Chapter 8

Watershed Assessments and Workplans

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So, you've worked in partnership with other groups, agencies, and interests to create a watershed council. You've got your mission statement and have developed your organizational structure and decision-making protocols. You may even have some money in hand to begin doing good work in your watershed.

Now what?!?

After spending so much time in meeting rooms and sitting around tables wrangling with the administrative details of setting up a new organization, many new watershed groups are tempted to rush right out and start doing "projects" to prove their worth. However, this is exactly the point at which you want to take a deep breath and plunge into yet another administrative-type task – and that is *a comprehensive watershed assessment*.

An overall assessment of the current state of your watershed is critically important to the long-term success of your organization. For one thing, an assessment will help you focus on the areas of greatest need. You don't want to waste time or money building composting toilets along a trail, for example, if your real problem is sedimentation from an old road upstream. By completing a watershed assessment, you will identify problem areas, probable causes, and, hopefully, workable solutions for dealing with the problems – all in an effort to maintain or improve the health of your watershed.

The good news is that there is money currently available and more probably on its way for watershed assessment work in California, especially through state and federal funding programs such as a potential new water bond and watershed funding legislation, CALFED and the US Environmental Protection Agency. (For more info on specific funding programs, see Chapter 9.)

Once the problems, their causes, and possible solutions have been identified, you can put together a work plan, timeline, evaluation plan and budget for initiating projects to address the problems. The assessment and workplan serve as tools for the organization in terms of giving direction and providing the basis for funding requests for watershed programs and individual projects.

Initial assessments give you a way to measure success throughout the life of individual projects and of your organization. By knowing where you started, you can determine what changes, both positive and negative – have taken place in your watershed. You can determine in the future if a particular activity or natural occurrence had an impact on water quality or other factors in the watershed by comparing that data with the original baseline data collected as part of the assessment.

Most funding sources, whether private or public, require some kind of justification for proposed projects and an evaluation of results for any activities they do fund. You will be in a better position to provide such justification or evaluation if you have solid, scientifically valid baseline data. Funders will be impressed if you can identify a specific problem and describe how your proposal addresses the problem, based on true scientific evidence. Then, once you receive funding, the baseline data serves as a tool to evaluate your post-project results and determine the relative success of the project.

Benefits of watershed assessments

- provides the vehicle for agencies and stakeholders to collaborate on quantifying existing conditions and improving the health of the watershed;
- provides a uniform body of consistent and reliable data for decision-makers with responsibility for resource management in the river corridor;
- helps identify contaminants and pathogenic organisms in the watershed and facilitates development of a plan to reduce those contaminants;
- provides valid information for stakeholders to use in prioritizing actions and activities to improve the health of the watershed;
- provides baseline reference data for documenting improvements resulting from specific management practices and/or restoration activities;
- allows for management and use decisions to be based on scientific evidence.

Watershed Assessments

Since a watershed consists of both the stream or river and all the land that drains into it, watershed assessments need to look at both stream conditions (water quality, structural elements, temperature, etc.) and streamside or upland conditions (deteriorating roads, non point source pollution, land use activities, etc.). On top of the actual biological/chemical/structural conditions of the stream and its drainage area, we also need to look at the social, cultural and economic conditions in order to get a true picture of the state of the watershed.

As River Network's Kevin Coyle put it in his article "Basic Elements of Local Watershed Conservation Plans" (***River Voices***, Fall/Winter 1995), a professional resource assessment looks at what resources exist within the watershed – from rare natural habitats to prime development sites – and identifies areas where there may be conflicts.

In the ***Working at a Watershed Level*** workbook, developed by TetraTech for a week-long course at the California State University at Chico, stream-based watershed assessment is broken down into six steps:

1 Data collection and analysis

2 Definition of existing conditions (structure and function) and causes of disturbance

3 Comparison of existing conditions to desired conditions or a reference condition

4 Analysis of the causes (disturbances) of altered or impaired conditions

5 Determination of how management practices might be affecting structure and functions

6 Development of problem and opportunity statements.

This list provides a good model for how to go about developing a stream assessment. Most of the same steps apply to streamside/upland areas of the watershed as well.

The scope of the assessment and the specific contents of the study will vary depending on the size of the watershed, the issues of concern in the watershed, the degree of disturbance, and the resources you have to draw upon for funding, technical expertise and volunteer time. But regardless of what level of assessment you plan to do, this list can serve as a basic framework.

