Summary
Watershed health is an elusive term; it can mean different things to different people. For the most part, though, it is defined as the condition of a watershed relative to a historical un-degraded condition, or a desired future condition. To measure watershed health requires this kind of definition, as well as evaluation of the watershed vital signs. This section describes how to use these vital signs to assess watershed health in a way that can inform decision-making. There is a wide variety of possible vital signs, so a process often is needed to select them and decide how to use them. This process defines the “who” of watershed health. A second concern is the choice of indicators and standards for “what” constitutes watershed health. Conditions in watersheds are measured at a variety of scales and in a wide range of places, from an individual salmon-resting pool to the extent of the whole Sacramento River Basin. This is the “where” of watershed health. The “when” of watershed health is tied to the frequency of measurements and the length of time over which measurements need to be taken in order for the findings to be meaningful. Certain changes take decades to express themselves to a measurable degree, and others may take a day or less. The “how” of watershed health is related to the process of selecting indicators, the types and sources of data, and analysis methods used to convert data to information about condition.

Once indicators of the health of a watershed are analyzed, a critical step is to report the findings to interested parties (stakeholders) in the watershed. This can be done using a number of different strategies. Some people respond to careful reading of summary or technical reports. Others want information delivered through a visual presentation. To allow future evaluation of watershed health, monitoring programs must be encouraged and supported. In the Sacramento River Basin, there are several regional monitoring programs and many local ones; coordination among these monitoring programs will be important to maintain. Monitoring information and evaluating watershed health are most useful when applied in an adaptive management context. This approach to learning-based management is the most likely way to facilitate stewardship behavior and ecosystem improvement.
Who
Stakeholders in watershed health have goals for health that can be expressed in narrative terms, then evaluated using appropriate indicators. Defining goals is necessary to know what to measure and why measuring it is important. A stakeholder process can consist of an advisory committee that helps an evaluation team gather narrative expressions of goals from stakeholder organizations and processes in the watershed. An important step in the overall process is to return to the group of stakeholders and report the results of the evaluation of watershed health.

What
An important component of evaluating watershed health is defining the targets for a healthy system. This can be defined as an agency target, such as a certain salmon population size, or a social goal, such as healthy ecosystem processes. The targets themselves and the process for selecting targets are important types of information to include in transparent reporting to stakeholders.

When
Most environmental data are collected at individual locations, or sampling points. These data are considered representative of the conditions in the waywaterway or landscape around the time of data collection. If the data from individual or collections of sites are representative, they may be aggregated to describe conditions in the subwatershed or watershed. This may be true if the frequency and number of samples over time suit the evaluation. The remaining data are often the result of cartography (mapping) and modeling in geographic information systems. For example, potential flows, distribution of plant communities, and habitat connectivity are expressed across the watershed.

How
Indicators are selected according to criteria such as representative value, ease of understanding, feasibility of monitoring, etc. Once indicators are selected, there is usually a fairly serious effort required to find or develop data for the indicators. Data analysis methods are chosen according to the types of available data, the targets chosen for indicators, and the desired reporting outcome for the indicators (e.g., maps). There have been great advances in environmental data analysis over the last 30 years, making statistical analysis tools available for measuring condition, trends, and causation among system components.

Suite of Indicators
Indicators are chosen individually to evaluate conditions relative to targets and goals. Collectively they compose the suite of indicators appropriate for evaluating overall watershed health. The following tables list indicators that can be used to evaluate conditions within watershed categories (e.g., hydrology) and the key management issues (Chapter 2). This is not a complete list of all possible indicators; it is a list of indicators that, taken together, should inform stakeholders about Sacramento River Basin health. Subsets of the indicators can be used for subwatersheds where they are most relevant, with the caveat that the fewer the indicators used, the less certainty in evaluating watershed health.

