Planning As Process:
A Community Guide to Watershed Planning

William A. Hashim

Washington State Department of Ecology
September 1998
Publication # 99-01-WQ

Planning As Process:

A Community Guide to Watershed Planning

William A. Hashim

Washington State Department of Ecology
September 1998

Foreward

Knowledge and understanding of the interactions between natural systems and human systems can lead to a reduction in pollution of the environment. The place where pollution is generated, local land use, is the place where solutions need to be found. Given knowledge and support, citizens can solve their own environmental problems. This workbook is dedicated to that purpose.

Some of the information for this workbook came from years of observation and assistance to locals involved in watershed planning and implementation. It is important that as many people as possible hear of the successes of others, especially those local efforts that have such a great impact reducing pollution and improving habitat. Please send in lessons learned so this workbook can be updated with new and innovative ways that are found to deal with watershed restoration. Processes and projects that are found to work can be sent to:

Watershed Management
Water Quality Program
WA State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Table of Contents

Chapter 1. Watershed Planning as Process

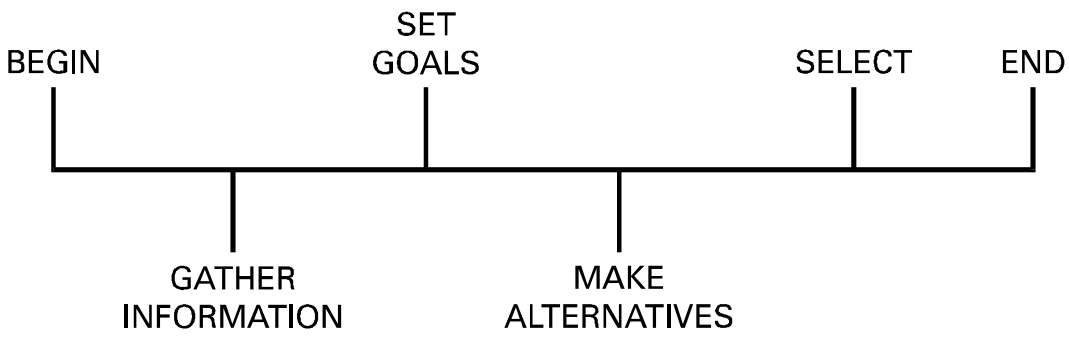
Some of the most successful efforts at solving environmental problems have happened through local watershed planning projects. Since most environmental problems originate as local land use issues, it makes sense that local efforts should be the primary means of determining ways to control land-use generated pollution. This workbook adapts those efforts and presents a watershed planning process that has been used throughout Washington State by local entities who have successfully battled water quality problems.

However, this workbook can be applied to most environmental problems that require local involvement. Problems of flood control, water quantity, total maximum daily loading (TMDLs) of pollutants, and fish or shellfish restoration activities are examples of such environmental problems solvable through local watershed planning. The planning process for each activity has related elements. Developing a general process that can be converted into the various applications is the idea behind this workbook. That is why this workbook is made to be as universally applicable as possible.

In Appendix A1, various watershed planning activities are listed, with suggestions on how the chapters in this workbook can be used to fulfill those relevant activities. For example, Chapter 400-12 Washington Administrative Code, Local Control of Nonpoint Source Pollution, is the watershed planning process promulgated by the Puget Sound Action Team (previously Puget Sound Water Quality Authority). 400-12 is very explicit in its watershed planning requirements. The information in this workbook can be easily applied to help fulfill those requirements. The same is true for water resource planning, and flood control planning.

Watershed Planning as Linear Process

Historically, land use planning was a very linear process. An agency identified goals, objectives, problem statements, and actions to solve problems. Then the plan sat on someone's shelf.



Linear Process Flow Chart

Obviously there were numerous problems with linear planning:

1. People affected by someone's planning were rarely part of the process;
2. Planning was done in a vacuum, without input from interested parties being affected;
3. The linear planning model was not interactive, and thus affected parties were disenfranchised:
4. There was little coordination with other planning efforts;
5. Decision-making was centralized by "experts," or those who thought they knew best;
6. Problems were not resolved by the limited solutions.

Because those who would be impacted by implementation of the plan were not consulted, there was no ownership for the outcome. That being the case, affected parties resisted implementation efforts.

This workbook presents a step-by-step watershed planning process and a format for working collaboratively with all participants interested in a particular watershed.

The Nisqually River Watershed Management Plan - A Circular Model

In contrast to the linear model of planning, a new model for watershed planning was instituted in Washington State with the advent of the Nisqually River Management Plan.[1] In response to Legislative direction, the Washington State Department of Ecology established "advisory committees to provide technical assistance and policy guidance" in the preparation of an "overall management plan" for the Nisqually River. As mandated, membership was composed of individuals representing the in-

terests of federal, state, and local government entities, agriculture, forestry, the Nisqually Indian Tribe, other property owners, and environmentalists. The process consisted of two advisory committees, a policy advisory committee (the Steering Committee), and a Technical Advisory Committee.

The Steering Committee was the decision-making body. To foster a better understanding of the river system and its resources, members went on five field trips between January and May 1986. Each field trip provided committee members with a better understanding of the area to be managed, and with an on-the-ground insight into specific areas of management concern. Education of the committee members played a pivotal role in the planning process.

Technical reports to the steering committee, combined with staff research and public testimony, identified several important issues and concerns relevant to the river and its basin. The Nisqually River is the fifth largest river entering Puget Sound and provides fifty percent of the discharge into the South Sound below the Tacoma Narrows. Even though water quality monitoring programs were inadequate, many problems were known to exist. The principal pollution source was dairy waste. However, many corridor landowners were primarily concerned with flooding, which was exacerbated by forest practices. The principal anadromous fish management problems are low flows and stream blockages.

Armed with information, the steering committee adopted draft management policy recommendations to Ecology for a Nisqually River Management Plan. The plan entailed water quality, water quantity, flood control, fish management, and other elements found within a watershed. Ecology approved it in February, 1987. This process was tremendously successful.

The Nisqually River Project was a pioneering effort by Washington State in basin planning. The Nisqually project showed that circular planning was fruitful. Watersheds are a functional process, in the sense that all interests interact and affect all other interest. The process of interaction of both the natural and built environments cannot stop or start anywhere.

Watershed Planning as Functional Process

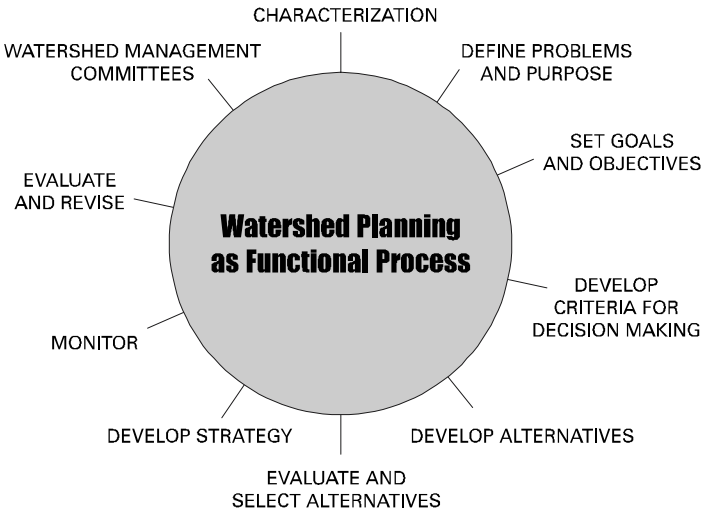


Figure 2: Watershed Planning as Functional Process

Each of the elements within the functional process, shown in the graphic above, will be given consideration in a chapter. This workbook will show ways in which watershed planning can be accomplished, given the unique nature of every watershed by allowing for diversity in goal setting, decision making, and implementation.

