentive programs](#), p.164 and [Reforming laws and policies](#), p. 194 )
- Number of events, buildings, project sites named in honor of key supporters
- Number of partnerships
- Size of coalitions
- Size of volunteer base
- Extent to which the public is aware of who supports you (based on poll)
- Frequency of interaction (phone calls, meetings, etc.) with key supporters
- Dollar amount of contributions from key people
- Number of other organizations or agencies that feature your events or activities on their website

### Data sources

- Newspaper articles or editorials about your organization
- Phone logs
- Attendance lists of events
- Surveys, interviews or focus groups

### Example

**The Chesapeake Bay Program** is a regional partnership involving several state and federal bodies working together since 1983 to restore the quality of the rivers and estuary associated with the Chesapeake Bay. The program includes comprehensive water quality monitoring. One of their measures of water quality improvements also reveals how well they leverage and maintain the continuous support of a key community leader. On Bernie Fowler Day, which has been held the second Sunday in June since 1988, former Maryland state senator C. Bernard Fowler leads several politicians and others into the Patuxent River at Broomes Island and measures how deep he can wade in and still see his white sneakers. The “sneaker index” is a monitoring tool, but based on the attendance, the number of similar events that now occur in other areas and the number of web sites featuring the day, it is clear that the event itself also serves other purposes. It raises community awareness and interest in the health of their water and in the Chesapeake Bay Program.

For more information see:

<http://www.mdp.state.md.us/INFO/patuxwadein/wadepaddle01.htm>

or

[http://www.dnr.state.md.us/bay/tribstrat/wadein\\_schedule.html](http://www.dnr.state.md.us/bay/tribstrat/wadein_schedule.html)

## GOOD TRACK RECORD OR REPUTATION

A positive image in the community or among other organizations can be a key asset to your organization. By contrast, if your reputation or track record is lacking or not well celebrated, you may be wasting limited time and resources responding to criticisms and clarifying misunderstandings.

Identifying and assessing your accomplishments to date can help you see strategic options for turning small successes into larger ones. It is useful also to solicit feedback from people and organizations outside your effort to gain a better understanding of who endorses your work, who are your critiques and why. With this information, you can leverage existing support and improve problematic relationships.

### ACCOMPLISHMENTS TO DATE CAN BE KEY ORGANIZATIONAL ASSETS

Anything you have already achieved that helps you with current progress can be an asset, such as:

- Successful policy changes
- Acquired land
- Completed management plan
- A restored habitat
- Completed watershed inventory
- Acquired funding
- Staff who have completed key training
- Good relationships with previous adversaries

## Sample evaluation questions and indicators

**?** To what extent do we have a good track record or reputation?  
How well are we maintaining a good track record?

- ◆ Number of awards or recognitions of service
- Number of phone calls asking us for advice
- Perception of long-term members about how the organization has changed over time
- Number of web sites that feature our events or activities
- Number and angle of newspaper articles or editorials about us
- Number of other organizations that see us as a model project or a good/objective source of information (based on a poll of key organizations)
- Percent of invited 'VIP's who attend events or meetings
- Percent of people offered a position with the organization who accept
- Level of public awareness of the organization name, logo, goals and activities (based on poll)
- Public opinion of the organization (based on interviews, focus groups)
- Vandalism of your organization's signs
- Continuity or stability of funding
- Accomplishments relative to management or action plan
- See also [Support of key people or organizations](#) (p.166) as an indicator of a good reputation



? How well are we building on our good reputation and accomplishments to date?

- ◆ Existence of a system to track accomplishments or impact
- Frequency with which we use our accomplishments list or measures of progress to gain support, apply for funding, demonstrate impact, hire new staff, clarify our mission, etc.
- Number and distribution of materials (posters, website, etc.) or events that celebrate or highlight past accomplishments
- Number of action items that build directly on past accomplishments
- Continuity of certain projects, teams or committees
- Percent increase in program budget over time
- Percent increase in membership or volunteer base
- Percent increase in acres of land acquired, data collected, trees planted, policies changed or other accomplishments

### Data sources

- Meeting minutes
- Program documents (management plans, agendas, funding applications, etc.)
- Web searches
- Phone logs
- Surveys, interviews, focus groups

### Example

**The Northeastern Nevada Stewardship Group** is a partnership that includes miners, ranchers, conservationists, agency personnel and business leaders working collaboratively to protect the health of the sagebrush ecosystem and local heritage and quality of life. NNSG captures their track record in terms of a list of their activities and awards, as well as their coverage in the news, all of which they feature on their website as a way of showcasing their accomplishments to date. They are also building on past successes by using them as a platform for discussing how they will move forward setting specific “moving forward actions.”

For more information see:

<http://nnsng.org/>



## DEDICATED AND CAPABLE PEOPLE

One of the most frequently identified project assets are the people *within* an organization or collaborative that keep it running. Common adjectives for these board members, leaders, volunteers or staff include: skilled, knowledgeable, experienced, energetic, committed and passionate.

The people in your organization who have these characteristics may include

- Good leaders (See also the organizational objective of maintaining [Good leadership](#), p. 102),
- People who are the only person in the organization with the skills to effectively fill key roles (e.g. grant writing, communicating to public, meeting with public officials, analyzing data, repairing computer problems, etc.)
- Original staff with long term vision / institutional knowledge/ experience
- Participants who are willing to try something new
- People who contribute an exceptional number of paid or volunteer hours to the effort

See also [Support of key people or organizations](#) *outside* your organization (p. 166).

### Sample evaluation questions and indicators

**?** To what extent are the people within the organization key to its success?

- ◆ Number of people who fit any of the characteristics above
  - Leaders, board members, staff, etc. recognized by staff or collaborative member to play an exceptionally important role and/or to be very effective in their role
  - Number of hours contributed per person
  - Diversity of skills represented in organization
  - Size of volunteer base
  - See also [Adequate resources and capacity](#), p. 100

**?** How well are we maintaining or supporting the dedicated and capable people in our organization?

- ◆ Number and budget of social events (holiday parties, picnics, etc.) for staff per year
- Existence of staff/volunteer award or recognition system (e.g. employee of the month or year, birthdays celebrated, achievement pins or hats, etc.)
- Percent of staff and volunteers who have been recognized/awarded
- Number and size of events to recognize staff or celebrate key contributors to the project
- Attendance at these events
- Staff, volunteer, board opinion of whether they feel recognized, appreciated, valued, etc.
- Staff, volunteer, board opinion of whether they have the work space and supplies they need to do their job effectively

Number and quality of staff opportunities for career development and enrichment or training in new skills

Staff, board member, leader or volunteer turnover rate

**?** How well are we using our human resources?

Do we effectively tap into the skills, knowledge or passion of the people within our organization?

- ◆ Existence of designated volunteer program coordinator
- Percent of volunteers that have been active in the last month
- Number of volunteer hours per month
- Number of volunteers trained in needed skills
- Percent of board, staff, volunteer, etc. that feels the skills or knowledge they possess is underutilized on the job
- Percent of staff that are working less than full time that would like to work full time

 **Data sources**

- Human resources records
- Surveys, focus groups
- Organizational calendar of events

 **Example**

The **Anacostia Watershed Society** works to protect and restore the Anacostia River and its watershed in the Washington, D.C. area. Recognizing that the people living near the river need to be involved for preservation to be successful, they use volunteer opportunities not only to complete strategies, but also as a way to get people involved, interested, educated and invested in the watershed. They maintain volunteers by making it easy to get involved (providing an online calendar of activities, directions to the volunteer site, contact info, etc.) and offering volunteers rewarding recreational opportunities (canoeing tours, pontoon tours, festivals, etc.). They assess the strength of their volunteer program in terms of the number of “mobilized” volunteers, the number of trees volunteers planted, tons of debris removed and the number of educational programs in which volunteers have participated.

For more information see:

<http://www.anacostiaws.org/>

**VOLUNTEERS**

According to Independent Sector, a coalition of nonprofit organizations, foundations, and corporate philanthropy programs, almost 84 million people volunteered their time and services in the U.S. in 2001 – a contribution equivalent to over 9 million full-time employees and worth \$239 billion. How well is your organization tapping this potential asset?

## ESTABLISHED AND POTENTIAL PARTNERSHIPS

Effective formal or informal partnerships, with other organizations, agencies or institutions, can allow your group to accomplish much more than it could alone.

Partnerships can provide a range of opportunities or assets for your organization, including:

- Financial support
- Logistical or technical support
- Information sharing
- Increased credibility
- Increased political strength

While this asset is similar in some ways to the [Support of key people or organizations](#) (p.166), it differs in that partnerships, even if not formal, involve a consistent *two-way exchange* of benefits. It is important to track the quantity and quality of these partnerships over time not only to make sure you are leveraging and maintaining them effectively, but also to assure that your choice of partners is strategic.



### Sample evaluation questions and indicators


**?** What is the strength or effectiveness of our current partnerships or collaborative?

- ◆ Number of formal and informal partners
  - Number of individuals or organizations involved in any one partnership
  - Diversity of partnerships relative to our stakeholder diversity
  - Percent of partnerships that have been formalized in some way (completion of a Memorandum of Understanding, rules of conduct, cost-share agreement, stated commitments, shared vision or mission statement, etc.)
  - Frequency of formal or informal interactions with partners (phone calls, meetings, walking the land together, conducting joint events, etc.)
  - Attendance or participation of partners at regular meetings
  - Percent of projects that are conducted jointly with partners
  - Perception of how balanced the exchange of benefits is between partners (based on surveys of both your and the partner organization)
  - Existence of structure or person to lead a multi-organization partnership (governance board of representatives, full or part-time coordinator, etc.)

**?** To what extent do we have the opportunity for additional effective partnerships?

- ◆ Number of organizations, institutions or agencies with goals or activities that strongly overlap ours
  - Number of potential partners that have expressed an interest in collaborating

Frequency of formal or informal interactions with potential partners  
 Time spent in partnership-building activities (see [Building collaborations and partnerships](#), p.208)

 To what extent are partnerships contributing to our success or effectiveness?