Sacramento River Watershed Health Indicators

<table>
<thead>
<tr>
<th>Key Management Issues</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish and Wildlife</td>
<td>Physical habitat, nonnative predators, bentic macroinvertebrates, native fish populations</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Water temperature, dissolved oxygen, toxic pollutants</td>
</tr>
<tr>
<td>Hydrology</td>
<td>Flow timing and magnitude</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Riparian forest</td>
</tr>
<tr>
<td>Life in the Watershed</td>
<td>Flow timing and magnitude</td>
</tr>
</tbody>
</table>

Upper Feather in the Fall

Clover Creek

CHAPTER 5: Measuring the Health of the Sacramento River Basin

South Yuba Subwatersheds). The longer datasets ranged from 3 years (North Fork Feather River Watershed, water temperature records were assembled from available data and ranged from 3 years (North Fork Feather Subwatershed) to >30 years (Lower Feather and South Yuba Subwatersheds). The longer datasets allowed determination of the slope and significance of trends in temperature over time.

Advances in environmental data analysis over the last 30 years, making statistical analysis tools available for measuring condition, trends, and causation among system components.
The 38 indicators listed in the table above are used in the Sacramento River Basin and its watersheds to evaluate health. The table on the previous page provides Sacramento River Basin Watershed Health Indicators