There are a number of reasons why local watershed planning is the preferred approach to solving watershed problems: [2]

The watershed provides a framework for analyzing the effects of human interactions with the environment.

1. The watershed is a geographic region established by physical boundaries.
2. Watershed planning is logical for evaluating the biological and physical linkages of upland and downstream activities because within the watershed they are linked through the hydrologic cycle.
3. Watershed planning is holistic.
4. The watershed approach has strong economic logic, since land use activities can be linked to the cost of implementation.
5. The watershed provides a framework for analyzing the effects of human interactions with the environment. By evaluating watershed implementation efforts, needed changes in the social system can be identified.
6. Local communities decide what works best for them, through an education and consensus building process in a watershed management committee.
7. The watershed approach can be integrated with or be part of programs including forestry, soil conservation, rural and community development, growth management, and agricultural systems.

In watershed planning as functional process, there is, in effect, no distinction between planning and implementation, and no discernible place where you can say this project has stopped. That does not mean that this process leads to perpetual planning, which is a viable complaint.

Planning is developing and implementing a strategy for identifying and prioritizing issues to be solved, whether that issue is to correct a problem, prevent a problem, or maintain the status quo.

Watershed planning at the community level is an educational process for the citizens and agencies involved. By recognizing this educational environment, effective planning, cooperating, and learning occur. The learning process underlies the educational process participants go through in watershed planning. Thus, education permeates every aspect of the functional watershed planning process. This is what makes local planning and problem solving so powerful.

With increased learning about the watershed, the community begins to think in new ways. Perspectives change from an individual's backyard to a landscape, and the result is a new understanding of the interrelationships of the physical properties within the watershed. Because of the human impacts on the natural environment, watersheds need to be managed. Management begins with a plan, one that is cooperatively developed.

During the public hearing of the Skagit Bay Watershed Action Plan, committee members told how they could barely speak to each other in the beginning, being always on opposite sides of the issue. However, during the 2+ years of discussions, field trips, and grappling with the issues, they learned to respect each other, to agree to disagree occasionally, to work cooperatively, and to have fun.

Definition: *Through literature research about the watershed, historical perspectives (stories), and technical reports, watershed management committees learn about the community, land uses, and the watershed.* [3]

Introduction

Taking inventory is a crucial first step in identifying problem areas, and for developing baseline information for use about your watershed. This chapter is about the process of collecting information for a watershed characterization report. A watershed characterization report is wholly descriptive. Just describe the watershed, what it looks like historically, seasonally, or on a certain day. The description will change with time, but it is important to create a description for baseline.

Use of GIS

Geographic Information System (GIS) links geographic data, the locations of sampling stations, shorelines, stream corridors, forestlands, or other lines, points, and areas with descriptive data. As more knowledge is gained in ways of using GIS capabilities, more attention is given to it. GIS is used most frequently as a mapping tool. The data can be analyzed and presented on a variety of scales and formats, including maps.

GIS can be used by watershed planners as a valuable decision making tool. For example, by linking and relating information about certain streams, the prevalent land use, and the degree of slope within a watershed, GIS can help estimate the probability of streambank erosion at various sites.

GIS can be time consuming and expensive to compile and operate. Most lead agencies lack the necessary funds to create their own geographic information systems from scratch, and instead use existing data sets to analyze watershed conditions and trends. [4]

Gathering Information

Gathering information usually starts with phone calls to agencies with a vested interest in your watershed. Technical experts are often willing to share their information, to help determine what additional information is needed, and where it can be gathered. A dedicated technical advisory committee will help compile the information and translate it into useful English.

Sometimes the watershed management committee requests information that is not available. Then some primary gathering needs to take place. Time, funds, and planning objectives should be considered when

determining the content and level of detail of field work. There are some work books available that will help in field gathering efforts. One such book, Describing Ecosystems in the Field, is particularly helpful. [5]

Usually, when you request watershed characterization information from an agency, it will come in a form that needs to be at least edited, or sometimes even translated.

The Characterization Report

The watershed characterization gives the reader a snapshot picture of what the watershed looks like on a certain date. It is important to note that the picture will change from day to day, so the characterization should never be taken as fixed. This is one reason why review and evaluation are so important for watershed planning and protection. Make sure you have enough information to evaluate the health of your watershed over time.

The watershed characterization gives the reader a snapshot of what the watershed looks like on a certain date.

Without an adequate description of your watershed, the planning process can be biased. Agencies that review your planning document will comment more often on the watershed assessment than on any other part of the plan.

A watershed contains most elements of culture and nature. Describe the biological environments, the physical condition, infrastructure, institutional structure, human culture, and existing environmental programs in as much detail as possible. The next page lists features you should describe:

NATURAL SYSTEMS

PHYSICAL SYSTEMS

- ❑ Surface water
  - ❑ quality
  - ❑ quantity
- ❑ Ground water
  - ❑ quality
  - ❑ quantity
- ❑ Animals
  - ❑ unique species
  - ❑ migration routes
- ❑ Plants
  - ❑ unique species
  - ❑ special habitats
- ❑ Fish
- ❑ Forests
- ❑ Riparian zones
- ❑ Wetlands
- ❑ Air quality
- ❑ Climate
- ❑ Soils
- ❑ Minerals
- ❑ Geology
- ❑ Hydrology
  - ❑ Water ways
  - ❑ Water bodies
- ❑ Topography
- ❑ Unique physical features
- ❑ Other

HUMAN SYSTEMS

INFRASTRUCTURE

- ❑ Cities
- ❑ Towns
- ❑ Roads and Railroads
- ❑ Utilities
- ❑ Dams
- ❑ Landfills
- ❑ On-site systems
- ❑ Industry

SOCIAL STRUCTURE

- ❑ Economics
- ❑ Politics
- ❑ Growth and Development
- ❑ Land Use
- ❑ Recreation
- ❑ Jurisdictions
- ❑ Historical Resources
- ❑ Cultural Resources

How do you determine the sufficient content and level of detail in the description to make the characterization report a useful document? The objective of the planning process will help. Sometimes you simply do not have information about a system, and that is okay. Filling in the gaps of a watershed characterization often becomes a recommended action identified in the final watershed plan.

A reader should be able to understand how all the systems in a watershed affect each other. Linkages have to be made. For example, if shellfish beds are negatively impacted, the characterization should provide enough information to either document the source of the problem, or to strongly intuit a link to the source of the pollution. Creating linkages between the different systems within the watershed is a difficult task, yet is a key part in the watershed planning process for creating solutions to watershed problems.

Chapter 3. Watershed Management Committees

Introduction

A key element to successful local watershed planning is to form committees made up of local interests. People who live, work, play, and own commerce of some sort are the ones who will ultimately need to solve their own community problems. One of the grand misconceptions of regulatory agencies is that local problems can be solved with a centralized decision making process. Environmental degradation is a local land use issue that can have regional ramifications.

Selecting committee members for the two main committees that truly represent the watershed is an important task for the lead agency. A Technical Advisory Committee can be very helpful in deciphering the technical jargon generated in a characterization report. The second committee is the Watershed Management Committee. This is a decision-making body made up of multiple interests within the watershed. It becomes crucial to the importance of a successful watershed planning and implementation effort simply because any implementation efforts to improve the quality of the environment will affect the members of the watershed community. Having the community agree to implementation through representation of its members is an essential ingredient for any planning endeavor.

The lead agency needs to answer these questions in deciding on committee formation:

- What process should be used to recruit members?
- What should the committee structure look like? Should the committee decide on their own structure?
- What is a manageable committee size?
- Who should participate from local government?
- How do we ensure that "affected parties" will have their say?
- Under what conditions should we use an advisory committee?
- At what points in the process should the general public be involved, and how will we do this?
- Who should facilitate committee meetings?

Use these questions for a start. Others will arise as you move through the process. It is important to develop your strategy before you contact potential members. Not having answers to questions they will probably ask can lead to an appearance of confusion. That is not a healthy way to start a watershed planning process.