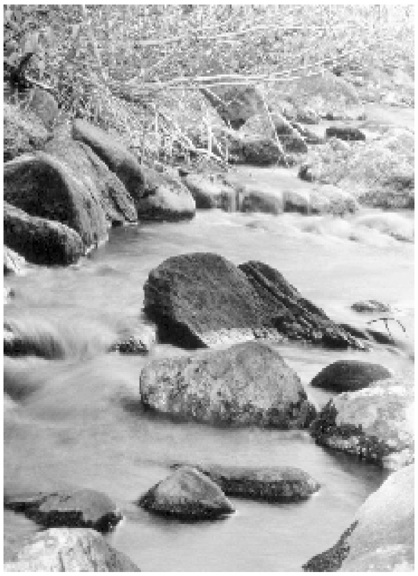
1. Data collection and analysis

Data collection typically falls into two categories: baseline data, to provide a snapshot of the current state of watershed health; and historical data, derived from existing unimpaired areas elsewhere in your watershed or a neighboring one, or from historical conditions relating to species, ecological processes and habitat, historic uses, development patterns, etc.

You need both kinds of data, both for the stream and for the streamside/upland areas, so that you have something with which to compare your present-day conditions. By seeing the changes that have taken place and understanding how and why they happened, you will be better equipped to develop realistic goals for restoring or maintaining watershed health.

Keep in mind that restoration does not necessarily mean returning your watershed to some pre-European settlement state. But learning about the pre-European conditions can help with decisions for achieving a desired state of equilibrium, one in which processes, structures, functions and habitat are healthy and sustainable for both human and non-human communities.

Baseline data



There are many techniques available for collecting baseline stream data, most of which will require some level of site-specific field testing. Examples of biological system data collection methods include:

- Chemical testing
- Using biodiversity to define stream conditions (e.g., relative degree of sensitive versus tolerant species within the watershed)
- Presence of certain indicator species, such as fish or macroinvertebrates, which can only exist under certain healthy conditions (the canary-in-the-coal-mine model)
- Diatom monitoring.

Some techniques are more useful than others, depending on the situation. For example, most people feel the need to do some sort of chemical testing. But chemical tests are expensive and they don't measure potential habitat impacts. Case in point: assume that some kind of chemical spill occurs on a Saturday afternoon. You took your water sample the day before the spill, Friday, and came back for a follow-up measurement five days later, on the following Wednesday. It's quite likely that your chemical tests wouldn't show anything out of the ordinary, since the spill would have had four days to dissipate. Yet, if you were using fish counts as a data collection method, instead of chemical testing, you would probably have seen lots of fish on Friday, but few or no fish the Wednesday following the spill. Only by doing the fish count would you have known that something happened in the watershed over the weekend.

In terms of collecting baseline streamside or upland data, GIS or other mapping may be your best bet. You ultimately want to create a detailed map outlining:

- terrain or topography – how flat or steep an area is – which helps determine how fast water will drain
- rivers, streams, lakes
- soil types, which also affect drainage
- wetland areas
- other types of habitat, including any threatened or endangered species
- different governmental jurisdictions and ownership patterns
- land uses and trends, including zoning areas, to determine what uses are allowed in different areas and at what degree of density
- any planned developments
- roads/trails and their conditions
- natural resource land uses, such as timber harvest, mining, OHV, and other recreational uses.

This gives you an overall picture of where existing and potential future land uses may be having an impact on watershed health.

Much of this kind of information will be available through your county planning department. The department should have zoning maps, ownership and population maps, at the very least. If your county has GIS, or Geographic Information Systems, capability, you may be able to get overlays showing different land uses, proposed development sites, roads, and more. GIS is a type of computer software that links different layers of information to specific locations on a map.

GIS map produced by GreenInfo Network

State and federal agencies are another source for this kind of baseline data. They often have maps depicting this information, at least for the areas of the watershed under their jurisdiction. Some of the larger environmental organizations, such as The Wilderness Society, may also be of some assistance in creating baseline maps for your watershed. And, there is an organization called GreenInfo Network in San Francisco that offers professional GIS mapping services for non-profit community and environmental organizations.

Given the number of different methods to choose from and the need for reliable data, it's probably helpful to develop your data collection methodology and sampling strategies with the help of experts, either from the private sector or from agencies or universities. Students and volunteers can be trained in various sampling protocols to help in the actual data collection. But deciding what methodology to use and analyzing the resulting data is probably best left to the experts.