**Sacramento River Basin Watershed Health Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benthic macroinvertebrates</td>
<td>Invertebrates (animals with no backbone) process plant material and are food for many other invertebrates, fish, birds, amphibians, and mammals, making them critical to the ecosystem's health. Certain groups of benthic macroinvertebrates (living on the benthos) are sensitive to pollution and can indicate impacts on waterways.</td>
</tr>
<tr>
<td>Benthic sediment</td>
<td>This is the fine (clay), small (gravel), and large (boulder) sediment on the bottom of water bodies. The size and movement of these sediments are important for aquatic processes and aquatic organisms.</td>
</tr>
<tr>
<td>Coarse woody debris</td>
<td>Part of or whole trees and shrubs that fall into water bodies are important aquatic habitat components. They contribute to habitat structure for many organisms, especially juvenile fish.</td>
</tr>
<tr>
<td>Dissolved organic carbon</td>
<td>Carbon-containing molecules of various sizes that come from soil, plant decomposition, and waste from developed areas. These molecules are food for bacteria, often new waterfowl to consume, and can lead to toxic alcohols and hydrocarbons during water treatment.</td>
</tr>
<tr>
<td>Dissolved oxygen</td>
<td>Oxygen is important for aerobic respiration, which is how aquatic invertebrates and many vertebrates live. Dissolved oxygen can be reduced to unsafe levels when waterways are enriched with nutrients or too warm.</td>
</tr>
<tr>
<td>Drinking water treatment</td>
<td>Surface and groundwater sources for drinking water can contain naturally or artificially high concentrations of toxic or unpleasant constituents. Drinking water treatment can remove many of these, but it is costly to communities.</td>
</tr>
<tr>
<td>Fire impact</td>
<td>When fire passes through an area, it can minimally or catastrophically damage attributes important to people, especially structures. Impact is the measure of the change brought by fire and, for structures, is often measured in financial terms.</td>
</tr>
<tr>
<td>Fire return interval</td>
<td>Fires naturally return to California’s plant communities at frequent (3 years for grasslands) to occasional (30 years for manzanita shrub) intervals. A comparison of the actual fire return intervals to the natural intervals is a measure of natural fire condition.</td>
</tr>
<tr>
<td>Fire suppression</td>
<td>Preventing fires and putting them out are important near communities, but are costly and can change forest conditions. The amount of area treated and the cost are two ways to measure suppression.</td>
</tr>
<tr>
<td>Fish nutrition</td>
<td>A commonly appreciated beneficial use of California’s waters is to catch and eat fish from various water bodies. Fish contamination and loss of fish native fish populations affect where, when, and what species people can benefit from.</td>
</tr>
<tr>
<td>Flood impact</td>
<td>Flooding is a natural phenomenon that benefits geomorphic condition of waterways and floodplains. Much of agriculture depends on a legacy of flooding. It can also negatively affect communities and human activities within the floodplain. Impact is the measure of change brought by flooding and is often measured in financial terms.</td>
</tr>
<tr>
<td>Floodplain connectivity</td>
<td>Through flooding, channels are connected to parts of the landscape that are periodically inundated—the floodplains. When connected to the channel, floodplains can provide temporary habitat for aquatic organisms and a two-way exchange of material and energy.</td>
</tr>
<tr>
<td>Floodplain vegetation</td>
<td>Several plant species and plant community types are found primarily on floodplains and with natural flooding will thrive and provide habitat for other species. Plant species composition, cover, and extent are important values in evaluating health.</td>
</tr>
<tr>
<td>Flow timing and magnitude</td>
<td>A hydrograph indicates the flows (volume) of water across a time period, such as a year. Water management alters hydrographs of rivers, affecting aquatic and riparian communities and processes. Comparing the actual hydrograph with an expected or desired hydrograph is a way to measure these impacts.</td>
</tr>
<tr>
<td>Groundwater management</td>
<td>Groundwater is a critical source of water for drinking and irrigation. Surface and groundwater are connected through groundwater emergence (springs) and infiltration of precipitation. Managing groundwater supply, replenishment, and quality is an emerging concern throughout California.</td>
</tr>
<tr>
<td>Habitat connectivity</td>
<td>Habitat loss and fragmentation are two of the three primary threats to California’s wildlife (exotic species invasion is the third). Connectivity is the opposite of fragmentation and is necessary to support most plants, animals, and ecological processes. It can be measured using wildlife movement and modeled in GIS.</td>
</tr>
<tr>
<td>Impoundment</td>
<td>In order to manage water supplies and flooding, waterways are often dammed. These impoundments benefit certain human needs and activities and harm others. For example, several beneficial uses are affected by impoundments (e.g., anadromous fish runs, water quality, harmful algal blooms).</td>
</tr>
<tr>
<td>Invasive aquatic plants</td>
<td>Weed invasions occur in both terrestrial and aquatic environments. Exotic aquatic plants can modify habitat for native species, displace native aquatic plants, and change the sediment, nutrient, and hydromodynamic properties of waterways. Metrics include plant cover, composition, spread rate, and biomass.</td>
</tr>
<tr>
<td>Invasive terrestrial plants</td>
<td>Weed invasions occur in both terrestrial and aquatic environments. Exotic terrestrial plants can modify habitat for native species, displace native terrestrial plants, and change ecological processes. Metrics include plant cover, composition, spread rate, and biomass.</td>
</tr>
<tr>
<td>Levee stability</td>