- ◆ Amount of funding, expertise, labor or other resources available for projects
- Perception/reputation of our organization (based on surveys, interviews, or focus groups of target audiences)
- Number of new members
- Amount of formal or informal knowledge or information gained from partners (databases, protocols, models, increased understanding of the issues, etc.)
- Perception of whether benefits of the partnership outweigh the costs of initiating/maintaining the partnership (based on survey of key staff, board, etc. of your organization and/or financial cost-benefit analysis)

#### COMPARED TO WHAT?

To assess the impact that a partnership has had on the capacity or support your organization has by comparing these resources *before vs. after* you established a key partnership.



#### Data sources

- Meeting notes, phone logs and project records
- Financial and human resource records
- Interviews, surveys and focus groups



#### Example

The **Vermont Rural Partnership** is a collaborative of several individual schools in rural Vermont dedicated to engaging youth and adults to support and strengthen communities. The partnership began as an effort of seven schools to collaboratively apply for funds in response to the 1996 Annenburg Rural Challenge, a program of the Annenburg Foundation dedicated to improving rural schools. The success of the partnership can be measured in terms of the amount of funding it has secured over time: more than \$1 million for the now 18 member schools that would have otherwise been unable to compete for these funds. But the partnership is also a measurable asset to the individual schools in other ways. It provides opportunities for professional and curriculum development, as well as networking opportunities - rural educators meet with others working in similar situations through regional meetings and work sessions.

For more information see:

[http://www.northernforest.org/tech\\_success.htm](http://www.northernforest.org/tech_success.htm)



# STRATEGIES

Use this section to help you answer questions like:

What approaches and actions are we taking or could we take to reduce threats, leverage assets, and achieve objectives?

How well are we implementing our strategies? To what extent have we developed and promoted best management practices? Have we planned a job-training program that meets current needs in the community? How well are we tracking relevant policy developments? What are we doing to form new partnerships?

## STRATEGIES

### Protection, restoration, and management

Protecting land and water through purchases, easements, & preserves

Restoring species, habitats, and processes

Managing natural resource use

### Economic and community development

Attracting new business/investors

Developing sustainable industries or business practices

Providing job or skills training

Building community

### Law and Policy

Reforming laws or policies

Enforcing or encouraging agency enforcement

### Education and Outreach

Communicating with the public

Working with local schools

### Organizational Management

Building and sustaining organizational resources

Gathering and managing information

Developing strategic direction and adapting over time

Building collaborations and partnerships



## INTRODUCTION TO STRATEGIES

Strategies and activities are what you *do* to minimize threats, leverage assets and achieve objectives. Your project's actions may include:

- Buying land
- Removing invasive species
- Developing or demonstrating best management practices
- Holding job trainings
- Lobbying for policy change
- Building interpretive panels along a boardwalk
- Researching the biology of an endangered species
- Holding meetings with potential partner organizations
- Writing grants

And much more! Your project may be involved in many different activities, or focus on a few.

### HOW TO IDENTIFY AND EVALUATE YOUR PROJECT'S STRATEGIES

Making strategic choices about *which* activities you engage in is an important process and others resources offer guidance on this process (see references in [Developing a strategic management plan](#), p.202). Here we focus on how to evaluate the strategies you have identified – either what you already are doing or what you plan to do.

#### ADAPTIVE MANAGEMENT: COMPARE YOUR STRATEGIES

You will choose to engage in certain activities or strategies because you believe that they will lead to certain desired outcomes. Sometimes, however, you will be *uncertain* about whether your strategy is the best choice. In this case, consider engaging in a variety of alternative strategies and then use evaluation to compare them and determine which is the more *efficient* and *effective* way to achieve your desired outcomes.

### How well have you *implemented* the strategy?

Planning and then carrying out strategies are the first steps towards success, and so it makes sense to know how well you are doing that. This means tracking both the *quantity* and *quality* of your activities. Though we give specific evaluation questions to consider in each section, here are the general questions to ask about the implementation of any strategy.

### *How well have we planned the strategy?*

To what extent have we:

- Gathered necessary information to make well-informed choices?
- Identified priority action items?
- Specified scope, targets and timeline?
- Established needs, cost and thereby feasibility?
- Identified appropriate strategy managers and implementers?
- Identified people whose involvement is critical to implementing the strategy?
- Assigned responsibilities?
- Acquired necessary resources or raised necessary funds?

### *How well have we carried out the strategy?*

- How many action items have we completed?
- Over what area or at what rate have activities been completed?
- What percent of initiated activities have been completed?
- Did activities involve key implementers or target audiences as planned?
- How many people/acres/targets were addressed?
- Did we set ourselves up to have an impact?

#### QUANTITY AND QUALITY

Strategy implementation is often measured in terms of the *quantity* of activities, such as:

- Number of workshops held
- Number of people attended
- Percent of planned acres burned
- Number of appeals written.

While these measures are informative, they do not tell you or others about the *quality* of the activities. Were they done well, in a way that sets you up for having an impact?

Quality measure might include:

- Diversity of stakeholders attending workshops
- Satisfaction level of workshop participants
- Percent of prescribed burns completed at desired intensity or temperature

### How *effective* is the strategy in the short and long term?

While implementation measures can be very useful to track and communicate more immediate progress, ultimately, you will want to know how effective you are. What *impact* are you having? To answer this you need to think about the ecological, social or process issues you were trying to change or affect with your strategy and use the relevant sections of the sourcebook to ask:

- Has there been a decrease in the [threats](#) (p. 107) targeted by this strategy?
- Have we maintained or enhanced the [assets](#) (p. 153) leveraged by this strategy?
- Are we closer to meeting the [ecological](#) (p. 21) or [social](#) (p. 57) or [organizational objectives](#) (p.87) we were hoping to reach with this strategy?

Generally, changes in threats or assets can serve as shorter-term measures of the impact of a strategy, whereas progress toward objectives more often reflects cumulative or long-term impact.

#### HOW DO WE KNOW CHANGES ARE BECAUSE OF *OUR* EFFORTS?

It's often difficult to distinguish the impact of your efforts from all the other variables in the system. One way to clarify your impact is to ***choose comparisons or benchmarks of progress that relate to your efforts.*** That is, measure changes in threats, assets or progress toward objectives:

- In several areas (plots, counties, watersheds) where you implemented the strategy vs. several where you did nothing, or implemented a different strategy
- For audiences who were targeted by your strategy vs. those that were not
- Before vs. after implementation of a strategy

Another way to more closely link your efforts to observed outcomes is to ***measure ecological, social and process changes on the scale at which your strategy is implemented.*** For example, measure changes in one meeting or one field and not only on the level of the whole community or whole watershed.

*Next: Two page spreads on specific project strategies*

## PROTECTING LAND AND WATER THROUGH PURCHASES, EASEMENTS AND PRESERVES

For many ecosystem and community-based organizations, especially land or water trusts, setting aside land or water from certain kinds of use is an important strategy to improve ecosystem health. This may include:

- Buying parcels of land in the free-market (*acquisitions*)
- Promoting *conservation easements* on private land
- Getting *protection status* for an area (nature preserve, state park, national park, wilderness areas, marine protected area, etc.)
- Acquiring *water rights* through donations, leases and purchases to provide for in-stream flow requirement or watershed or riparian habitat restoration

Successful implementation of these kinds of strategies is most often measured simply as the *number* of acres or acre-feet purchased or protected, but you can also assess the *quality* of the acquisitions with respect to what you hope to achieve with that action.

### Sample evaluation questions and indicators

**?** To what extent have we engaged in acquiring land or water?

- ◆ Amount of money being spent
- Acres acquired or put into protected status per year
- Acre-feet of water acquired per year
- Baseline data to make acquisition decisions have been obtained
- Targeted land areas, water rights or property owners have been identified
- Estimated cost of acquisitions compared to available funds

**?** Do we have well-defined decision rules on *how* to target land or water for protection (consideration of cost, uniqueness/rarity of habitats, proximity to high quality habitats, long-term public support, etc.)?


- ◆ The types of areas being protected relative to prioritized types (see for example, [ecological priorities](#), p.23)
- Existence of a strategic plan or selection criteria based on GIS (e.g. GAP analysis), habitat quality or other key information, etc.

**?** How well have we promoted private protection through easements?

- ◆ Number of households that have received educational materials on easements
- Number of community “educational classes” held to teach landowners how to put their land into an easement
- Number of articles in the local paper describing the conservation benefits of easements
- Percent of people in community who know about easements
- Quality of knowledge of easements (extent of misinformation)

 How well do landowners meet the requirements of easements?

- ◆ Number of easement applications accepted vs. rejected
- Number of landowners who have received easement “education” (mailings/phone calls/informational sessions)
- Percent of properties with regular monitoring

 How has acquired or protected property improved regional or overall habitat quality? Do acquired properties reduce fragmentation?

- ◆ Number of acres of acquired land adjacent to protected land or water
- Edge to area ratio of total protected habitat
- (see also other measures of [landscape connectivity](#), p. 30, [habitat quality](#) p. 32 and [fragmentation](#), p. 110)



### Data sources

- Organizational records of activities, purchases
- Landowner records (use, wildlife on the land, etc.)
- GIS databases (such as the Federal Geographic Data Committee <http://www.fgdc.gov/> or the USGS GAP Analysis Program data warehouse: <http://gapanalysis.nbi.gov/>)
- Vegetation maps
- Public land surveys - see [http://www.geocommunicator.gov/GeoComm/Isis\\_home/home/index.html](http://www.geocommunicator.gov/GeoComm/Isis_home/home/index.html)
- Satellite images (see <http://landsat7.usgs.gov/index.php>)
- Aerial photographs
- State water right records
- WaterBank database (<http://www.waterbank.com/>)



### Example

The **Washtenaw Land Trust** is a non-profit organization that works to protect farmland, natural areas and open space in Washtenaw County, MI and to educate members, local officials and the public on land use issues. One way in which they protect and preserve open spaces and native habitats is by conservation easements and the purchase of development rights. In May 2004 the Washtenaw Land Trust completed a land protection project on 10 acres of organic farmland in Lima Township. The property was farmed since 1992 and was in danger of being sold for development. Instead, the Washtenaw Land Trust purchased the development rights (at a value of \$50,000) and a conservation easement was placed on the property restricting its future use to agriculture or open space. This purchase/conservation easement assured that these 10 acres of farmland cannot be developed but will continue to offer open space and an area for community gardening.