In addition to stream and ecosystem-based data, watershed groups should look at social, cultural and economic conditions, since these often determine the degree of acceptance of overall watershed restoration goals and the relative feasibility and potential for support of projects designed to meet those goals.

Historical data

In gathering historical stream data, the ***Working at a Watershed Level*** workbook recommends researching changes in land use, channel structure, plant cover, and other physical conditions. You can use old photographs, maps, and even interviews with long-time residents of the watershed to find this information. Major human-induced or natural disturbances, such as land clearing, floods, fires, and channelization, should also be considered. This information is critical to understanding present-day conditions.

In addition to stream and ecosystem-based data, watershed groups should look at social, cultural and economic conditions, since these often determine the degree of acceptance of overall watershed restoration goals and the relative feasibility and potential for support of projects designed to meet those goals.

To get at social and cultural information, which helps you undertand the people, interests and institutions in your watershed, you will probably want to consider some kind public opinion survey or set of surveys. Again, your county government and/or state and federal land managing agencies may have some helpful data. You may also want to check with local community organizations, business associations and environmental groups to see if they have any survey or other data on their individual constituent groups.

Many counties have economic development organizations which can help in gathering information on major employers, per capita income, different employment sectors, and other information. If there isn't a specific economic development organization, you may want to check with your local Chambers of commerce, since they often publish such information for potential new businesses and residents. Real estate associations and local business associations are also sources for such economic data.

Realizing that it's not always possible for groups to collect all of this information, you may want to work with a technical team and some kind of advisory committee to help prioritize the data needed based on the issues facing your watershed. This is a good role for your new watershed council. Assuming your membership is representative of the broad spectrum of interests within the watershed, you can use your own council or the governing board or a specially-appointed subcommittee to help scope out and prioritize data needs.

Analysis of the data can also take many forms, from site-specific collection and analysis to elaborate computer modeling – both for stream and streamside/upland data. The scope and complexity of your collection and analysis systems or protocols will be determined largely by your budget and the amount of cooperative assistance you can get from existing agencies and specialists in your watershed.

2. Defining existing stream conditions

Just as human health is assessed by looking at conditions or parameters such as blood pressure and body temperature, stream health is determined by a set of conditions or characteristics related to structure and function. The amount of information you could collect is limitless. But at a minimum, the ***Working at a Watershed Level*** workbook recommends determining present stream conditions based on the following components:

√ Hydrology – the level and flow of surface and groundwater
√ Erosion and sedimentation yield
√ Floodplain/riparian vegetation
√ Channel processes
√ Connectivity
√ Water quality
√ Aquatic and riparian species and critical habitats
√ Corridor dimension, also called stream morphology.

Even within these parameters, there are myriad measurements for describing watershed conditions (see list on page 95). Again, you will need to prioritize how much of this information is critical to the issues you are facing and how much you would realistically be able to accomplish, based on your access to financial and technical support.

3. Existing vs. Desired Structure and Functions

Conservation, actions to sustain existing conditions.

Preservation, extra protective measures to preserve pristine or sensitive areas.

Restoration, measures to return a watershed to a healthier functioning condition.

The next step is to compare the existing stream conditions with some reference condition that represents, as closely as possible, the desired condition of your watershed. Again, this might be a condition that is less-than-pristine, but one that demonstrates desired stability and equilibrium.

You can define the reference condition in a number of ways, including:

- hydrologic data describing natural flow and sediment regimes
- regional hydraulic geometry relations to define channel dimensions, pattern and profile
- published soil surveys with soil map-unit descriptions and interpretations reflecting long-term ecological conditions
- species lists for plants and animals (both historic and present)
- literature on species habitat needs for information on distribution of organisms by habitat characteristic and geographic range.

You can also define reference conditions by using specific parts of your watershed or another nearby watershed that is believed to be relatively free of natural or human-caused disturbances. This kind of information can be found through study of "relic" areas (enclosures, preserves), historical photos, survey notes, and other descriptive accounts.

Analysis of this type will help determine whether you need to focus on *conservation*, actions to sustain existing conditions; *preservation*, extra protective measures to preserve pristine or sensitive areas; or *restoration*, measures to return a watershed to a healthier functioning condition.