Lead Agency

Every watershed planning effort requires an agency to perform work and coordination. This Lead Agency usually receives the grant or other money needed to develop the watershed plan and dedicates staff time for the planning effort.

The lead agency:

- Administers the grant or other funding;
- Hires staff or consultant to perform the work;
- Coordinates and oversees the planning process;
- Schedules committee meetings and performs other tasks for the committees;
- Oversees the document review process;
- Negotiates implementing agency concurrence and commitment, and
- Coordinates development and implementation of the watershed plan.

The Lead Agency also completes the environmental checklist as part of the State Environmental Policy Act (SEPA), once the plan is written but not yet final. Coordinating the SEPA review takes time and it should be scheduled in the review process.

Coordination with other resource or environmental management agencies is essential to prevent various agencies from performing redundant work. Coordinating staff time, efforts, and programs saves time and money, increasing chances of success when funds are limited.

The lead agency also plays another extremely important role, educating community and committee members on environmental issues, problems to overcome, and implementation processes. This can have very far-reaching and positive ramifications. It also needs to inform other government agencies of the difficulties watershed community members face in trying to solve environmental problems. This face-to-face communication can lead to conflict resolution between these agencies and citizens.

Most often, the lead agency will create a team of experts to perform the work. Typical team members include a planner, educator, technician, and an administrator to care for the budget and paper work. If the Lead Agency cannot perform the work, consultants will be hired. However, the qualifications for the individuals performing the work remain the same. The individuals must be dedicated to working with community members, have skills in planning, facilitation, writing, and patience.

Technical Advisory Committee

Technical Advisors are "experts" in technical issues found in a watershed. They can be of immense value to staff and the Watershed Management Committee, not as decision makers, but as consultants who provide information and recommendations for watershed management committee decisions.

Experts can:

- Evaluate technical needs;
- Translate technical jargon;
- Help evaluate political needs;
- Provide information exchange and training to the lay person;
- Perform technical tasks requested by the committee;
- Identify specific problems areas and general problem conditions, and
- Help determine technical solutions when necessary.

A dedicated Technical Advisory Committee can gather information and compile it into a watershed characterization report, saving the lead agency time and effort. When working as a committee, members can understand the interrelationships within the watersheds more readily than if someone were doing it alone.

Another way to use technical experts is to call on them individually as needed. An individual can be more flexible than a committee, and can come to the beck and call of the Watershed Management Committee when needed. Sometimes technical committees are called only when needed and the expert does not have to attend regularly scheduled meetings. There are a variety of ways to use technical help. Ultimately the Lead Agency and Watershed Management Committee should decide on the best method for them.

Who should be technical advisors? Consider:

LOCAL GOVERNMENT

Planning Department _____

Public Works _____

Soil and Water Conservation District _____

Elected Officials _____

Environmental Health Staff _____

Building Department _____

School District _____

Well Drillers and Water Purveyors _____

Engineers _____

STATE GOVERNMENT

Dept. of Ecology _____
Dept. of Fish and Wildlife _____
Dept. of Health _____
Dept. of Agriculture _____
Dept. of Natural Resources _____
Dept. of Transportation _____
Universities _____

TRIBES

Fisheries _____
Water Quality _____

FEDERAL GOVERNMENT

U.S. Forest Service _____
Natural Resource Conservation Service _____
EPA _____
Bureau of Reclamation _____
Dept. of Transportation _____
U.S. Geologic Survey _____
Fish and Wildlife Service _____
Military _____
Other _____

The ultimate role the Technical Advisory Committee plays should be up to the lead agency and the Watershed Management Committee. As experts and consultants, this technical group has an important role to play, and ownership in the outcome of the planning process. The watershed planning process is the perfect arena for technical issues.

Watershed Management Committee

This committee is the capstone group for any successful local watershed planning effort. Meticulous care must be taken to assure representation of all affected parties within a watershed. There is a watershed community made up of government agencies, tribes, residents, industry, commercial enterprises, and other interests who all have a stake in the outcome of a watershed plan. Simply put, know your watershed and the community therein. There are several considerations that affect committee size and structure. Ask yourself the following questions:

What is the composition and size of this watershed? urban, suburban, or rural? _____

_____

_____

What are the government jurisdictions and which land is publicly owned?

_____

_____

_____

What is the amount and type of privately owned land? _____

_____

_____

What are the types of commercial activities: farming, industry, shopping centers, forestry? _____

_____

_____

What are the general environmental concerns? _____

_____

_____

What else do you want to know about the watershed? _____

_____

_____

What is the current political climate? _____

_____

_____

What are the marginal interests within the watershed? _____

_____

_____

Once you have an idea of the composition of the watershed, committee membership can start to take shape. There are usually a large number of potential members, but getting someone to commit to 18 months of meetings is not easy. For now, start listing potential members.

COUNTY GOVERNMENT
(What is the most appropriate mix of staff and officials?)

Planning _____
Health _____
Public Works _____
Council/Commission _____
County Executive _____
Planning Commission _____

CITY GOVERNMENT
(Who is the most appropriate contact from city government for the management committee? Consider a watershed that has more than one city.)

Planning _____
Public Works _____
City Manager _____
City Council/Mayor _____

TRIBE(S) _____
(Are there more than one?) _____

AFFECTED/INTERESTED PARTIES

Commercial Farms _____
Non-commercial Farms _____
Developers/Realtors _____
Environmental Groups _____
Recreationists _____
Commercial/Industry _____
Residents "At Large" _____
Property Owners _____
Educators/students _____
Other _____

SPECIAL PURPOSE DISTRICTS

Sewer _____
Water _____
Drainage _____
Diking _____
Conservation _____
Flood Control _____
Ports _____
River Improvement _____
Other _____

COUNCIL OF GOVERNMENTS _____

STATE AGENCIES (To be included as appropriate)

Natural Resources _____
Fish and Wildlife _____
Health _____
Ecology _____
Transportation _____
Parks and Recreation _____
Agriculture _____
Cooperative Extension _____
Puget Sound Action Team
(for Puget Sound Watersheds) _____
Universities _____

FEDERAL AGENCIES (To be included as appropriate)

NRCS _____
Forest Service _____
Transportation _____
Park Service _____
Fish and Wildlife _____
Military _____
US Geologic Survey _____
Environmental Protection Agency _____
Other _____

Watershed Management Committee members should be able to represent the full range of interests within their local governmental entity, tribal, or

interest group. It is important that they have the authority to make decisions that will affect their constituents and the watershed community.

The Committee as a Partnership

An important part of committee function is to develop a sense of autonomy and self direction. A number of steps can assure this. As a starting point, the lead agency should:

- Determine and record ground rules, decision-making processes, and conflict resolution procedures;
- Keep records of attendance and minutes in accordance with Open Public Meetings Act;
- Prepare work plan, schedule, and budget;
- Prepare roles and responsibilities of committee members;
- Prepare a strategy for public participation and education;
- Circulate written information on process to local governments, federal agencies, planning and health agencies, tribes, affected parties, and general public. Provide and encourage public review and involvement.

The lead agency should be prepared prior to the first committee meeting so that it can review and approve elements of the process that affect them. A great resource for helping to develop committee autonomy is the set of guidance documents from the Know Your Watershed Campaign coordinated by the Conservation Technology Information Center. In their brochure, Building Local Partnerships, they have identified several key steps toward building successful partnerships. [6] They are:

1. Establish a sense of need and direction;
2. Select partners (committee members) based on existing and potential skills, not personalities;
3. Pay particular attention to the early meetings and activities;
4. Set some ground rules;
5. Start with a few short-term tasks that have a good chance for success;
6. Challenge the group regularly with fresh facts and information;
7. Spend time together outside of formal meetings, for example go on field trips; and
8. Use the power of positive feedback, recognition and reward.