For more information see:

<http://www.washtenawlandtrust.org> and <http://lta.org/>

## RESTORING SPECIES, HABITATS AND PROCESSES

On-the-ground restoration activities are as varied as the sites they are aimed at restoring. They can range from doing prescribed burns, to removing invasive species, to stabilizing stream banks, to reintroducing individuals from a captive breeding program. In all cases, the system is directly changed in some way that aims to bring it closer to a more natural or 'healthy' state.



Restoration strategies can be evaluated in terms of:

- Reduced threats to biodiversity, such as invasive species or fire suppression (see [Threats](#) p. 110)
- Change in the overall quality of the system after restoration, such as native species diversity, habitat structure or water quality (see [Ecological Objectives](#), p. 17).
- How well restoration activities were planned and implemented, which is the focus on this section.

### STRATEGIC PARTNERSHIPS FOR RESTORATION

Large scale restoration projects may involve extensive channel alteration, a mosaic of prescribed burns, or many miles of stream-side tree plantings. These activities can restore whole watersheds or ecosystems and are most effective when organizations with similar restoration goals and strategies partner together across the landscape.

### Sample evaluation questions and indicators

**?** How well have we planned our restoration activities?

- ◆ Estimated cost of activities compared to amount of funds available
- Quantity and quality of baseline data
- Peer review of planned restoration activities
- Use of best available information
- Existence of clear protocols
- Existence of project-specific data sheets

**?** To what extent have we completed restoration activities?  
How well have activities been completed?

- ◆ Number of acres treated, planted, cleared of invasives, graded, etc. compared to planned timeline or target
- Number of individual species reintroduced, planted, etc.
- Number of habitat restoration project work days per month or year
- Survival rate of reintroduced species

Number of times application or procedure needs to be repeated at the same site because of inadequate first attempt (for example, repeat prescribed burn because of inadequate temperature reached, repeat herbicide application because inadequate or not well targeted first application)

**?** How well have we used available [assets](#) (p. 153) of volunteers, public support or expertise to complete our restoration activities?

- ◆ Number of volunteers or volunteer hours
- Diversity of volunteers relative to community or stakeholder diversity
- Number of newspaper articles/radio show interviews about the restoration activities
- Number of public events / celebrations held at restoration sites
- Number of people who attend these events
- Percent who attend public events who then sign up as volunteers
- Number of presentations or publications about techniques or results
- Number of partnerships with other conservation organizations

### Data sources

- Volunteer and work days records
- Field notes from restoration activities
- Photo monitoring
- Surveys, interviews and focus groups
- Offices of local newspaper and other media sources

### Example

The **'Ahakhav Tribal Preserve** consists of 1,253 acres of wilderness area and a 3.5 acre park centered around a reconstructed Colorado River backwater. The preserve provides recreational and learning opportunities to the surrounding community and visitors and serves as an important habitat for endangered and threatened plants and animals native to the Lower Colorado River Basin. This area faces many threats, from changes in natural stream flow to a variety of invasive species. As a restoration strategy, the preserve is engaging in major revegetation efforts, supported by many local and regional partner organizations and the 'Ahakhav Revegetation Nursery. They measure the implementation of this strategy in terms of the number of acres planted and the number of each tree species planted (mainly Cottonwood, Willow and Mesquite). They also track survival of the trees and in this way were able to determine that beavers were a major source of tree mortality. In response to this information they install and patch hogwire fences on border areas between revegetated sites and backwater areas to keep beaver off the newly planted sites. As a first and clear measure of how well their revegetation sites are implemented they can show a noticeable difference in the photographs of the sites taken over time.

For more information see: <http://www.ahakhav.com/>

## MANAGING NATURAL RESOURCE USE

A common strategy to improve ecosystems is to improve the ways in which people manage or use natural resources. The actions related to managing natural resources may overlap with restoration activities (previous section), but deal specifically with the “working land” or resources such as:

- agriculture,
- managed forests,
- land with construction or development,
- fisheries and aquaculture and
- hunted or trapped animals.

Often this strategy involves developing, communicating or applying *best management practices* (BMPs) or specific guidelines for resource use that are designed to reduce especially the threats of soil erosion and water pollution, but also overall ecosystem impact.

Here we focus on how well you are *implementing* the strategy of managing resource use. To assess whether these activities are having desired impacts you can measure the threats the practices are designed to reduce ([Ecological threats](#), p. 110) or the overall ecological condition of the managed system ([Ecological objectives](#), p. 21).

### Sample evaluation questions and indicators

**?** How well are we determining or developing best management practices?

- ◆ Diversity of stakeholders participating in BMP development (agencies, independent scientists, environmentalists, resource users - farmers, ranchers, foresters, miners, developers, etc.)
- Quantity and quality of available baseline data or research studies on which practices are based
- Estimated cost vs. benefit of practice (To measure ecological benefit put dollar values on ecosystem services such as purification of drinking water)
- Cost of activities to mandate, encourage or suggest practices vs. cost of not implementing BMP's
- Knowledge of existing or needed incentives (tax credits, subsidies, etc.)
- Plan in place to evaluate impacts of alternative management practices

**?** How well have we promoted or disseminated best management practices? (See also [Reforming laws or policies](#), p. 194 and [Education and Outreach](#), p.198)

### SAMPLE MANAGEMENT TOOLS

#### Agriculture

- Integrated Pest Management
- Irrigation and water table control
- Waste management
- Riparian buffer zones, conservation tillage, cover crops, etc.

#### Forests and timber harvest

- Stream Management Zone
- Road construction and maintenance
- Felling, bucking, skidding practices

#### Fisheries

- Hatcheries management
- Bag & size limits
- Harvesting methods and areas

#### Construction and development

- Silt fences
- Limits to impervious surfaces
- Detention ponds
- Stormwater management



- ◆ Number of educational opportunities or materials created for resource users (trainings, demonstration sites, stormwater management manuals, etc.)
- Number and quality of reforms to forest management policy (limits the amount of area affected by skidding, area that can be clear-cut, width of riparian buffer zone, etc.), fisheries (quotas for endangered fish, laws against destructive extraction, etc.) or oil, gas and mineral extraction
- Number of individual resource users contacted about using BMPs
- Number of storm drains labeled to deter the public from dumping toxics
- Dollars or volunteer hours spent on disseminating BMP information

**?** Have best management practices been implemented, applied or enforced?

- ◆ Percent of farms with decreased tillage, increased buffer zones, etc.
- Amount of pesticide or fertilizer use on farms over time
- Percent of working forests (or area of forests) employing partial cutting systems, retention of woody debris, clustering of harvest units, etc.
- Number of new quotas for over-fished species
- Amount of area closed to bottom trawling
- Percent impervious surface in new developments
- Amount of water used by households, industry or agriculture
- Percent of sewer infrastructure with combined sewer overflows (CSOs)
- Percent of residents or businesses that use storm water friendly landscaping

### Data sources

*Will depend on which management practices you are focused on. See example below.*

### Example

**Wisconsin's Department of Natural Resources (WDNR)** has developed and implemented a series of voluntary BMPs to help landowners, loggers and natural resource managers minimize nonpoint pollution from forest management activities. To evaluate this strategy they monitor the extent of BMP use throughout Wisconsin; whether BMPs were being used correctly and by which subset of landowners; and whether BMPs were effective in pollution control. To do this they did field audits (visual assessment and professional judgment) on timber sales and qualitative evaluations of the application and effectiveness of 118 forestry BMPs from the BMP field manual. They found that a) over time BMPs were being applied on timber sales correctly more often and with greater consistency, b) landowners enrolled in the DNR tax law program applied BMPs correctly more often than those not enrolled in the program and c) correctly applied BMPs were 99%-100% effective in mitigating impacts to water quality. Based on these results WDNR is implementing an outreach opportunity for those landowners not currently enrolled in a tax law program.

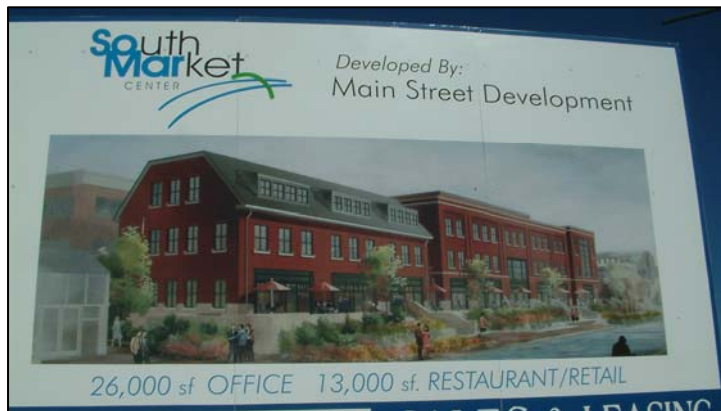
For more information see:

<http://www.dnr.state.wi.us/org/land/forestry/Usesof/bmp/bmpmonitoring.html>

## ATTRACTING NEW BUSINESSES OR INVESTORS

Based on indicators of your community's economy (rates of local investment, number of jobs paying a livable wage, etc.), your project may have decided that in order to boost economic activity or diversify the economy, you need to attract new businesses or investors. This could include activities such as:


- Identify and provide incentives for specific innovative or sustainable businesses to come to your town and/or
- Improve infrastructure, recreational opportunities, services or other amenities that would make your community more attractive to investors.



To determine the effectiveness of your investment activities look for progress toward the economic, social and ecological [objectives](#) you hope to achieve with this strategy, considering especially the *balance* between economic and ecological goals. Here, we focus on how well you are implementing this strategy.