<td>Levees have been built by a wide range of private and public organizations to protect adjoining lands from flooding. Levees vary in their stability, role in natural systems, and relative value for flood protection. Levee stability and extent are key in understanding both the protective value and ecosystem impact of the levee systems.</td>
</tr>
<tr>
<td>Metals</td>
<td>A legacy of mining and contemporary sources keeps certain metals on the list of water pollutants. Mercury can bioaccumulate in fish that people like to eat, and certain other metals can poison waterways. Metrics include concentrations of metals in the water and, for mercury, concentration of the surrogate dissolved organic carbon.</td>
</tr>
<tr>
<td>Native fish populations</td>
<td>Native fish can be stressed by a wide range of environmental drivers. The number of species, number of individuals in a population of a species, spatial distribution of individuals, and role of nonnative fish species are all important measures of condition for native fish.</td>
</tr>
<tr>
<td>Native species composition and cover</td>
<td>Native plant communities provide habitat for native species, depending on the composition (types of species) and cover (how much land they cover individually and collectively).</td>
</tr>
<tr>
<td>Nonnative predators</td>
<td>Most species are prey to another organism, with top predators being the usual exception. When nonnative predators (e.g., striped bass) invade, they can displace or eat the fish of other primary producers and can lead to syndromes catastrophic impacts on native systems.</td>
</tr>
<tr>
<td>Nonnative species composition and cover</td>
<td>Nonnative plant species may provide habitat for certain species. However, they typically modify plant communities and ecosystem processes, resulting in decline in valued native species and systems. Certain weeds also increase fire risk.</td>
</tr>
<tr>
<td>Nutrients</td>
<td>Living things rely on nutrients to live. Human activity has resulted in the enrichment of certain nutrients in aquatic environments and possibly depletion of others, which can negatively affect communities and ecosystem processes. Impacts include changes in nutrient cycling and changes in the abundance and composition of aquatic organisms.</td>
</tr>
<tr>
<td>Outdoor recreation</td>
<td>People enjoy different parts of a watershed for different reasons. Walking, bird-watching, and camping are the most popular outdoor recreation activities in California. Protection of the natural systems that people want to enjoy often must be balanced with providing opportunities for people to enjoy the outdoors.</td>
</tr>
<tr>
<td>Park access</td>
<td>Access to public spaces for recreation is important for physical and mental health. Park access is often correlated with childhood obesity, adult cardiovascular condition, and home value. Distance to the nearest park or certain types of parks is a good measure of park access.</td>
</tr>
<tr>
<td>Particulate organic carbon</td>
<td>When plants, animals, fungi, and bacteria decay, they break down into particulate and dissolved organic material. Particulate material is broken down further by benthic and water column invertebrates and bacteria, releasing more dissolved compounds and functioning as food. Concentration and timing of this resource are important measures of condition.</td>
</tr>
<tr>
<td>Pathogens</td>
<td>When animal waste enters waterways, it can threaten human and aquatic organism health. Usually when pathogenic microorganisms pose a risk, it is because of inadequate waste management by urban areas, agriculture, and septic systems. These are usually manageable pathways and concentrations of pathogens is a good measure.</td>
</tr>
<tr>
<td>pH</td>
<td>Activity or alkalinity of waters can change with natural rainfall or plant material decay, or with artificial enrichment of waterways, acid mine drainage, or developed area runoff. Above pH 8.5, or below pH 6.5, fish and other aquatic organisms may be harmed.</td>
</tr>
<tr>
<td>Physical habitat</td>
<td>Benthic sediments, streams, channels, and woody morphology, make up the physical habitat setting for organisms in streams. These factors can determine what organisms and natural processes can exist. Improving aquatic condition is often a matter of improving physical habitat characteristics.</td>
</tr>
<tr>
<td>Riparian forest</td>
<td>Riparian forests are broadleaf deciduous trees and shrubs along the edge of waterways. These habitats provide habitat for terrestrial and amphibious organisms, as well as interacting with streams in nutrient cycles, preventing erosion, and contributing woody material to streams and rivers. Metrics include composition and extent.</td>
</tr>
<tr>
<td>Suspended sediment</td>
<td>When sediments naturally erode into waterways, finer sediments are suspended by water motion. Impoundments can reduce suspended and benthic sediments, while anadromous fish can increase them (e.g., agriculture). Concentrations of suspended sediment relative to historical or desired condition is an appropriate measure of condition.</td>
</tr>
<tr>
<td>Toxic pollutants</td>
<td>There is a wide variety of toxic compounds and elements that can enter waterways, often as a result of human activity. Pesticides, herbicides, metals, polycyclic aromatic hydrocarbon compounds, and various food chemicals can enter waterways from urban and agricultural lands; their concentrations are usually related to degree of impact.</td>
</tr>
<tr>
<td>Water rights</td>
<td>California water law governs the disposal of water in places where people have developed riparian or other water rights. With reduced water availability as a result of drought or growth, water rights may be the source of contention among competing interests, so describing these rights is part of solving many waterway issues.</td>
</tr>
<tr>
<td>Water temperature</td>
<td>One of the most critical factors in determining where organisms can survive and thrive is the temperature of their environment. In many parts of California, high water temperatures may occur naturally or occur with certain land and water management. Coldwater fish species are threatened by high and increasing water temperatures.</td>
</tr>
</tbody>
</table>