Committee Ground Rules

Prior to full-fledged committee work, the lead agency should set the stage for discussion by developing, with committee review and approval, a set of ground rules. This helps everyone understand what is expected of them as committee members and as watershed neighbors trying to solve

problems together. Here are some sample ground rules compiled from several watershed planning efforts:

Committee Membership:

- Maintain respect for the group and individuals within it;
- Create an atmosphere for effective consideration of options;
- Support the primary purposes of the group;
- Maintain focus on issues, not individuals;
- Recognize the value of presenting different ideas and perspectives;
- Provide an opportunity for each person to talk;
- Give full attention of the group to the person who is speaking;
- Reserve side discussions for breaks or after meetings; and
- Respect the voice of the Chair; the chair's authority derives from and represents the group.

Making decisions:

- Ensure that all critical questions are addressed;
- Create an atmosphere for making effective choices;
- Make choices that all participating parties can support; and
- Create a solid foundation for the Watershed Management Plan

How to get there:

- Decisions are made only by those who attend the meeting at which the issue is considered;
- Seek to build consensus on significant issues;
- Routine procedures can be done using majority rule ("Robert's Rules");
- Listen to and respond to needs expressed by each participant;
- Ensure that each person has had a chance to speak to the issue;
- Before finalizing a decision, make sure that each concern has been addressed; and
- Record each decision in writing, and attach the record to the meeting minutes. Once recorded, the decision stands.

Decision-Making Models

There are several decision-making models to choose from. However, the ones most used in watershed planning are Robert's Rules of Order, Collaborative Negotiations, and Consensus and Modified Consensus. Most everyone is familiar with Robert's Rules of Order (the process of voting), but very few people have had the opportunity to use consensus because it requires a facilitator. In addition, the committee itself should be trained in the process, otherwise the consensus process can flounder.

Robert's Rules of Order

This process requires a chair who leads discussion, debate, and other arguments about a topic. Once all participants voice their opinion, a call is made for a motion to vote. The chair will issue forth a request for all in favor of the motion. Then a request is made for those that oppose the motion. After all votes are tallied, the majority wins.

The major disadvantage of voting for decision-making in watershed planning is that often times a majority may be one or two more than minority. Voting creates losers.

Collaborative Negotiation

Collaborative negotiation is a process composed of a set of complex and effective communication techniques. Education and the use of personal power are employed as collaborators attempt to satisfy their own essential self-interests and at the same time satisfy the needs and interests of others. Collaborators collectively, consciously, and deliberately strive to develop and exchange equitable, practical, and durable promises which satisfy their own interests and other people'[7]

There are certain keys to this process:

- identifying the real interests of each party involved in the conflict;
- distinguishing interests from issues and perceived issues from real issues,and
- developing positions on the real issues based on satisfying the real interests of all parties.

Consensus should lead to an outcome that all of the members can support at varying levels of committment.

The purpose of collaborative negotiations is to resolve conflict. In traditional resource based planning, interests were threatened or ignored, and people were generally left out of the planning strategy. The employment of collaborative negotiations places all participants on an equal platform for the intent of reaching issues, interests, and resolving conflicts at the psychological level.

Consensus

Consensus is a method of reaching group decisions that uses a process of collecting information and airing viewpoints, group discussion, analysis, and the development of a solution that is acceptable to the group. It may not lead to everyone's ideal outcome, but it should lead to an outcome that all of the members can support at varying levels of committmen8 Consensus is essential for achieving committee unity and for building equity and ownership for their individuals.[9]

Here are some ways to build consensus:[10]

1. Total participation - all major interests are identified and brought together;
2. All committee members are responsible - everyone helps plan activities and offers suggestions to make them more effective;

3. The committee members discuss the history of the issue, their perceptions and concerns, and ideas for solutions;
4. People stay informed - the committee keeps their own groups and the rest of the people who live in the watershed informed;
5. The committee discusses and agrees on a common definition of the problem;
6. The committee seeks a range of recommendations and avoids pushing single positions;
7. Decisions are made by mutual agreement - the committee doesn't vote; members modify options or seek alternatives until everyone agrees that the best decisions have been reached;
8. The committee identifies ways to implement solutions.

The biggest complaints about consensus are: 1) the time it takes to go through the process; and 2) the difficulty in maintaining it as a decision making style. Those are valid issues. However, it is worth the time and effort it takes to create partners in your watershed. Even though consensus is not easy, there are methods you can use to maintain consensus:

- Actively involve a broad range of watershed interests and residents in planning and implementing the watershed management effort;
- Ensure each interest has the opportunity and responsibility for meaningful contributions;
- Document, publicize, and celebrate the successes through an ongoing recognition program;
- Designate an effective and respected committee leader who can maintain the activities of the committee;
- Make sure activities are exciting and fun to maintain interest and commitment;
- Identify and manage conflicts early in the process.

Consensus may not happen easily or quickly. Very often it is a tedious and laborious process.

Consensus may not happen easily or quickly. Very often, it is a tedious and laborious process. Some people may dismiss it as inconvenient. Others may resist making the required honest investment of disclosing self-interests. Some do not have the patience and openness needed in making sincere efforts to understand the interests of others.

Consensus may be regarded by some as a threat to authority, position, status, principles, and to themselves, particularly if they have previously enjoyed controlling the decision making process. Nonetheless, consensus building is essential for achieving internal team unity. The advantages far outweigh the disadvantages. With consensus, each member of the committee can realize a sense of equity and ownership. [11]

Finally, it is important to remember that the Watershed Management Committee has a relationship to members of the watershed, including governmental members. How that relationship develops depends upon the

role the committee decides to take. They are the decision makers for the contents of the watershed plan, given the parameters of the law and funding guidelines. Pick committee members wisely based on representation and willingness to participate.

Definition: *Through a collaborative process, participants learn to identify shared problems within the watershed, and start defining possible solutions.*

The watershed characterization report is wholly descriptive. Analysis is not necessary. This chapter discusses how to synthesize the report into a useful watershed assessment which allows the watershed committee to focus their attention on particular areas of the watershed.

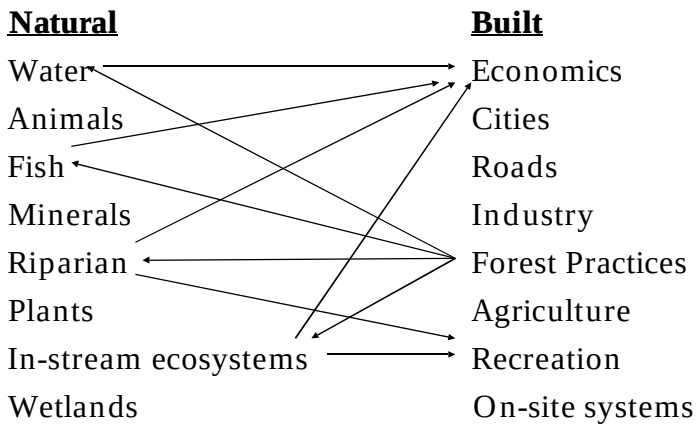
The distinction between characterization and assessment is one of intent. The characterization is a description of an area of land; an assessment is a diagnosis of problems found there, based on information found in the characterization report. It is not uncommon to combine the two efforts under one report. However, for the purpose of discussing the method of assessment, this handbook delineates the two into separate tasks. Technical experts usually perform both.

In Washington State, a watershed analysis is performed on forestlands as part of a forest practices plan. Based on a biological and physical inventory, watershed analysis is a collaborative process involving resource scientists and managers representing landowners, agencies, tribes, and other interested public. It is a diagnostic process involving the gathering of information and interpretation of resource conditions and sensitivities at a watershed scale. This chapter encompasses the scope of a watershed analysis, but goes beyond just that by incorporating both human and natural inputs.