### Sample evaluation questions and indicators

- ?** How well have we planned our strategy to attract new business/investors?  
To what extent have we determined what would make our community more attractive to investors?
- ◆ Reasons for attracting new business are clear and agreed upon
  - Target investors/businesses or business types have been identified in concert with economic and ecological goals and values
  - Quantity and quality of community input on desired businesses
  - Amount of funds available compared to estimated costs of attracting new business/investors
  - Number of meetings, phone calls or focus groups with potential investors/businesses
  - Number of action plans developed from group meetings
  - Number of meetings/focus groups with local/state politicians, community members, etc.
- ?** To what extent are we improving attractiveness to investors?
- ◆ Number of new roads/buildings being developed
  - Number of new parks/green spaces being developed
  - Number of new policies that give tax incentives for investment
  - Surveys of potential investors or businesses about degree of interest
  - Quantity and quality of promotional materials created

 Have we succeeded in attracting new businesses/investors to the community?  
Are they the kinds of businesses/investors we hoped to attract?

- ◆ Number and type of new businesses established over the past year, compared to five years ago or to a neighboring community
- Percent unemployment in community
- Percent of local economy products that meet sustainability certification or standards (such as certified timber, organically grown food, etc.)
- Community surveys or focus groups about changes in quality of life, employment opportunities, etc.



### Data sources

- State and local government agencies data
- Interviews/focus groups of local business owners and investors
- Chamber of Commerce
- Business and Economic growth division of state/local governments
- Regional Economic Information Systems



### Example

**Umbagog Area Chamber of Commerce:** The town of Errol, NH historically has depended upon the forest products industry for its economic livelihood. By the early 1990s, however, the forest industry had become so mechanized that job opportunities for many residents began to disappear and the community's economic future became uncertain. In 1991, around the same time that the local paper company was folding, the U.S. Fish and Wildlife Service designated Lake Umbagog, an area adjacent to Errol, as the Umbagog National Wildlife Refuge. Business owners in Errol joined together with businesses in other nearby communities to create the Umbagog Area Chamber of Commerce. Among other initiatives, the Chamber launched a tourism and recreation marketing campaign, promoting Errol as a four-season recreation area. As a result, twenty-three new businesses have started since the Refuge was established, and a total of seven campgrounds and two state parks have opened as well. As of late 2000, Chamber members estimate that approximately \$100,000 per year was being spent in the area as a result of the Refuge, with a noticeable increase in the number of annual visitors to Errol, particularly those engaging in canoe and kayak trips.

For more information, see [http://www.northernforest.org/tech\\_success.htm](http://www.northernforest.org/tech_success.htm).

## DEVELOPING SUSTAINABLE INDUSTRIES OR BUSINESSES PRACTICES

If unsustainable industrial practices are damaging the environment or the quality of life in your community, your project may engage in activities related to developing more sustainable industries or practices.

For example, you may:

- Promote green building practices that reduce energy consumption or improve waste management
- Develop or improve certification eco-labeling programs
- Support or develop new profitable “green” industries such as waste recycling and management, ecotourism, native landscaping, organic groceries, biodegradable cleaning products, low-impact development, etc.



(For changing practices related to farming, forestry or fisheries see also [Managing natural resource use](#), p.184)


### Sample evaluation questions and indicators

**?** How well have we planned our strategy to develop sustainable industrial practices?

- ◆ Number of community meetings to discuss and define “sustainable industries”
  - Organizational consensus or common vision has been reached on the meaning of sustainable (set of criteria)
  - Amount of funds available compared to estimated costs developing sustainable industrial practices
  - Quantity and quality of baseline data on types of sustainable industries suitable for the community
  - Target industries have been identified
  - Communities with policies that are similar to the ones we envision for ours have been identified
  - Number of interviews with experts
  - Cost-benefit and/or feasibility analyses completed

**?** To what extent have we shared our ideas with local industries?

- ◆ Number of meetings with industry leaders
- Number of publicity events (press conferences, etc.)
- Level of industry interest in adopting sustainable practices
- Demonstration projects
- Attendance at demonstration projects or other information sessions

 To what extent are sustainable industrial practices being implemented? Are they replacing unsustainable industries or practices?

- ◆ Percent of people employed by industry
  - Annual budget of sustainable vs. unsustainable industries
  - Non-renewable resource use by industry over time
  - Percent of local revenue that meet sustainability certification or standards (certified timber, organically grown food, reputable ecotourism, sustainable building materials, etc.)
- See also [Ecologically sustainable economy](#), p. 84

### Data sources

- Chamber of commerce
- State and local government agencies
- Correspondence with local government officials
- On the ground monitoring of industrial sites
- Interviews/surveys with industry employees

### Example

**Leadership in Energy and Environmental Design (LEED)** is a voluntary, consensus-based national standard for developing sustainable buildings developed by the U.S. Green Building Council (USGBC), a coalition of professionals working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. LEED helps industries adopt sustainable practices by providing a framework for assessing green building performance and sustainability goals, training and accrediting professionals and certifying green building. The USGBC assesses the success of their strategy in terms of the number of USGBC members trained and accredited, the number of new USGBC state/regional chapters and the number of projects that meet LEED certification criteria for sustainability.

For more information see: [http://www.usgbc.org/LEED/LEED\\_main.asp](http://www.usgbc.org/LEED/LEED_main.asp)

## PROVIDING JOB OR SKILLS TRAINING

You may engage in a strategy of vocational or skills training in order to:

- Support *new industrial practices* by training people who work in those industries (for farming, forestry or fisheries see also [Managing natural resource use](#), p.184)
- Support the transition toward *a more sustainable local economy* by providing residents the skills they would need to create and participate in that economy
- Improve residents' *quality of life* by increasing their ability to have a living-wage job or a more satisfying career.

Whether you are training people how to write resumes, use a computer or GPS unit, manage hazardous waste or weave traditional tribal baskets, there are several ways to measure the effectiveness of your efforts.

### Sample evaluation questions and indicators

**?** To what extent have we planned our job training program to meet current needs in the community? Are we establishing a base of support for the program?

- ◆ Training program objectives or expected outcomes are clearly stated
- Number of industries contacted to assess interest in hiring trainees
- Existence of formal partnerships with local industries
- Completed economic or social assessment of job or skills needs
- Number of grant opportunities, agency programs or other financial support identified and pursued
- Target audience identified

**?** How well are we recruiting potential trainees? Is our advertising campaign effective?

- ◆ Recruitment rate
- Percent of target audience who is familiar with the opportunity
- Survey of how potential trainees or employers view the program
- Number of applicants over time

**?** How well are we implementing the training program?

- ◆ Number of trainings held
- Number of people trained
- Retention rate of participants
- Percent of target industry employees or target community members trained
- Program completion rate
- Scores on knowledge or skills tests
- Survey of participant satisfaction
- Employer or other external review of program graduates

#### ASSESSING WORKFORCE DEVELOPMENT

Through a collaborative learning project called “Business Value Assessment” the **Aspen Institute’s Workforce Strategies Initiative** (WSI) has developed practical tools to help businesses document the benefits of workforce development. This includes quantifying improved skills and retention rate of the workforce, as well as the costs of participating in workforce development programs.

For more information see:  
[http://www.aspenwsi.org/ne\\_ws-currentproject002.asp](http://www.aspenwsi.org/ne_ws-currentproject002.asp)

**?** To what extent have sustainable industrial practices been adopted by target industries? Have job training opportunities diversified the economy or increased sustainability?

- ◆ Percent of trainees who are applying new skills
- Measurable changes in industry practices (efficiency, energy use, waste management, landscaping practices, certification, etc.)
- Types of jobs held by program graduates
- Percent of people in community in “green” jobs
- See also [Diverse and stable industries](#), p. 60 and [Ecologically sustainable economy](#), p.84

**?** Are training opportunities improving quality of life of participants?

- ◆ Post-training job placement rate
- Participant survey of how training impacted their quality of life, career, etc.
- See also [Living wage jobs](#), p.64 and [Quality of life](#), p. 70



### Data sources

- US Census Bureau
- Department of Commerce
- Interviews/surveys with industry leaders, employees, community members



### Example

**The Bridges to Friendship Partnership** began in 1995 to improve the lives of citizens living near the Washington D.C. Navy Yard, an area listed on the National Priorities List (NPL) as a hazardous waste site. Through the EPA Superfund Job Training Initiative (SuperJTI), area partners (The Institute for Workplace Safety and Health, STRIVE DC and Covenant House Washington) have provided more than 475 residents job training in hazardous waste management as well as general skills in applying for jobs, personal finance and workplace issues. The project is successful in terms of recruitment rate (from only a few applicants to now over 50), training completion rate (64-88%) and job placement rate and range (70% across the metro area). Interviews with program participants and actual and potential employers have also informed partners of the project’s success. By tracking the project over time, partners have been able to identify specific ways to improve the program, for example by including guidance counselors in public school systems as recruiters, providing free pre-employment physicals to alleviate a barrier to job placement after the training and partnering with EPA’s Brownfields Job Training program to further the skills and upward career mobility of SuperJTI graduates.

For more information see: <http://www.epa.gov/superfund/tools/sfjti/success.htm>

## BUILDING COMMUNITY

Organizations or collaboratives concerned with a lack of community cohesion or pride or aiming toward goals such as a higher quality of life or restored cultural heritage will engage in community-building activities. This may include:

- Establishing community gathering places (centers, pools, parks, gardening plots, etc.)
- Holding events to celebrate cultural or natural sources of community identity or pride (a historic downtown heritage festival, community gathering along the river, etc.)
- Developing residential neighborhoods in a way that encourages interaction
- Revitalizing the town center by initiating community clean-up days, restoring historic buildings, holding festivals featuring local retailers, painting community-inspired murals or improving infrastructure (see also [Attracting new business/investors](#), p. 186)

While you can evaluate the success of these efforts by tracking progress toward your social and ecological objectives, you can also simply assess how well you are implementing these community-building activities. That is, to what extent have you planned and carried out them out? Your measures will differ depending on what you are engaged in, but some examples are provided below.

### Sample evaluation questions and indicators

**?** How well have we planned our community-building activities?


- ◆ Assessment of community threats and values complete
- Diversity of people involved in planning relative to community diversity
- Estimated budget completed
- Amount of funds raised (through donations, grant proposals, etc.) vs. estimated budget
- Community member opinion/interest (based on survey or focus groups) of planned activities

**?** How well have we implemented community festivals, events or gathering centers?


- ◆ Number people in attendance/visiting or using center over time
- Diversity of attendants/users relative to community diversity
- Opinion (based on poll or survey) of people attending – Did they enjoy it? Would they come again? Would they recommend it to others in the community? Did they learn something new about their community?
- Cost of event/center vs. budget
- Number of volunteers involved in organizing or maintaining event or center





 To what extent have we planned neighborhoods that build community?