4. Causes of Altered or Impaired Conditions

If you have a stuffy nose, you can take decongestants to treat the symptom. But if that stuffy nose lasts too long, you will

Measurable Attributes for Describing Watershed Conditions

Hydrology
- Total (annual) discharge
- Seasonal (monthly) discharge
- Peak flows
- Minimum flows
- Annual flow durations
- Rainfall records
- Size and shape of the watershed

Erosion and Sediment
- Watershed cover and soil health
- Dominant erosion processes
- Rates of surface erosion and mass wasting
- Sediment delivery ratios
- Channel erosion processes and rates
- Sediment transport functions

Floodplain/Riparian Vegetation
- Community type
- Type distribution
- Surface cover
- Canopy
- Community dynamics and succession
- Recruitment/reproduction

Channel Processes
- Flow characteristics
- Channel dimensions, shape, profile, and pattern
- Substrate composition
- Floodplain connectivity
- Evidence of entrenchment and/or deposition
  - Lateral (bank) erosion
  - Floodplain scour
  - Channel avulsions/ realignments
  - Meander and braiding processes
- Depositional features
- Scour-fill processes
- Sediment transport class (suspended, bedload)

Water quality
- Color
- Temperature, dissolved oxygen (BOD, COD, and TOC)
- Suspended sediment
- Present chemical condition
- Present macroinvertebrate condition

Aquatic and Riparian Species and Critical Habitats
- Aquatic species of concern and associated habitats
- Riparian species of concern and associated habitats
- Native vs. introduced species composition
- Threatened or endangered species
- Benthic, macroinvertebrate, or vertebrate indicator species

Corridor Dimension
- Plan view maps
- Topographic maps
- Width
- Linearity

probably end up going to the doctor and discovering that the *cause* of your stuffy nose is really a sinus infection which requires antibiotics to treat. The decongestant you took was a waste of time and money, since it didn't completely eliminate the symptom nor did it do anything to address the cause.

Similarly with watersheds, a thorough analysis of the *cause* of degradation, if such degradation exists, is critical in order to identify the right "treatment." This is true of both in-stream and streamside/upland conditions.

The Importance of Understanding a Causal Chain of Events

Consider the problem of accelerated streambank erosion. First, you must be able to determine that bank erosion has increased relative to some reference rate. That lets you know you have an impaired condition. But in order to effectively deal with the symptom of accelerated bank erosion, you must know what is causing it. There are many potential causes of accelerated streambank erosion, such as:

- increases in peak runoff or sediment delivery due to catastrophic fire, construction, road- or trail-building, timber harvesting, OHV use, etc.;
- loss of bank vegetation from clearing, fire, grazing, etc;
- structures in the stream, such as bridge abutments, that redirect the water flow into the bank.

Until you can pinpoint which of these is the cause, you can't develop an effective plan of action or management change to address the problem.

5. Management Influence on Watershed Conditions

Once you've assessed in-stream and upland conditions and have identified the causes of those conditions, you can start determining how to address the causes. One way is through changes in watershed management. For example, if you've determined that your accelerated bank erosion is due to loss of vegetation caused by current grazing practices, you may be able to solve the problem by altering grazing management in that area.

Other management issues to consider include water rights and water uses – who owns the rights to the water and for what purposes. This takes into account water deliveries for residential, commercial and agricultural uses; flows required by some legislative or contractual mandate, such as required fish flow releases from hydropower dams, and more. The movement of water through your watershed, whether naturally occurring or manipulated by dams and diversions, is something you need to understand in order to determine overall impacts on the watershed.

Identifying management influences on stream and upland conditions is especially important when weighing different solution alternatives and evaluating the potential effectiveness or feasibility of specific treatments.

6. Problem or Opportunity Statement for Watershed Management

The final step in the assessment process is developing concise problem and/or opportunity statements that will direct where and how watershed management and restoration efforts will take place. These statements – based on your data analysis, existing conditions study, comparison with some reference standard, identification of cause and determination of management impacts – will serve as the framework for developing your overall watershed goals, objectives and specific plans of action.

The final step in the assessment process is developing concise problem and/or opportunity statements that will direct where and how watershed management and restoration efforts will take place.

To be most effective, problem and/or opportunity statements should 1) describe the impaired conditions in measurable units that can be related to specific processes within the watershed, and 2) describe the deviation from the desired reference condition, so that progress can be measured.

Problem statements usually focus on impaired structural or functional aspects of the watershed that need attention, whereas opportunity statements often deal with things like reintroduction of native species to add to the dynamic equilibrium of the system. Opportunity statements should also reflect any economic benefits resulting from the proposed actions.