Synthesizing Information

There is an art to synthesizing information into a succinct, coherent statement. The first step is to set aside, for now, previous perceptions of your view of the watershed. Do not throw them away, but be willing to set them aside during this critical juncture. Synthesis is somewhat like a filter funnel. Many ingredients go in the wide end and get sifted, filtered, and sorted. The watershed assessment comes out the narrow end. Understanding the relationships of the different ingredients, how to put them together, to see the connections between one and the other is not always easy, but there are methods that can help.

One method is to list the watershed features next to each other. This helps in visually bringing together the information gathered in the characterization, and to determine whether the land use activities (the built environment) are causing the watershed to be degraded. The land (the natural environment) and the built environment are linked together by a series of actions and reactions.



For example, forest practices impact forests, riparian zones, in-stream ecosystems, fish, and water, which in turn impact economics, recreation, etc. By drawing lines between the land use activities and the known impacts on the natural environment, you can determine the activity that contributes to watershed degradation.

Start this process by asking a series of questions about the watershed based on the characterization report: [12]

- What are the impacts or potential impacts to the watershed caused by land use activities?
- Which areas are particularly sensitive to the surrounding land uses?
- What pollutants do land use activities generate?
- Which pollutants are likely to reach a body of water, and why?

These questions, and more, are answered with empirical evidence found in the characterization report. Answering them leads directly to an assessment of watershed problems, and a problem statement that the watershed management committee will use to develop goals, objectives, and problem solving solutions.

Another way to synthesize information is to use Geographic Information Systems (GIS). GIS is a computer system capable of holding and using information relating to geographic areas. For example, suppose you need to know what percent of the watershed land base is agriculture and how many stream miles are within agricultural lands. The data is stored in different layers. When they are combined, the question can be answered. The computer processes the information arithmetically. GIS can answer questions about location, condition, trends, patterns, and predictions. However, using GIS to answer questions about the future—such as what will happen when forest land is converted to residential land—is still in its infancy.

GIS is not simply a computer system for making maps, although it can create maps at different scales, different perspectives, and with different

colors. GIS is an analytical tool which allows you to synthesize and identify the relationship between layers.

Watershed Assessment

Once synthesis is complete, an assessment is developed. An assessment is a statement about the known conditions of your watershed. Through the synthesis process, you can get specific information about:

- known areas of soil or streamside erosion
- pollution of water
- changes in stream flow
- loss of habitat
- the number of salmon spawning in a particular river system.

The watershed assessment allows you to understand the reasons for these problems. The fact they occur is found in the characterization report. How do you find out how one system affects another? Ask direct specific questions:

1. Why is this particular streamside eroding.?
2. What are the probable sources of water pollution at this site?
3. Why is the flow in the river or stream reduced?
4. For what reasons are we losing important ecological habitat?
5. Why are fewer salmon returning to spawn than three years ago?

Answering these questions are statements about where the problems within the watershed originate, and specific problems that need to be addressed. It also allows you to identify probable sources of pollution. Some of these may include:

1. agriculture
2. forestry
3. stormwater runoff
4. household hazardous waste
5. recreation
6. onsite sewer systems
7. construction
8. mining
9. grazing
10. industry
11. marinas

There may be others, but these capture most of the sources of pollution disrupting watershed processes. These are also the probable sources of pollution that will need source control actions.

The art of synthesis and assessment is difficult, but going through the process can yield a set of problem statements, which can help the Watershed Management Committee determine watershed goals and objectives. This is a logical step in the planning process, one that everyone needs to agree on. Watershed problems may impact several members of the committee, but if this stage of the process is done without pointing fingers and disenfranchising committee members, then enormous strides can be made.

CHAPTER 5. Developing Goals and Objectives

Definition: *Goals and objectives are derived from the Watershed Management Committee's collaborated expression of a mission statement. A goal is a general expression of destiny. Objectives are quantitative expressions of a condition that should exist following the completion of a project.*

The goal statement is the most important statement in the watershed planning process. Without a well-defined goal statement, your plan has no direction, with no desired outcome. The goal can also be the most difficult element of your plan to accomplish. The goal needs to be an agreed-upon statement from all the interests sitting at the watershed management table. Some of the goals that watershed planning can help fulfill are:

- Meeting water quality standards
- Controlling recurring floods
- protecting groundwater
- enhancing water resources
- Controlling stormwater runoff
- determining Total Maximum Daily Loads (TMDLs)

The goal statement is the most important statement in the watershed planning process. Without a well-defined goal statement, your plan has no direction, with no desired outcome.

Getting to one overriding desire or outcome is time consuming and often frustrating. Because a goal statement reflects personal values, this area can cause conflicts during the watershed planning process. The second section of this chapter will deal with managing them.

Goals and Objectives

There is a lot of confusion between the definitions of goals and objectives. The following are standard planning definitions that will help you understand the differences:

Goal - A general expression of destiny that is not immediately translatable into action. The goal is an ultimate, given the best-of-all-worlds statement that expresses an overall mission to be worked toward.

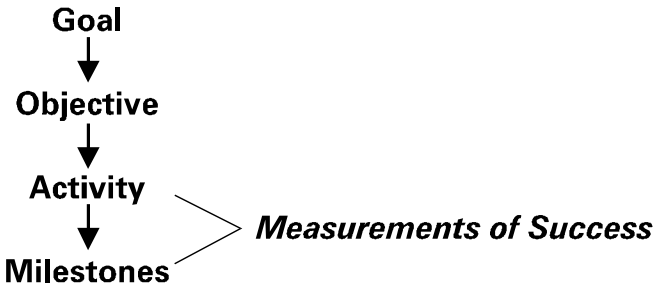
Objective - A quantitative expression of a condition which should exist following the completion of a program or project. An objective represents movement toward fulfillment of a goal. It is a specific way to achieve a goal. There can be more than one objective to fulfill a goal.

Strategy or Activities - These are action statements that call for the mobilization of resources toward a specific end. Strategies directly involve persons, money, material, and other resources in the development of a program or project.

Tasks or Milestones - These are the day-to-day, time-sequenced, order of events involved in the development and implementation of a strategy.

In the flow of your planning strategy, the outline should look something like this:

A carefully defined set of goals and objectives helps you determine where



you are going, what the value is of getting there, and the probability of success. Without a clearly defined set of goals and objectives, you take potluck with the outcome. When you work with a Watershed Management Committee to develop a goal statement, start by having the committee develop a single value outcome for the watershed. Then:

1. Determine the price of achieving it;
2. Make the commitment to pay the price;
3. Figure out how to fulfill your commitment and make the commitment to do so.

This is the watershed planning process.

Here are some sample goal statements developed by Watershed Management Committees throughout Washington State:

The Padilla Bay/Bay View Watershed Management Committee developed an overriding goal and objectives to address nonpoint pollution sources identified within the watershed. The number one goal was to have clean water and prevent further degradation. In addition, the committee felt that achieving this required cooperation between watershed residents and implementing agencies. This cooperation, along with respect of private property rights by implementing agencies, would be the best way to reach the goal of clean water.

Reduce pollutant loading from nonpoint sources of pollution, and prevent new sources from being created, enhance water quality and protect beneficial uses within the Padilla Bay/Bay View Watershed.

Bay/Bay View Watershed Nonpoint Action Plan, April 1995

The Dungeness Watershed Management Committee listed several major goals, each of which had several objectives, and each of those had any number of actions.

Encourage interagency cooperation, coordination, and management among different levels of government—tribal, federal, state, and local—to protect water quality.

Goal #4, Dungeness River Area Watershed Management Plan,October 1993

During the development of the Chewelah Creek Plan, it became clear that the creek and its tributaries are an important part of the City of Chewelah and the surrounding area. It was apparent that many watershed residents preferred local solutions as opposed to solutions to problems being developed outside the area.

Allow for the wise use of Chewelah Creek and its tributaries in the present so that acceptable stream conditions exist in the future.