- ◆ Number of houses per acre
- Percent of houses with features that foster interactions among neighbors (front porches, within walking distance to community centers, etc.)
- Average price of houses vs. average income of community members
- Average length of time residents stay

 To what extent are our efforts increasing a sense of community?

- ◆ Number of organizations or clubs formed per year related to community heritage, pride, gathering, revitalization, etc.
- Percent of community engaged in these clubs or organizations
- Number of people in community who volunteer
- See also [Community character](#) (starting on p. 66) and [Community interaction and engagement](#) (starting p. 72), threats related to [Social stresses](#) (starting p. 134) and the asset of [Community cohesion](#) (p.160).

### Data sources

- Organizational planning documents and meeting minutes
- Focus groups, surveys, interviews
- Chamber of commerce

### Example

**The Abacoa Project** aims to foster a sense of community in the 2,050-acre development of Abacoa, Florida. Strategies include using a new urbanist development design, which involves mixed uses and housing types, pedestrian-friendly and environmentally low-impact design and accessible educational and cultural facilities). The Abacoa project also engages in several other community-building activities such as a “Talks About Community” Speaker Series, clean-up and nature study walks within the development’s greenway and cultural festivals. One measure of how well they have implemented these activities is the number of participants. For example, the 2003 Annual report documents that the speaker series averaged 187 persons per event, environmental stewardship activities had nearly 1,000 participants and cultural events brought over 1,500 people representing the diversity across Palm Beach County. In addition, one of their most important measures of progress is a survey of residents on how satisfied they are with the features of the community and their quality of life. This information contributes to a “Chronicle of Life at Abacoa,” which will both capture how successful the community-building activities are, as well as share values and histories across community members.

For more information see:

<http://www.cuesfau.org/Abacoa/index.asp>

## REFORMING LAWS OR POLICIES

For many ecosystem and community-based projects, bringing about changes in laws or government policies or building political support for new or existing legislation is an important strategy to achieve their objectives. This may include:

- Lobbying for particular pieces of legislation on the local, state or federal level,
- Advocating for changes in zoning laws or tax incentives,
- Providing testimony at public hearings or
- Preparing comments on proposed regulations.

This strategy, like many others, can require significant time and resources, so keeping track of your group's efforts and assessing their impact is critical.

### BUILDING POLITICAL SUPPORT

Many groups aim to build political support for key policies or initiatives that would then lead to their ecological or social goals.

Building political support usually involves a combination of strategies, including:

- Developing new policies or laws or reforming existing ones (this page),
- [Education and outreach](#) (p. 192) to key constituencies or decision-makers, informing them of underlying issues or of voting opportunities, and
- Coalition-building or [forming partnerships](#) (p. 205) among potential supporters to increase their weight behind an initiative.

### Sample evaluation questions and indicators

**?** How well have we planned our law and policy reform strategy?


- ◆ Target reforms/policies have been identified and prioritized
- Amount of funds available compared to estimated costs for lobbying policy makers or reforming policies
- Quantity and quality of baseline data on how specific policies & laws affect ecosystems or community

**?** To what extent are we staying up-to-date with policy and program developments that relate to our goals?

To what extent are we a significant voice in policy and government program decision-making in areas that relate to our goals?

- ◆ Number of lobby visits to decision-makers
- Number of times testimony was prepared and presented at public hearings
- Number of comments submitted on proposed regulations
- Number of letters-to-the-editor published in local paper
- Number of other organizations that call us for advice or information



 How well are we using the assets of public support or the support of key leaders or partners to increase our ability to reform laws or policies?  
Are potential supporters familiar with our strategy?

- ◆ Percent of successful campaigns done individually vs. in partnership
- Dollars or hours spent involving or educating the public in our efforts
- Percent of community members or voters familiar with the issues we are working on
- Number of educational or advocacy materials (pamphlets, fliers, etc.) distributed

 How well are we reforming laws or policies?

- ◆ Percent of legislation backed that successfully passes
- Percent of legislation fought against that is successfully defeated
- Percent of lawsuits tried that win
- Overall changes over time in state or local policies, ordinances, taxation policies, etc.



### Data sources

- Law cases within your state/region
- Correspondence with local government officials
- National Resource Defense Council: [www.nrdc.org](http://www.nrdc.org)
- Council on Environmental Quality (CEQ): <http://www.whitehouse.gov/ceq/>
- U.S. Senate Committee hearings (see <http://www.capitolhearings.org/>)



### Example

The **National Resources Defense Council** (NRDC) is an environmental action organization that protects wildlife and natural areas by bringing about changes in government policies and laws. Using their large member base as well as teams of lawyers and scientists, the NRDC lobbies for environmentally beneficial policies, lobbies against environmentally destructive policies and challenges environmentally unfriendly laws. NRDC measures the success of these strategies by documenting the number of pro-environmental legislation that they have backed (and passed), the number of anti-environmental legislation they have fought against (and defeated) and the number of successful lawsuits they have tried (and won). They highlight their progress in newsletters and on their web page.

For more information see: <http://www.nrdc.org/action/default.asp>

## ENFORCING OR ENCOURAGING AGENCY ENFORCEMENT

In addition to efforts to reform existing laws and policies, ecosystem and community-based groups often engage in strategies designed to encourage enforcement of *existing* laws. This can include:

- litigation
- citizen monitoring or “watchdog” activities
- hiring independent evaluators to assess local environmental conditions
- establishing relationships with individuals in agencies and engaging in effective communication with them.

To evaluate the impact of your efforts, you would look at changes in the affected ecosystems or populations you are aiming to protect (see relevant topics in [Ecological objectives](#), p21). But first, you should assess how well you are implementing your enforcement efforts.

### Sample evaluation questions and indicators

**?** How well have we planned our enforcement strategies?

- ◆ Completed assessment of existing laws and polices
- Identified threats that could be reduced with proper enforcement of existing laws or policies
- Amount of funds available compared to estimated enforcement costs
- Baseline data on current enforcement levels
- Action items identify what is needed for effective enforcement
- Target agencies have been identified

**?** How well are we informally encouraging enforcement?

- ◆ Number and quality of relationships established with agency personnel
- Number of times project staff have engaged in a dialogue with agency staff about a particular issue of concern
- Number of commitments from agencies to improve enforcement efforts
- Number of community education events that stress the importance of citizens being on watch for violations
- Level of support for enforcement (see [Support by key people or organizations](#), p.166)
- Size of budget available for enforcement
- Percent of budget from donors, organization members, local community members, etc.
- Level of trust among people supporting enforcement and those violating laws or policies (see [Conflict or lack of trust](#), p.142)

? To what extent are we being effective in our efforts to formally encourage enforcement?

- ◆ Number of lawsuits initiated
  - Percent of lawsuits initiated that are won
  - Number of illegal harvesters or poachers caught
  - Number of citizen monitoring or “watchdog” activities initiated
  - Percent of target audience involved in citizen monitoring or “watchdog” activities
  - Quality of data or information collected by citizen monitoring or watchdog activities
  - Survey of people involved in these activities about the perceptions of effectiveness
  - Number of assessments conducted by independent evaluators

### Data sources

- Federal, state and local government agencies: DNR, DEQ, EPA, such as EPA’s Enforcement and Compliance Online History (ECHO): [http://oaspub.epa.gov/enviro/ef\\_home2.compliance](http://oaspub.epa.gov/enviro/ef_home2.compliance)
- USGS Water Resources Division: <http://water.usgs.gov/>
- County health and human services agency

### Example

**The Citizen Water Quality Monitoring Program** was established in 1998 in Virginia to monitor the quality of Virginia’s waterways. This program provides the Department of Environmental Quality (DEQ) with volunteers to help the DEQ identify polluted areas and unusual water conditions as well as provides long-term data to understand how water quality is changing. Volunteers measure macroinvertebrate populations, dissolved oxygen content and pH, collect water samples to be analyzed for bacteria and nutrients and conduct habitat evaluations. By partnering with citizen volunteers, the DEQ can increase the number of streams, rivers, wetlands and lakes sampled. Volunteer data alerts the DEQ about “problem” waterways. Once these problem waterways are identified, DEQ then sets up formal monitoring so that potential water polluters are identified and water pollution rules are enforced.



For more information see: <http://www.deq.virginia.gov/cmonitor/homepage.html>

## COMMUNICATING WITH THE PUBLIC

You may use a variety of tools to communicate with the public, including:

- *Press releases* targeted toward radio, television and print media sources
- *Website* for your organization or specific project
- High profile *community events* such as stream clean up days involving elected officials or a tree planting event involving school children
- *Demonstration sites* to illustrate best management practices
- *Written materials*, such as brochures, pamphlets or manuals distributed to target audiences
- *Interpretive panels* or structures placed in parks or along trails

**Education and outreach** can be used to help people in your community:

- Understand and support your project or organization
- Increase ecological, economic, or political knowledge or understanding
- Gain an environmental ethic, concern, awareness and appreciation
- Build skills, capacity, or motivation to engage in environmentally responsible actions (resource use, voting, buying, etc.).

Because these activities may be quite time-consuming and costly, it is key to evaluate early on how well you have planned and implemented them and what impact you have had on target audiences.

### Sample evaluation questions and indicators


**?** How well have we planned our community education and outreach campaign?

- ◆ Communication goals (attract new members, stimulate behavior change, educate on a specific topic, etc.) are clear and relate to project goals
- Amount of funds available compared to estimated costs of education activities, materials and evaluation
- Baseline data on knowledge or attitudes available or plan to collect it
- Target audience has been identified

**?** How well have we implemented our outreach campaign?

- ◆ Number of press releases issued / newsletters sent
- Frequency of web updates
- Number of new hits to the website
- Number of people who have received educational material (e.g., mailers, phone campaigns)
- Number of signs posted to alert visitors to restored sites
- Feedback from stakeholders about how strategy is being implemented



 How effective have our efforts to communicate with the public been?