The 38 indicators listed in the table above are used in the Sacramento River Basin and its watersheds to evaluate health. The table on the previous page provides short descriptions of each indicator and its possible application in evaluating watershed health.
Examples of Application of Indicators for Sacramento River Basin
Certain indicators listed have been used in parts of the Sacramento River Basin to measure health. The examples below are from the WHIP for the Feather River Watershed.

Water Temperature
Surface water temperature is an important measure of aquatic ecosystem health. Temperatures above 16°C begin to affect larval and juvenile salmonids, above 20°C, growth is affected, and above 25°C, complete mortality can be expected. In the Feather River Watershed, for example, water temperatures can vary considerably among subwatersheds and across years. In general, temperatures are on the rise in the watershed and within 10 years, many of the subwatersheds scoring well (e.g., Lower Feather River) will begin to lose ground.

Native Biota
Fish Community Condition

Fish Populations
Returning salmon and steelhead and resident native fish populations both are important indicators of watershed health and important to society. Proportion of native to nonnative fish species and the number of native species expected in a watershed are robust fish indicators for species. For the Feather River Watershed, only the East North Fork Feather and the Middle Fork Feather Subwatersheds are close to good condition for these indicators. In the lower subwatersheds, returning salmon populations are in fair condition. No trends in health were found to be statistically significant.
Habitat Connectivity
Roads, urban areas, and agriculture all can break up natural landscapes, causing habitat loss and fragmentation for resident and migratory species. According to the state wildlife action plan, habitat loss and fragmentation are two of the three biggest threats to California’s wildlife. As human development activities proceed, movement of individual animals and whole plant and animal populations is inhibited, eventually resulting in endangerment or even loss of populations and species. For the Feather River Watershed, agriculture in the lower watershed, rural towns and subdivisions, and forest roads in the upper watershed have fragmented the landscape and habitats to a great degree. Only the South Yuba, North Yuba, and North Fork Feather Subwatersheds are in good condition.

Landscape and Habitat Structure
Fragmentation

Reporting
Describing watershed health to stakeholders and the public is one of the most critical components of measuring watershed health. This can be in the form of a report card, such as the Sacramento River WHIP (see table on the next page). People are familiar with report cards and can respond appropriately to achieving or failing grades. In a varied landscape with many issues, high and low report card scores among subwatersheds or waterways can help inform prioritization of actions and funding, assuming that we know or can determine the drivers of good and poor condition. For example, the Lower Yuba River Subwatershed has a low score for water temperature because of a combination of high temperatures in a tributary creek to the mainstem Yuba River and occasional high temperatures in the mainstem itself because of water withdrawals. Fish populations in the Deer Creek Subwatershed (of the Feather River) are doing poorly because of impoundments, water diversion, urbanization, wastewater discharge, and dense road networks. By knowing the combined health scores and reasons for them, prioritization of management is improved.
### Method for Evaluation

Each indicator was evaluated for how well it met the target for the particular indicator. For example, the water quality indicator “water temperature” was evaluated according to standards for early life-stages of native fish species (i.e., salmon and trout). The “distance to target/reference” for each indicator was converted to a 0 (poor) to 100 (good) scale. The values for each indicator were then averaged for each goal and objective and expressed for each subwatershed. Trends in condition were calculated for indicators where data were available for more than 2 or 3 years. Confidence in the expression of average condition and trends findings were a combination of quantitative assessments of variability within and among subwatersheds, significance of trends assessments, and how representative the indicator is of the system.

### Feather River Report Card

Each subwatershed was evaluated for its condition relative to targets for each indicator. The subwatersheds are:

- EBNFF – East Branch North Fork Feather
- NFF – North Fork Feather
- MFF – Middle Fork Feather
- LF – Lower Feather
- NY – North Yuba
- MY – Middle Yuba
- SY – South Yuba
- DC – Deer Creek
- LY – Lower Yuba
- UB – Upper Bear
- LB – Lower Bear.

Trend is evaluated from a combination of trend assessments from each subwatershed. Confidence refers to quantitative or professional assessment of confidence in the result. For more information, visit [www.sacriver.org](http://www.sacriver.org).