Chewelah Creek Watershed Management Plan, June 1994

For the committee, acceptable stream conditions means at least meeting water quality standards for swimmable and drinkable water.

The Yakima Watershed Management Committee decided to give priority to protecting relatively undegraded basins instead of restoring those that needed attention.

The mission of the Yakima River Basin Water Quality Plan is to maintain, restore, or enhance the quality of the Yakima River Basin's surface and ground water for designated and desired uses for the present and future.

Yakima River Basin Water Quality Plan, March 1993

As is evident, goal statements reflect the desired outcome of the committee. The outcome is stated as a vision for the future achievable through an active set of objectives and actions. Establishing a single goal for the watershed is worth the time and philosophical conflicts that will probably ensue.

Decision-Making Without Conflicts

There are numerous methods for dealing with conflicts. Watershed conflict resolution has particularly received attention as a venue for solving local land use problems. Nearly every writer on the topic identifies one key item that is important to understand about conflict: it is normal. Lyle Raymond from Cornell Cooperative Extension says conflicts are generated by differences in values, stakes, interests, availability of information, and perceived roles among affected parties. He also states that the outcome need not be negative. [13]

Professional mediator Rosalind Diamond makes the case that we ought to welcome conflict when it occurs. She says conflict is not bad or disagreeable; rather it is an inherent part of our human condition, and it is full of creative potential.[14] She says each individual is distinct and unique, and it is the individual differences and experiences that are viewed as threatening and wrong.

Understanding differences and resolving conflicts can open people to a deeper understanding of themselves and of the others with whom they disagree. Diamond claims conflict resolution can lead to creative breakthroughs in problem solving.

The pamphlet, "Managing Conflict: a guide for watershed partnerships," provides five steps that can be taken to resolve conflicts. [15]

1. Analyze the conflict;
2. Determine management strategy;
3. Prenegotiate a resolution by laying a foundation for all parties to feel safe;
4. Allow each party to air their interests rather than their position;
5. Post-negotiate resolution through an active implementation process.

Healthy conflict can lead to growth and innovation, new ways of thinking, and additional management options

As a result, conflict resolution can be healthy if managed properly. Healthy conflict can lead to growth and innovation, new ways of thinking, and additional management options.

There are many ways to deal with conflict and many successful models to choose from. In some cases, the watershed planning staff have had the skills necessary to bring a group to consensus. In other cases, professional mediators have been hired to help a group resolve conflict. In either case, the person has had enough training to know how to deal with contentious issues that arise during conflict resolution, and enough skills to wind their way around the conflict resolution process.

Conflicts will arise, but the message is let them, and don't try to minimize a person's interest. Remember, each person is unique and distinct, and the differences can lead to creative solutions. Be patient and persistent in your conflict resolution efforts.

Chapter 6. Brainstorming Alternatives and Decision Making

Definition: *Brainstorming is the collective expression of creative problem solving*

Once problems are agreed upon and problem statements are developed, the next step is to develop a list of problem-solving alternatives. Many Watershed Management Committees use professional facilitators to help them in decision making. In some cases, agency staff lead the process after taking training in facilitation. However you decide to go, it is imperative that all voices are equally heard during this critical time in the watershed planning process. Everyone needs ownership over decisions, not just a few "prominent" committee members.

There are several methods for helping committees decide on solutions. Probably the most successful is to develop a list of criteria that will be used to help make decisions, then brainstorm alternatives, and finally select the best alternatives using collaborative negotiations, consensus, or Robert's Rules of Order.

Developing Criteria

Criteria should reflect both the interests of the Watershed Management Committee and the ability to solve a problem. Criteria should be developed early in the problem-solving stage, because they helps focus the choices. There are two kinds of criteria: a set of general criteria used for overall non-specific solutions; and specific criteria used for solving specific problems.[16,17]

Specific Criteria	Descriptive Question
■ Cost	How much is the action? If dollars are limited, then actions that need extra money are not viable.
■ Cost effectiveness	Will the cost exceed the value of the problem?
■ Technical feasibility	Technically, will the solution work?
■ Political feasibility	How much support would you get from the implementing, regulatory and jurisdictional agencies?
■ Practicality	How practical is the action? Is it a proven approach?
■ Acceptability	Is the action socially or politically acceptable?

■ Timeliness	Are there any specific time constraints when something has to get done?
■ Ease of implementation	Is the action easily implementable? Are there major roadblocks to imple mentation?

General Criteria	Descriptive Question
■ Sustainability	How self-sustaining is the project/pro gram? Does it require long-term support?
■ Human resources t	Are there enough specialists, volun eers, or able bodies in the watershed to help with implementation activities?
■ General resources	What facilities and space are available?
■ Agency policy	Does the project fit policies and constraints of implementing agencies.
■ Culture	What is the culture of the watershed? How well will the action serve to change polluting practices?

These are just examples of criteria for decision making. Ultimately, the Watershed Management Committee should determine their own with all in agreement. The following are sample criteria developed by Watershed Management Committees in Washington State:

The Chewelah Creek Watershed Management Committee was very clear in stating:

> **...that their responsibility was to propose voluntary actions, as opposed to demanding certain actions be taken.**
> *Chewelah Creek Watershed Management Plan, p. 42*

The Tenmile Creek Watershed Management Committee chose to accept the criteria outlined in Chapter 400-12-600(2)(b) of the Washington Administrative Code. Their criteria included:

- **technical feasibility**
- **legality**
- **ability to achieve and maintain or improve water quality**
- **ability to restore and maintain beneficial uses**
- **effects or potential effects on groundwater quality**
- **ability to control source of nonpoint pollution**
- **consistency with local comprehensive plans and other state, federal, or tribal water quality management plans, programs, or rules**

Tenmile Creek Watershed Plan, p. 38

Developing criteria is an important first step on the road to decision making. Make sure all committee members' concerns and issues are heard, and all ideas surface. Once that happens, then jointly decide what criteria are important. A coherent set of criteria will save time and resources.

Brainstorming

Once criteria are agreed upon, the next step is to brainstorm ideas to solve the problems. This step is extremely creative, and no ideas should be excluded, at least not yet. At this stage, start with one problem at a time and ask committee members to develop their ideas. There are two ways to go about this process. First, have each committee member develop their ideas for brainstorming at home and submit them to the planning staff. Staff can then compile the list and take them to the next meeting for application of the criteria. For shy committee members, this process works well.

The second method is to develop ideas while everyone is sitting together around a table. Ideas are spoken and recorded on paper. The ideas are not discussed at this time. The benefit of this method is that creative minds can feed off each other. One idea can spawn an even greater idea. There is also the sense of community involvement and ownership over what is being said and expressed as creative problem-solving.

Remember, do not disregard any idea, and do not analyze it at this juncture. Choosing actions will happen when the ideas are applied to the criteria.

One idea can spawn an even greater idea. There is also the sense of community involvement and ownership over what is being said and expressed as creative problem solving.

Applying Criteria to the Brainstorming List

The process of applying decision-making criteria to a list of brainstorming ideas is analytical. This may be the most objective part of the process; yet this step still needs subjective judgement. There is no magic formula for the application process, but there are some systems that have been applied with success. Here is one that has worked fairly well with locally developed watershed plans.

Once actions appropriate to the watershed are identified, an analysis is used to compare and prioritize them. The matrix style is the easiest to use. Each criterion is given a weighted score, say between 1 and 3. The committee should decide which criteria are least important (1), and the most important (3). The committee also gives each action a rating, say between 1 and 5, where 5 is the score for the best possible action to solve a problem, and 1 is given to an action least likely to solve a problem. The rating times the weighted criteria equals the score for that action. The final score lets the committee know what are the highest priority actions, and which actions are low priority.