- ◆ Number of new members, volunteers or donors
- Number and quality of articles in the paper on your organization or the issues of your campaign
- Surveys of target audience
- Decrease in [Lack of public environmental awareness/concern](#) (p. 144)
- Frequency of behaviors related to [Environmentally responsible stewardship](#), p. 82).

### Data sources

- State and local newspapers
- Surveys and focus groups
- Environmental Education departments at local universities/cities/local schools

### Example

The **Huron River Watershed Council** (HRWC) is a non-profit organization that inspires attitudes, behaviors and economies that protect, rehabilitate and sustain the Huron River System. One of their strategies is the Adopt-A-Stream program. This program provides a hands-on opportunity for local residents to learn about their streams. During spring and fall river roundups, Volunteer Teams go out to different streams with an experienced volunteer team leader. Each leader teaches the new volunteer team members how to assess habitat, water quality and aquatic life in the Huron River and its tributaries. The data the volunteers collect are used by the HRWC for long-term monitoring of the river. HRWC assesses whether their strategy of communicating with the public through the Adopt-A-Stream program is successful by quantifying the number of volunteers over time, the number of new volunteers each year and how long an average volunteer remains working with the program. In addition, after each volunteer event, volunteers assess their experience through an evaluation survey. To date, over 350 residents have collected data (at 58 study sites) and have learned about the habitats and aquatic life within the Huron River Watershed.

For more information see: <http://www.hrwc.org/adopt/>

## WORKING WITH LOCAL SCHOOLS

A specific approach to education and outreach is to collaborate with local schools. This strategy increases youth knowledge, awareness and skills, but also forms important collaborative ties between your organization and the community via teachers, parents and the school system. Working with schools may include developing:

- Service-learning activities, such as environmental organization staff support or restoration work days
- Field trips or lab activities, such as water quality monitoring or species surveys
- Week or year-long curricula in environmental education

You may want to assess how satisfied participants and collaborators are with the program, what knowledge and skills have been gained and what behaviors or attitudes have changed.

### COMBINING EDUCATION AND INFORMATION GATHERING

**Project CAT (Cougars And Teaching)**, a program of the nonprofit organization Canopy, involves the collaboration of Washington Department of Fish and Wildlife, local universities, businesses, and school districts to answer the question: What happens when wide-ranging cougars are confronted with a booming human population? The project tracks cougar movements 24 hours a day through the use of Global Positioning Satellite (GPS) collars. While wildlife biologists lead capture and collaring efforts, the local Cle Elum school students analyze and use the data collected to engage in “real-life” science lessons. The information helps wildlife managers and community planners design wildlife- and human-compatible communities. At the same time, this project builds partnerships and addresses a lack of public knowledge about the ecological role cougars play in their ecosystem.

For more information see:

<http://www.thecanopy.org/cat.htm>

### Sample evaluation questions and indicators


**?** How well have we planned our strategy to work with local schools?

- ◆ Quantity and quality of baseline data on knowledge/skills of students at the various schools
  - Target schools/classrooms have been identified
  - Contact has been made with teachers and principals


**?** How many different groups have been reached?

- ◆ Number of schools participating in events
  - Number of students/homerooms within each school participating in events
  - Percentage of grade/middle/high schools in the community that have participated in events
  - Number of teachers or adult volunteers involved
  - Percent of parents who are familiar with their children’s school program or content of the program



 Do participants understand the threats to their natural resources?

- ◆ Assessment of knowledge through pre and post test questions
- Assessment of students through essays and comments in “project journals”
- Assessment of knowledge/behaviors via peer-evaluation
- Number of participants who have become more active in the events and are comfortable leading the education events

 Has the service-learning project invoked a sense of civic participation? Are participants more engaged in volunteer or service-learning projects?

- ◆ Number of students participating in volunteer activities outside of class time
- Number of individuals who repeatedly volunteer for workdays
- Number of participants who return to the interpretation center on days without “planned activities”
- Compare student/participant objectives before and after project (work with teachers or environmental educators to develop evaluation questions/projects)



### Data sources

- Video or photo log of project highlights
- Articles about the project, photos, planning schedules, etc. to create an action project scrapbook that students can sign and write comments in
- Students essays and/or journals about any changes in their thinking or behaviors as a result of the project/program or whether they thought objectives were met
- Student peer evaluations
- Surveys, interviews or focus groups of participants



### Example

The **Chicago Wilderness Coalition** (CWC) is a coalition of organizations that work together to protect, manage and restore the natural heritage of the central Midwestern region. The Chicago Wilderness Mighty Acorns program involves local schools and the Chicago Field Museum and combines classroom instruction with hands-on exploration activities in natural areas throughout Chicago. Specifically, students learn about native ecosystems and are involved in restoration and stewardship activities such as seed collecting, brush cutting and planting. CWC measures how well they are implementing this strategy by monitoring the number of organizations, schools and students who have participated in the program. In 2001, over 8,000 students from 80 schools worked with 20 Chicago Wilderness partners to help restore and preserve native ecosystems.

For more information see:

<http://www.chicagowilderness.org/coalition/initiatives/index.cfm> and  
[http://www.fieldmuseum.org/research\\_collections/ecp/cons\\_edu.htm#mighty\\_acorns](http://www.fieldmuseum.org/research_collections/ecp/cons_edu.htm#mighty_acorns)

## BUILDING AND SUSTAINING ORGANIZATIONAL RESOURCES

It is likely that many of your day-to-day activities involve maintaining and managing project staff, volunteers, board members and the resources they need to be effective. This may include:

- Fundraising
- Hiring or training staff
- Acquiring computers, office and field supplies, etc.
- Coordinating volunteer activities
- Distributing workloads

**Organizational strategies** are all the things you do to keep your organization efficient and effective. They include

- Maintaining resources, like funding and skilled staff (this page)
- Gathering and managing information (p. 199)
- Developing a strategic plan that is adaptive (p. 201)
- Working in collaborative groups and partnerships (p. 204)

Everything else you do to achieve your goals – from restoration to policy reform – *depends* on the effective implementation of these organizational strategies.

Assessing the extent to which you are engaging in these activities will inform you whether you are on your way to reducing threats such as [inefficient or ineffective management](#) (p. 148) or [inadequate resources](#) (p. 150)

### Sample evaluation questions and indicators

**?** How well are we engaging in fundraising activities?

How effectively are we diversifying our funding?

- ◆ Completed strategic fundraising plan, including budget and identification of potential funding sources (private donors, foundations, government programs, businesses, member contributions, etc.)

Number of meetings or phone calls with key people in foundations, government, corporations, etc.

Number of grant proposals submitted

Percent of grant proposals accepted

Number of long-term funding commitments

Number and size of fund-raising events

Level and variation over time in operational and programmatic funding

**?** How well are we building the capacity of our organization or collaborative?

What are we doing to increase staff expertise and skills?

- ◆ Completed assessment of staffing needs based on strategic plan

Percent of funds allocated to staffing needs

Number of new hires

Percent of recruited staff that accept the position

Number and quality of staff opportunities for career development and enrichment or training in new skills (computer skills, leadership development, management skills workshops, etc.)

Number of formal and informal partnerships developed to meet specific expertise or skills needs

? What are we doing to increase membership or build our volunteer base?

- ◆ Number of events held to reach out to community
  - Attendance at fund-raising or organizational support-building events compared to target audiences
  - Percent of attendees that sign up as members or volunteers
  - Number of skills-building trainings held for volunteers
  - Percent of trained volunteers that are using those skills for the organization
  - Number of volunteer or member recognition/celebration events
  - Percent of volunteers that have not turned over in the last 3 years
  - Percent of community members who are involved in organization or collaborative in some way

? How well are we addressing our space, supplies and equipment needs?

To what extent are we providing a supportive and productive work environment?

- ◆ Staff/volunteer opinion of whether they have the work space and supplies they need to do their job effectively
  - Identification of donors for needed equipment or supplies
  - Number of informal meetings between coordinator/leader and staff to discuss staff needs
  - Staff satisfaction levels

### Data sources

- Surveys, interviews and focus groups
- Annual budgets
- Employment and volunteer time records
- Resumes of staff, board, volunteers



### Example

**Amigos Bravos** is a nonprofit dedicated to preserving both the ecological and cultural richness of the Rio Grande watershed in New Mexico. The group works on diverse issues such as monitoring mining activity and assisting communities in the area to protect and restore their rivers. During a strategic planning retreat involving 40 representative constituents, members of the Board of Directors and staff, they recognized the need to ensure the sustainability of organizational resources, and focused on achieving measurable increases in membership and net assets, which they assess annually. The group also engages board members and staff in leadership and financial management training aimed to “strengthen organizational infrastructure.”

For more information see:

<http://www.amigosbravos.org/>

## GATHERING AND MANAGING INFORMATION

Having the best available information is essential for any organization to set goals, to plan and to implement their activities. This includes information such as:

- Initial **assessments**,
- **Inventories** of natural/cultural resources,
- Short or long-term **monitoring** programs,
- **Research** of key ecological or socioeconomic questions or
- Informal **knowledge** or **understanding**.

Gathering information is what the Sourcebook is all about! It is critical to know how well you are acquiring and managing information because many of your strategies *rely* on this information.

### Sample evaluation questions and indicators

**?** How well have we planned our information gathering strategy or monitoring programs?

- ◆ Board retreats or organizational meetings have been held to discuss information needs
- Priority needs identified (including research, assessments, evaluation questions, key uncertainties, etc.)
- Goals and use of collected information are clearly identified
- Roles and responsibilities for collecting, analyzing, reporting on and storing information are clearly identified
- Required budget and timeline determined
- Assessment of already available information completed (see also [Available expertise and information](#), p. 162)

**?** How well are we gathering the information we need?  
Are we efficient in our data collection? Are the data credible?