### FEATHER RIVER REPORT CARD — Score (0 – 100)

<table>
<thead>
<tr>
<th>Goals</th>
<th>Measurable Objectives</th>
<th>Indicators</th>
<th>EBNFF</th>
<th>NFF</th>
<th>MFF</th>
<th>LF</th>
<th>NY</th>
<th>MY</th>
<th>SY</th>
<th>DC</th>
<th>LY</th>
<th>UB</th>
<th>LB</th>
<th>Trend</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality and supply for natural and human communities</td>
<td>Water quality for aquatic health</td>
<td>Water temperature, algae, mercury in fish</td>
<td>73</td>
<td>75</td>
<td>38</td>
<td>50</td>
<td>53</td>
<td>47</td>
<td>39</td>
<td>35</td>
<td>13</td>
<td>40</td>
<td>61</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Maintain natural stream flows</td>
<td>Current flow vs. historical flow</td>
<td>69</td>
<td>n/a</td>
<td>n/a</td>
<td>54</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>63</td>
<td>40</td>
<td>60</td>
<td>41</td>
<td>n/a</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Protect and restore native animals and plants</td>
<td>Native birds</td>
<td>Bird species richness</td>
<td>100</td>
<td>n/a</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>n/a</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Protect native aquatic communities</td>
<td>Land disturbance, aquatic insects, fish</td>
<td>69</td>
<td>64</td>
<td>69</td>
<td>61</td>
<td>66</td>
<td>69</td>
<td>62</td>
<td>47</td>
<td>55</td>
<td>61</td>
<td>82</td>
<td>high</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect aquatic connections</td>
<td>Barriers to aquatic organism movement</td>
<td>77</td>
<td>82</td>
<td>76</td>
<td>82</td>
<td>82</td>
<td>76</td>
<td>79</td>
<td>69</td>
<td>77</td>
<td>67</td>
<td>79</td>
<td>n/a</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Protect landscape connections</td>
<td>Barriers to wildlife movement</td>
<td>23</td>
<td>81</td>
<td>44</td>
<td>5</td>
<td>54</td>
<td>27</td>
<td>100</td>
<td>5</td>
<td>11</td>
<td>14</td>
<td>2</td>
<td>n/a</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Maintain natural production and nutrient cycles</td>
<td>Carbon storage and sequestration, nitrogen loads</td>
<td>88</td>
<td>93</td>
<td>63</td>
<td>94</td>
<td>93</td>
<td>89</td>
<td>93</td>
<td>48</td>
<td>96</td>
<td>91</td>
<td>96</td>
<td>n/a</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Maintain and restore natural disturbance</td>
<td>Fire frequencies compared to expected frequency</td>
<td>2</td>
<td>9</td>
<td>14</td>
<td>39</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>15</td>
<td>0</td>
<td>4</td>
<td>medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage natural flooding, while protecting people</td>
<td>Floodplain access</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>43</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>70</td>
<td>n/a</td>
<td>38</td>
<td>n/a</td>
<td>low</td>
<td></td>
</tr>
<tr>
<td>Improve social and economic conditions &amp; benefits from healthy watersheds</td>
<td>Enhance wildlife-friendly agriculture</td>
<td>Pesticide use and organic agriculture</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>51</td>
<td>n/a</td>
<td>98</td>
<td>100</td>
<td>100</td>
<td>17</td>
<td>100</td>
<td>62</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Improve community economic status</td>
<td>Poverty measure</td>
<td>49</td>
<td>52</td>
<td>54</td>
<td>34</td>
<td>64</td>
<td>32</td>
<td>40</td>
<td>73</td>
<td>35</td>
<td>70</td>
<td>61</td>
<td>high</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Link to Monitoring and Adaptive Management

Monitoring and research programs are the source of data for watershed health evaluations. They are important components in adaptive management, which theoretically is based on a learning process. In reality, adaptive management is a complex interplay among stakeholder interests, social and political priorities, scientific information, and occasional investigations of system condition. Using monitoring programs and health evaluations to reinforce each other in an investigation/reporting feedback loop is likely to encourage the next steps of doing something about problems that are discovered and promising approaches that people are trying. In other words, measuring how effective we are at protecting and restoring watershed health may help us adapt our management of human activities to achieve even more.