Workplan or Implementation plan

The most successful and useful workplans typically start with a vision statement of some sort – the desired outcome or desired future condition of the watershed that the group is working toward. This, coupled with the group's mission statement of how it plans to achieve this vision, is the heart of the plan.

Objectives should be
S M A R T:

Specific
Measurable
Achievable
Results-oriented
Tractable (within your control)

From there the plan should outline the specific problem/opportunity statements or goals established as a result of the watershed assessment. Often watershed groups will find they generate a primary set of goals in direct response to the specific issues that brought them together in the first place, such as habitat restoration or sediment management. But sometimes a set of secondary goals will arise out of the assessment process, such as helping to revitalize a depressed local economy (through hiring displaced forestry workers for some of the restoration work) or achieving flood management benefits (through sediment control, meadow restoration or other activities).

Next come the more specific objectives, which outline in general terms how you plan to achieve your goals. Objectives are often measurable, referring to the specific condition being addressed and a quantitative measure of what constitutes success in meeting the objective. This quantitative component is what allows you to evaluate your success at the end of the project.

For example, an overall goal might be to improve fish habitat. One objective to help reach that goal might be to improve water temperature conditions by planting shade plants. But to be most effective, you'd want to get even more specific, including how many plants and what type(s), the anticipated survival rate, anticipated height and coverage, and perhaps how many degrees of temperature change you hope to achieve in the stream. These specific criteria show that you've thought the action through, and they give you something to measure against to determine whether you've reached your goal.

From the objectives flow the specific actions you plan to take. In the case of the plantings, your specific actions could include things like seeking donations of the plants, outlining techniques for planting and follow-up care, lining up volunteers to help with the planting and follow-up, etc. Or, in the case of the secondary goal of revitalizing the local economy, your objective may be to hire 12 displaced forestry workers to do restoration work in the first year. The specific tasks associated with hiring these workers might include attending local job fairs, contacting local economic development or job placement agencies, or putting advertisements in local publications to attract job candidates.

The idea is to work from the general (the vision and goals) to the specific (the measurable objectives and the steps you plan to take to achieve them). In addition, you will probably want to assign specific timeframes to each goal, objective and action or task, along with identifying who is ultimately responsible for each. And lastly, you will need to figure out the costs associated with each task in order to develop overall project budgets. Don't forget to count any donated goods, labor or other services. These amounts can often be used as "matching" funds for project proposals. Even though you don't have to pay out-of-pocket for them, the value of these donated goods or services should be tallied and added to the overall cost estimate for the project.

CHAPTER 8 - KEY CONTACTS/REFERENCE/RESOURCES

Working at a Watershed Level: A Training Course, developed by TetraTech Inc., under contract with the CSU, Chico Research Foundation, for Jan. 11-15, 1999 course at California State University at Chico. Course sponsored by California State University at Chico, Anadromous Fish Restoration Program of the US Fish & Wildlife Service and US Bureau of Reclamation, part of the Central Valley Project Improvement Act of 1992. Co-sponsor, The Nature Conservancy.

Kevin Coyle, "Basic Elements of Local Watershed Conservation Plans," ***River Voices***, Fall/Winter 1995. Quarterly journal published by River Network, PO Box 8787, Portland, OR 97207-8787. Tel: 503-241-3506. Fax: 503-241-9256. Website: http://www.rivernetwork.org.

Getting to Know Your Local Watershed: A Guide for Watershed Partnerships, published by the Conservation Technology Information Center (CTIC) as part of its "Know Your Watershed" program. You can reach the "Know Your Watershed" program at 1220 Potter Drive, Room 170, W. Lafayette, IN 47906-1383. Tel: 765-494-9555. Fax: 765-494-5969.

Putting Together A Watershed Management Plan: A Guide for Watershed Partnerships, published by the Conservation Technology Information Center (CTIC) as part of its "Know Your Watershed" program. You can reach the "Know Your Watershed" program at 1220 Potter Drive, Room 170, W. Lafayette, IN 47906-1383. Tel: 765-494-9555. Fax: 765-494-5969.

GreenInfo Network, 201 Mission St., 4th floor, San Francisco, CA 94105. Contact: Brian Cohen. Tel: 415-979-0343, ext. 305. Webpage: www.greeninfo.org.

Healing the Watershed: A Guide to the Restoration of Watersheds and Native Fish in the West. Published by The Pacific Rivers Council, Inc., as part of its "Healing the Watershed" series. PO Box 10798, Eugene, OR 97440. Tel: 541-345-0119. July 1996.