- ◆ Quantity or quality of data or information compared to desired levels (quality assurance or control standards relative to data quality objectives, such as accuracy, completeness, precision, etc.)
- Cost of acquiring information vs. expected or realistic cost
- Percent of acquired information that is *used* (to make management decisions, inform funders, communicate with public, etc.)
- Expert review of collection protocols or data quality
- Number of requests from other organization for our information
- Consistency of collection protocols across years

### APPROACHES TO COLLECT INFORMATION

How you collect information depends on the type of information and level of accuracy you need. Some common approaches include:

- **Ask people what they think** (surveys, focus groups, interviews, expert panel, informal conversations.)
- **Observe or measure something** (species inventories, stream assessments, head count at meetings, volunteer monitoring, photopoints, etc.)
- **Use available data collected by other agencies or organizations** (existing maps, survey results, economic analyses, census data, voter registration records, etc.)

See [Sources of information for evaluation](#), p. 10, and the EMI web site for additional guidance on how to write surveys or monitor and find available information.

Consistency of collection protocols between our organizations and other organizations collecting the same type of information


 How effectively are we using potential assets to gather information?

Number of volunteer hours spent on information gathering

Match between staff expertise and type of information gathered

Percent of information needs met by local universities

Percent of monitoring programs that involve partner organizations

 How well are we managing or storing the information we have?

 Number of hours it takes staff/partner/public to find needed information

Existence of a data management system

Ability of target audience to understand presented information

Staff satisfaction level with data management system based on survey

Extent to which people within and outside of the organization are familiar with what information the organization is gathering

Percent of information that is easily accessible to general public

### Data sources

- Monitoring planning/reporting, financial or other strategic planning documents
- Surveys of people in the organization, especially data management staff and external experts, as well as potential and actual users of the information

### Example

The **Feather River Coordinated Resource Management (FRCRM)** group is a diverse collaborative aimed at improving the health of the upper Feather River Watershed. They implement numerous restoration projects, including stabilizing stream banks and re-establishing riparian vegetation. To assess long-term trends in watershed condition, as well as evaluate the effectiveness of specific restoration projects, a monitoring program was established to collect a variety of water flow, quality and aquatic habitat data. To evaluate how well this information is being collected the group uses the Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Plan, which includes quality control and quality assessment measures. In addition, the group ensures that the program is well integrated with other monitoring activities by, for example, basing their methods on an existing protocol (the USFS Stream Condition Inventory protocol), creating a GIS data management system compatible with the Plumas National Forest system and getting feedback from a technical guidance committee that includes agency specialists and academic reviewers.

For more information see:

<http://www.feather-river-crm.org/monitoring.html> and

<http://www.swrcb.ca.gov/swamp/qapp.html>

## DEVELOPING STRATEGIC DIRECTION AND ADAPTING OVER TIME

Projects may engage in a variety of activities to maintain clarity of purpose and adapt over time, including:

- Working through a visioning or strategic planning process at an annual retreat
- Developing a prioritized action list with assigned responsibilities
- Developing a comprehensive strategic management plan
- Establishing a process choosing among future opportunities
- Creating an advisory committee of scientists & practitioners
- Identifying measures of progress (using the Sourcebook!)

Developing a strategic or adaptive management plan can be a complex and lengthy process – we only scratch the surface here. For more information see related links on the EMI website.

To assess how well you are developing a strategic direction and adapting over time you can evaluate the quality of your planning activities and products. You can also measure whether you already have [Effective decision-making and planning processes](#) (p. 98) in place, a key characteristic of an effective organization, or whether you have weaknesses in this area ([Ineffective or inefficient management of organization](#), p. 148).

### Sample evaluation questions and indicators

**?** How well have we developed a vision or mission statement?

- ◆ Diversity and representation of stakeholders attending meetings to develop vision statement (see also [Effective participation](#), p. 94)
- Existence of a completed and accepted mission or vision statement
- Percent of target external and internal audiences who clearly understand the vision or mission statement
- Existence of documents or web site with the mission or vision statement

**?** How well have we developed a management or strategic plan?  
Was the management plan developed in an appropriate manner?

- ◆ Participants are pleased with the strategic planning process used to create plan (feel it took a reasonable amount of time, produced a good product, included fair and open decision-making, etc.)
- Existence of a plan that includes: clear objectives, action items, logic model or situation map depicting how objectives and actions are linked, responsible parties, timeframes for implementation and completion, estimated costs and how the effort will be financed, measures of progress or change and a plan to collect and respond to this information, etc.
- Number of plans produced relative to number of people involved
- Frequency with which staff, board, leaders, etc. consult the plan to guide activities, decisions or discussions

**?** How well are we incorporating best available information, technical guidance and stakeholder values into the development of strategic management or action plans?

- ◆ Frequency of formal and informal interactions with a scientific or technical advisory board
- Number and size of public input meetings
- Date and source of scientific material used to support decisions
- Participants feel that decisions are based on credible information
- Number of different sources of information used (traditional ecological knowledge, peer-reviewed journals, expert opinion, public input, etc.)

**?** To what extent are we engaging in adaptive management?  
Do participants learn from one another and from their mistakes?

- ◆ Existence of an evaluation framework that includes: Measures or indicators of progress of how well activities have been implemented and what impact they have had in the short and long term; and possible course of action that will be taken if desired targets are not reached or threshold level of threats are exceeded in a given time frame
- Percent of meeting time or number of meetings or retreats specifically used to discuss progress to date in measurable terms
- Frequency with which monitoring data is summarized and discussed by decision-makers
- Timeframe for re-evaluation relative to timescale of activities and changes
- Existence of a system to share information across participants such as a website, monthly update meetings, email updates, minutes
- Participants perception of whether they belong to a “learning organization”

### Data sources

- Planning documents, meeting agendas or minutes
- Surveys, interviews or focus groups

### Example

The **McKenzie Watershed Council** seeks to ensure sustainable watershed health, functions and uses through voluntary partnerships and collaboration. The council charter has many indicators that the council is engaging in strategic and adaptive planning. For example, it clearly states mission, goals and tasks. It also explicitly describes their decision-making process and criteria for strategic partnerships. They lay out a system for measuring council effectiveness in terms of a series of indicators for each goal, with specific benchmark conditions they aim to achieve by certain points in time. This includes measures of how well they are tracking progress, such as the number of benchmarks successfully tracked and the completion of annual and state of the watershed reports.

For more information see:

<http://www.mckenziewatershedcouncil.org/history.html>

## BUILDING COLLABORATIONS AND PARTNERSHIPS

Partnerships and collaborators can be key to your success and so it makes sense to know how well you are engaging in the activities necessary to build and maintain relationships with other organizations, universities, businesses or agencies. This includes how well you are

- identifying the reasons for collaboration,
- networking and
- establishing formal and informal agreements, coalitions or collaborative initiatives.

To assess whether you have *achieved* strong and effective partnerships, see Assets: [Established and potential partnerships](#) (p. 172) or Objectives: [Good working relationships](#), p. 96).

### Sample evaluation questions and indicators

**?** How well have we articulated our needs and how those needs could be met by potential partners?

- ◆ Organization has gone through an assessment of needs

List of your organization's partnership needs (expertise, equipment, political clout, credibility, legitimacy, etc.)

List of what you could provide to potential partners

List of potential partners / target audiences matched to identified needs

**?** To what extent are we building a base of support? How well are we networking?

- ◆ Number of telephone calls and meetings (formal and informal) between potential partners

Number and diversity of people involved in walking the land together

Number of people we have talked to get a sense of interest in partnerships

Level of outreach activities (size and frequency of events, disseminated materials, etc.)

Attendance at other groups' conferences or meetings

Frequency with which you are talking to people you usually avoid because they disagree with you

**?** To what extent have we engaged in activities that enable partnerships?

- ◆ Involved in coast-share programs, volunteer agreements, coalitions or Collaboratives (Watershed coalitions, Teaming for Wildlife, etc.)

Program budget includes funds for refreshments at meetings

Meeting schedule is consistent, reliable, predictable

### BENEFITS OF WORKING TOGETHER

In the past, groups that focused on environmental and social issues often worked in isolation. Today, most organizations work with partners because they recognize the many benefits of collaboration, including:

- Sharing of information and ideas
- Jointly developed funding proposals for larger scale and more far-reaching projects
- Pooled staff and volunteer resources
- Better understanding and increased respect for each others' views which leads to less conflict and smoother progress toward shared goals



Percent of key partners and staff members who are able to attend scheduled meetings

Liability coverage exists for people working on other's land

**?** Is there a compelling need or shared interest that encourages people to work together?  
Are partners or potential partners committed to working together?

- ◆ Community members face an urgent, crisis situation (job layoffs, species loss)
- People feel they are better off working together than apart
- Partners see one another as part of the solution, not the problem
- Partners feel the process opens up new opportunities
- Completed joint mission or problem statement, Memorandum of Understanding or joint task agreement
- Partners commit staff or financial resources to the effort
- Partners use consensus or near consensus in decision-making

**?** How well are we ensuring a lead or coordinator role for the collaborative?

- ◆ Number of grants written and received for funds for coordinator position
- Task list with responsibilities includes who will plan and coordinate meetings, etc.
- See also [Good Leadership](#), p.102

### Data sources

- Local or regional media coverage of key organizations and their relationships
- Documents from organizational and collaboration meetings
- Surveys, focus groups, interviews

### Example

The **School for Field Studies Center for Sustainable Development Studies** (CSDS) in Costa Rica is a field-based education and research program engaged in developing models of sustainable management that protect the country's rich biodiversity. In designing and implementing research projects they aim to meet the needs of local stakeholders, especially National Park staff and the farming community. As part of an evaluation of their Five Year Research Plan, they will also assess how well they are building and maintaining collaboration with these stakeholders. Planned measures include the number of organizations and individuals working with CSDS, the amount of time that lapses between meetings with collaborators, the consistency of information-sharing based on a survey of collaborators and the number of requests received for participating in new projects.