ACTIONS	RATING CRITERIA												
	Tecnically Feasible			Cost Effective			Timely			Publicly Acceptable			
	Rating	Wt.	Score	Rating	Wt.	Score	Rating	Wt.	Score	Rating	Wt.	Score	
Stream Fencing													
Education													
Aquire Land													
Riparian Restoration													

This is a fairly objective means of applying criteria and prioritizing actions. Unless the committee can decide through consensus on how to do both, this is the most expedient way of deciding which actions are important and implementable, and which are not. Even though this method has a tone of rigidity, its basis is the subjective brainstorming of all committee members. This method allows the committee to work together and to collectively make decisions.

Determining actions and prioritizing them for implementation is an important element of the watershed planning process. Brainstorming allows the committee to collectively create the most appropriate solutions to watershed problems. By integrating subjective solutions with an objective model of decision making, hopefully most, if not all, issues and concerns about implementation activities can be addressed.

Chapter 7. Strategy - the Key to Success

Definition: *Strategy is the culmination of actions that call for the imminent mobilization of resources toward a specific end. They involve persons, money, material, and other resources in the development of a program or project.*

Strategic planning is a process that begins with a perceived need and ends with implementing recommended actions. This chapter identifies ways to develop a strategy to achieve a desired end. Thus, strategy is a process to put actions into place.

One way to get there is to ask yourself three simple questions:

- Where are we now?
- Where do we want to be?
- How do we get there?

The process outlined thus far in this guidebook has helped answer the first two questions. The characterization report and problem assessment have told you where you are in terms of watershed protection. All the work the committees have done and the resultant goals and objectives have told you where you want to be. This chapter and the next two will give you the tools to get there. The lead agency staff with input and approval from the Watershed Management Committee typically does this work.

Planning Strategy

All the work you have done thus far can be boiled down into the planning strategy. The strategy lists the sequence of actions you will take to solve the problems identified thus far. In the strategy you are calling for the mobilization of resources toward some specific end, in this case the goals and objectives of this plan. Your strategy directly involves persons, money, material, and other resources needed to accomplish the goals for your watershed plan.

There are several ways to set up the strategy chapter in your plan. The basic elements you need are what, who, when, and how much. The specific implementation guidance documents should be developed by the implementing agencies and do not need to be in the watershed plan. However, each agency's program plan ought to be available to the Lead Agency in order to track implementation efforts. That will be covered in the next section of this chapter.

The strategy can take on different looks. It can range from a single page matrix, or be coalesced into a format that encompasses many pages. The following are sample strategies taken from several watershed planning documents. Notice that they all contain the important information identified above:

Example #1 - Lake Chelan Water Quality Plan

This first example comes from the Lake Chelan Water Quality Plan. It shows the matrix style of strategy. All the particulars have been worked out, agencies have agreed to implement, and projected costs have been developed. There were numerous other entries, and some of the entries shown have been modified in content, but the basic matrix was all that was needed to show the strategy.

Agency/Implementation Activity	Time Period	Estimated Project Cost (1991) *(thousands)*	Potential Funding Source	Grant/Loan Funds *(thousands)*
Chelan County				
☐ Prepare Stormwater Management Plan	1992-5	$150	State and County	$75
Lake Chelan Reclamation District				
☐ Extend sewers past Willow Point	1993-4	$1,390	State	$1,425
Chelan Conservation District				
☐ Conduct Agricultural Drain Monitoring	1992	$ 75	State	$60
☐ Prepare farm plans	1992-3		State	$20

Lake Chelan Water Quality Plan, December 1991

In prior chapters, we saw Watershed Management Committees develop complete problem statements and choose specific solutions. Detailed descriptions of each recommendation were included in the plan. Afterwards, it was up to each implementing agency to work out the final details, including costs, staffing, and timeline.

Example #2 - Nookachamps Watershed Action Plan

The Nookachamps Watershed Action planners took a different approach in developing their planning strategy. They listed each source category and in priority order described the chosen alternative with detailed information. In the plan it looked like this:

AGRICULTURAL PRACTICES SOURCE CONTROL PROGRAMS

#1 - Inventories/BMPs on Commercial Farming Operations

For each recommendation, the following information was filled out.

Recommendation:
Lead implementing entity:
Additional participating agencies:
Estimated cost:
Source of funding:

Here is the actual write up:

#2 - Inventories/BMPs for Small Non-Commercial Farming Operations

Recommendation:

The Skagit Conservation District should inventory small non-commercial farms in the Nookachamps Watershed every 5 years. This inventory will prioritize farms in regards to their impact to water quality, identify specific BMPs needed for improvement, and identify waste utilization capacity. The Skagit Conservation District should secure funding to provide staff which could effectively provide technical assistance to small non-commercial farm operators for installing **BMPs** for improving water quality.

Lead Implementing Entity: Skagit Conservation District

Additional Participating Entities: None required

Estimated Cost:

Source of funding: The Centennial Clean Water Fund with 75 % coming from the Washington State Department of Ecology and 25 % coming from local match. Eligible categories of the Centennial Fund could include Nonpoint, Discretionary, Conservation Commission or CWA Section 319 funds.

0.4 FTE per year	$17,028
Mileage/Travel per year	$ 2,400
Miscellaneous expenses per year	$ 600
Annual report	$ 475
Total	$20,503 per year

This is a fairly detailed approach in describing the recommendations. The way this planning strategy was laid out left little room for interpretation. The committee knew what they wanted and prompted staff to find out the costs and funding sources for each action.

Example #3 - Ludlow Watershed Action Plan

The Ludlow Watershed Action planners had an interesting way of developing their strategy. For each source category of nonpoint pollution, recommendations were listed in priority order. The strategy itself was about 70 pages, so it did not afford the reader a birds-eye view of the plan. However, it was very detailed and gave implementing agencies sufficient information to make decisions on whether to agree to implement or not.

The outline they used was:

Recommendation number:
Nonpoint source:
Location:
Ludlow Watershed Management Committee priority: high, medium, low
Problem definition:
Watershed benefits:
Implementing agency estimated costs:
Estimated schedule:
Status:

Like the Nookachamps Watershed Action Plan, this approach was extremely detailed. There was no room for guessing the intent or the justification for choosing the action. Although justification statements should have occurred in the brainstorming and action selection process, the committee thought it important to list both the problem and the benefit in solving the problem.

Determining Costs

Every implementation action should have a time frame, a concurring agency or group, and total costs. A number of items need to be considered when determining the total costs. Some take time and this shows up in salaries. In addition, time, travel, and other expenses need to be accounted for with regard to the following steps:[18]

- Investigate your site.
- Define action goal.
- Develop action task list and outline.
- Identify project partners.
- Design project.
- Obtain permits or site access (if necessary).
- Develop project work schedule and time line.
- Develop monitoring plan.
- Develop project management and maintenance plan.
- Order materials and supplies.
- Determine number of volunteers/laborers needed.
- Prepare site for restoration project and volunteers.
- Arrange tools and supplies.

- Train volunteers/laborers.
- Implement project.
- Follow monitoring, management, and maintenance plan.
- Evaluate results.

Once these items are listed and elements of each are determined, number of shovels, transportation to the site, number of hours to complete, etc., you can start placing costs on each. The following outline can be used to help determine costs:

Budget Summary

Project Items

Salaries and Wages.....$/month X 12 months.....$
Benefits.....Salary or Wage X 25%.....$
Personal services contract.....by contract.....$
Goods and services.....$
  supplies.....estimated.....$
  materials.....estimated.....$
  postage.....estimated.....$
  printing.....estimated.....$
  reproduction.....estimated.....$
  maintenance.....estimated.....$
Travel.....miles x .31.....$
Capital costs.....expensive equipment.....$
  hardware.....$
  software.....$
Tools.....inexpensive equipment.....$
Training.....$
  conference.....$
  workshops.....$
  tuition.....$
Overhead.....(15% of salaries and benefits).....$
Total Project Cost.....$

Proposed Revenue Source

Grants.....$
Fund Raising.....$
Direct Support from Agency.....$
Subscriptions.....$
Other.....$

It is important to know where your money is coming from. The proposed revenue should equal the cost of implementation. If you cannot raise the revenue, cut down on implementation activities.