For more information see:

[http://www.fieldstudies.org/pages/63\\_five\\_year\\_research\\_plans.cfm](http://www.fieldstudies.org/pages/63_five_year_research_plans.cfm)



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- p. 47 Clear Wisconsin. Wisconsin Field. Online Image. .  
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- p. 52 Schueller, Sheila. Post-fire forest in the Smoky Mountains. Personal Image.
- p. 57 Yaffee, Steven. Missouri River Basin. Personal Image.
- p. 65 Yaffee, Steven. Seattle. Personal Image.
- p. 66 Schwartz, Mark. Lighthouse on Martha's Vineyard. Personal Image.
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- p. 70 Yaffee, Steven. Seattle, Washington sunset. Personal Image.
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- p. 74 Dotzour, Althea. Missouri River Basin. Personal Image.
- p. 76 Dannen, Kay. Portland Streetcar. Online Image.  
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- p. 79 Minnesota department of Administrations. Parkland and open space graph.  
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- p. 83 Resourceful Bag and Tag, Inc. makers of ClearStream™ Recycle Bin. Online Image. <<http://www.clearstreamrecycler.com>>.
- p. 85 Yaffee, Steven. Seattle, Washington. Personal Image.
- p. 90 Yaffee, Steven. Columbia River Greenways Initiative Evaluation Workshop. Personal Image.
- p. 92 Yaffee, Steven. Grand Junction Collaboration Workshop. Personal Image.
- p. 94 Yaffee, Steven. Catalina Island Conservancy Workshop. Personal Image.
- p. 96 Higgs, Stephen. Resources for Community Collaboration Workshop. Personal Image.
- p. 100 Yaffee, Steven. Seattle Public Utilities Conference Room. Personal Image.
- p. 102 Yaffee, Steven. Community Forestry Workshop. Personal Image.
- p. 110 Kahn, Jason. Aerial view of farmland. Personal image.
- p. 112 Schueller, Sheila. Japanese Barberry. Personal Image.
- p. 114 Yaffee, Steven. Gavin's Point Dam, Missouri River. Personal Image.
- p. 115 Angus, Ruth. Morro Bay National Estuary Program. Great White Egret. Online Image. <<http://www.mbnep.org/about/foundation.php>>.
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- p. 129 Yaffee, Steven. Catalina Island. Personal Image.
- p. 132 Middle Smithfield Township. Zoning Map. Online Image. <<http://middlesmithfield.com/zoningorddraft.htm>>
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- p. 172 Yaffee, Steven. Pelican Island National Wildlife Refuge. Personal Image.
- p. 182 Fox, Glen. Volunteers removing buckthorn. Personal Image.
- p. 186 Yaffee, Steven. Thurmont, Maryland. Personal Image.
- p. 188 Kahn, Jason. California windmills. Personal Image.

- p. 192 Friends of Burlington Gardens. Lakeview community garden sign in Burlington, Vermont. Online Image.. <[www.burlingtongardens.org](http://www.burlingtongardens.org)>.
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- p. 198 Yaffee, Steven. Jupiter Beach, Florida. Personal Image.
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# INDEX

- Acquisitions, 28, 31, 180  
Adaptive management, i, 10, 207  
Agriculture, agricultural, 23, 27, 49, 64, 68, 69, 115, 116, 122, 165, 181, 184, 185, 188, 190  
Air, 46, 47, 50, 70, 118, 119, 122, 123, 130, 131  
Best management practices, 82, 164, 165, 177, 184, 185, 198  
Biodiversity, 5, 21, 22, 23, 34, 48, 49, 52, 53, 108, 110, 112, 116, 122, 124, 182  
Collaboration, i, 75, 92, 143, 208, 209  
Collaborative, i, 5, 13, 17, 27, 89, 90, 91, 92, 94, 96, 97, 125, 142, 148, 150, 170, 172, 173, 192, 200, 202, 203, 205, 208, 209  
Community character, 57, 68, 108  
Conflict, 72, 96, 97, 140, 142, 143, 144, 146, 163, 166  
Connectivity, 17, 27, 28, 30, 39, 181  
Conservation easements, 69, 132, 164, 180, 181  
Contamination, 116, 117, 120  
Corridors, wildlife, 29, 30, 31, 111, 156  
Cost of living, 64, 136  
Crime, 70, 141  
Critical habitat, 35, 115  
Cultural heritage, 17, 61, 66, 192  
Dams, 44, 45, 114, 115  
Decision-making, 3, 6, 10, 74, 75, 83, 94, 95, 96, 97, 98, 99, 103, 132, 133, 144, 149, 163, 164, 194, 206, 209  
Demographics, 59, 134, 136, 137, 140  
Development, 23, 39, 59, 62, 68, 82, 84, 85, 107, 110, 132, 134, 135, 137, 150, 158, 161, 163, 164, 171, 173, 181, 184, 186, 188, 193, 202, 206  
Economic, economy, i, 5, 17, 57, 58, 59, 60, 61, 62, 63, 64, 65, 84, 85, 129, 136, 137, 138, 139, 140, 158, 160, 164, 165, 167, 186, 187, 189, 190, 191  
Ecosystem health, i, 17, 21, 26, 89, 130, 180  
Ecosystem services, 23, 184  
Education, 59, 75, 80, 81, 82, 83, 108, 125, 163, 181, 196, 198, 200, 201  
Employment, 60, 61, 64, 136, 138, 187  
Energy flow, 34, 48, 50, 51  
Erosion, 44, 48, 49, 115, 122, 128, 130, 165, 184  
Fire, 24, 27, 28, 34, 52, 53, 124, 125, 140, 182  
Fish passage, 44, 45, 115  
Forest, i, 4, 24, 27, 29, 34, 37, 41, 53, 61, 101, 108, 110, 111, 129, 139, 144, 151, 156, 161, 185, 187  
Fragmentation, 27, 30, 38, 108, 110, 111, 128, 156, 181  
Funding, 77, 78, 83, 91, 100, 101, 102, 103, 107, 144, 149, 150, 151, 164, 168, 169, 173, 202  
Genetics, 39  
GIS, 29, 31, 69, 111, 125, 157, 180, 181, 205  
Habitat loss, 110  
Human health, 42, 46, 59, 70, 76, 116, 118, 119, 120, 122, 140  
Hydrology, 27, 34, 42, 44, 52, 114  
Incentives, 121, 164, 165, 184, 186, 194  
Indicator species, 26, 29, 30, 35, 36, 42, 111  
Invasive species, 26, 27, 36, 53, 107, 112, 113, 124, 144, 148, 177, 182, 183, 198  
Jobs, 17, 59, 60, 61, 63, 64, 65, 85, 108, 136, 137, 138, 186, 191  
Land trust, 31, 69  
Land use, 23, 24, 28, 32, 33, 42, 48, 59, 68, 69, 85, 108, 110, 135, 181  
Landscape, 17, 22, 23, 27, 28, 29, 30, 31, 37, 48, 51, 68, 110, 128, 137, 157, 161, 181  
Laws, legal, 47, 120, 126, 131, 132, 133, 134, 144, 155, 164, 167, 184, 185, 194, 195, 196, 197  
Leadership, 17, 51, 61, 77, 89, 91, 102, 103, 121, 148, 149, 170, 202  
Littering, 120, 134, 145  
Logging, 82, 111, 122, 123, 124, 129

Marine or coastal, 42, 51, 53, 116, 129, 130, 163  
 Mining, 122, 128, 129  
 Nutrients, 22, 48, 50, 51, 123  
 Outreach, 80, 144, 185, 198, 200, 208  
 Partnerships, 72, 96, 100, 150, 162, 163, 167, 172, 173, 183, 190, 202, 208  
 Physiology, 40, 41  
 Planning, i, 10, 29, 35, 69, 83, 91, 94, 98, 99, 100, 125, 131, 133, 134, 135, 150, 164, 192, 193, 201, 205, 206  
 Policies, 108, 119, 120, 125, 132, 133, 134, 138, 144, 155, 164, 165, 167, 169, 184, 186, 188, 194, 195, 196  
 Political support, 194  
 Pollution, 43, 46, 47, 50, 82, 84, 116, 117, 118, 119, 130, 131, 132, 184, 185, 197  
 Poverty, 70, 83, 140, 141  
 Prairie, 27, 125, 156  
 Quality of life, i, 4, 17, 57, 65, 70, 71, 75, 76, 77, 89, 120, 140, 169, 187, 188, 190, 191, 192, 193  
 Ranching, rangeland, 33, 64, 65, 66, 68, 69  
 Range of natural variability, 24, 27, 33, 36, 44  
 Recreation, 23, 42, 59, 78, 79, 128, 130, 131, 139, 187  
 Relationships, 72, 73, 74, 91, 96, 108, 142, 168, 196, 208, 209  
 Research, 39, 77, 79, 101, 111, 129, 131, 151, 157, 163, 184, 201, 204  
 Restoration, 42, 84, 85, 123, 125, 143, 145, 155, 156, 158, 159, 180, 182, 183, 184, 200, 201, 205  
 Riparian, 23, 28, 44, 116, 180, 185, 205  
 Rural, 62, 66, 68, 76, 134, 137, 173  
 Safety, 61, 70, 71, 140  
 Schools, 62, 70, 80, 119, 162, 163, 173, 199, 200, 201  
 Sense of place, 57, 66, 70  
 Soil, 27, 34, 48, 49, 51, 110, 120, 122, 123, 128, 129, 130, 165, 184  
 Species interactions, 27, 34  
 Sprawl, 28, 68, 133, 134, 135, 148  
 Stewardship, 72, 81, 82, 85, 107, 144, 164, 193, 199, 201  
 Stormwater management, 185  
 Strategic plan, 3, 85, 91, 92, 96, 98, 99, 148, 149, 162, 180, 202, 205, 206  
 Succession, 27, 52, 124  
 Sustainability, i, 21, 51, 84, 85, 187, 189, 191  
 Tourism, 64, 85, 130, 139, 187, 188, 189  
 Trust, i, 4, 72, 74, 96, 97, 142, 143, 145, 146, 196  
 Unemployment, 138, 140, 187  
 Vision, 85, 92, 148, 170, 172, 188, 206  
 Volunteers, 91, 96, 100, 148, 149, 150, 151, 159, 166, 170, 171, 183, 192, 197, 199, 200, 202, 203  
 Water diversion, 28, 114, 115  
 Water quality, 17, 23, 42, 44, 45, 70, 84, 110, 114, 115, 116, 117, 167, 182, 185, 197, 199, 200  
 Water quantity or flow, 44, 45, 115, 205  
 Watershed, i, 29, 42, 43, 45, 114, 116, 117, 162, 166, 171, 180, 205