Implementation Strategy

Implementing the action plan involves more than completing the recommendations. It is the process of translating strategic plans and policies into action. A few strategic steps can ensure that implementation happens successfully.

The implementation strategy is different than the planning strategy in that this calls for the completion, reporting, and feedback of actual on-the-ground implementation activity. The most perfect planning process and strategy are virtually worthless unless they are implemented successfully. The best planners discover that setting goals, objectives, timelines, and deliverables, and formulating a planning strategy are one thing; but making those strategies work to achieve goals and objectives is another.[19]

Every implementation action should have a time frame, a concurring agency or group, and total costs.

Before implementing the plan, decide what kind of monitoring needs to be done apart from water quality monitoring. Some of this will be discussed in the next chapter. Part of the implementation strategy will be to determine reporting requirements, evaluation, and feedback. One of the things that keeps a plan on track is regular monitoring of project progress and watershed improvements. When done correctly, this provides a strong basis for keeping people informed, maintaining interest, and making course corrections if necessary. Some of the items you may need to think about are:

- Who should evaluate the projects?
- How often should monitoring, evaluation, and feedback be given?
- Who receives feedback?
- What kind of feedback report is needed?
- Are feedback meetings a good idea? If so where and when should they happen?

Since each watershed plan and process are different, the feedback mechanisms will be different also. However, it is an important element to consider during this phase of the process. In addition, all implementing entities should be aware of the feedback requirement, and agree to participate. Make this a part of the agency implementation agreement.

In developing the implementation strategy, be sure to:

- Give each implementing agency a description of the actions they have agreed to implement;
- Develop some type of coordination process;
- Develop a dispute resolution process in the event the implementing agency does not implement their action;

- Schedule annual milestones for all source control programs;
- Involve the public;
- Help analyze existing funding sources and be prepared to solicit funds from granting and other organizations;
- Plan to evaluate the effectiveness of implementation activities.

Once these basic elements are developed and put into place, make a wall size chart, or any other data management system that works for you, in which you can list each action as a calendar event. This will allow you to see when actions have been implemented, when they are due to be implemented, and the category the action belongs to. That is important to know, especially when you prepare an evaluation report. The calendar can take on many different forms, but the basic idea is this:

AI - Conservation District meets with producers

A2 - Natural Resource Conservation District begins developing farm plans

SI - City of_____ convenes stormwater management committee

EI - Cooperative Extension writes first newsletter

E2 - Cooperative Extension holds first public meeting

E3 - _____ County Adopt-a-Stream holds first meeting

Phase I													Phase 11	
Source Control Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Agriculture	A1				A2									
Stormwater						S1								
Public Education		E1		E2					E3					

This is not unlike what your planning strategy spreadsheet would look like, and is something that can be updated and given to anyone upon request. This type of calendar can also be given to the implementing agency as a gentle prod and reminder that an activity they agreed to implement is nearly due.

Implementing Agency Concurrence

An important step in the implementation strategy is to negotiate an action with the potential implementing agency, and then solicit a letter of concurrence from them. During the planning process, each potential implementing agency should either be part of the process, or be kept apprised of issues that may involve them. A request for concurrence should at least be in the form of a letter, but the lead agency has the option of using a more formal legal instrument such as a memorandum of understanding. An im-

portant consideration is the time required to obtain the statement of concurrence, relative to the implementation timelines contained in the watershed plan.

The statement of concurrence should clearly state a commitment to specific actions, and should be signed by somebody with authority to commit dollars or staff. It is very important that a watershed plan contain implementation strategy details. A high level of detail in the plan should make it easier to obtain statements of concurrence.

The concurrence letter should contain:

- Statement of agreement
- Specific actions to be taken
- Reference to the plan action or recommendation number
- Responsible parties within the organization who will carry out the action
- Timeline for completion of actions.

The statement of concurrence should be a firm, detailed document which commits the implementing entity to carry out the activities it is charged with, subject to adequate funding being available. However, the implementing entity may submit letters of nonconcurrence indicating suggested revisions to those sections requiring their involvement. If, through the dispute resolution process, concurrence with an action is not granted, then that action ought to be taken out of the plan, or placed in a chapter usually titled "Unfinished Agenda." That is a place where issues are revisited for future consideration.

The need for developing coherent planning and implementation strategy cannot be emphasized enough. Without strategy, you take pot shots at solving a problem, even with the most well-intentioned efforts. You have been given several different models on how strategy can be displayed, but you need to be comfortable with your own. However you decide, make sure it contains useful information, mainly what, who, when, and how much. Other information is optional.

Chapter 8. Monitoring the Watershed

Compiled by Randy Coots

Definition: *Monitoring is the process of gathering data for determining baseline water quality conditions and for determining the outcomes of recommended actions.*

Water quality monitoring is an integral part of the watershed planning process. Watershed Management Committees will need data as a tool to guide them through the evaluation process, to see if desired water quality improvements have resulted from recommended actions.

Water quality monitoring has traditionally meant collecting water samples and having them analyzed at a lab. The focus of this chapter is on traditional methods of water quality monitoring. Biological and physical assessment methods can also be used alone or in conjunction with water sampling, as a way to evaluate the quality of streams. These methods, which will be briefly discussed, are qualitative, but they offer valuable information on cumulative impacts on water quality and may be less costly than lab analysis.

Water Quality Monitoring Plan and Design

Planning A Watershed Monitoring Project

The purpose for collecting data may be to:

- identify pollutant types and sources for control actions
- assess the success of pollutant controls
- detect long-term trends
- measure compliance with ambient standards
- provide a summary of average or extreme conditions or
- establish baseline data for future reference.

There is no one design that can fulfill all of these purposes. Therefore time must be taken to carefully design a system of monitoring stations that will answer the most important questions. The following is a list of steps that should be addressed when undertaking any monitoring program:

1. Develop a problem statement. For example:
   High levels of fecal coliform, nutrients, and sediment are routinely found in streams draining the Survey Creek watershed. The major contributor to the elevated concentrations is suspected to be poor agricultural practices.

2. Clearly define project objectives. The more specific the objectives, the better chance they have of being met. For example:
    - Determine fecal coliform, nutrients, TSS, temperature, and conductivity values on stream reaches above and below the major impact areas.
    - Determine the number of water quality criteria exceedances for each variable from impact areas.
    - Relate the exceedances to impairment of beneficial uses under state water quality standards.
3. Define geographic area of interest. For example:
    - estuary
    - stream reach or
    - watershed.

Clearly define project objectives. The more specific the objectives, the better chance they have of being met.

4. Collect available background information on the physical characteristics of the study area. For example:
    - land use
    - soils
    - topography
    - vegetation
    - weather patterns and
    - other information that might help in the monitoring design or interpretation of data.
5. Examine existing water quality data, or where data is unavailable, conduct preliminary sampling to obtain information on possible concentration ranges and variability.
6. Develop a sampling design that provides representative data from the study area. Define:
    - the types and number of samples to be collected
    - the sampling frequency and station locations and
    - field measurements and collection procedures to meet project objectives.
7. Develop a quality assurance plan.
    - See the Quality Assurance/Quality Control Section on the following page.
8. Conduct the monitoring according to established protocols and the quality assurance plan.
9. Summarize relevant information.
10. Prepare a water quality assessment report summarizing steps 1 through 9 above, including an evaluation of whether objectives have been met.

Regardless of who is selected to develop and implement the monitoring plan, experience in conducting water quality monitoring programs, expertise in the area of environmental science, and management and logistic capabilities should be prerequisites in selecting the person to develop and implement the monitoring plan.

Quality Assurance/Quality Control

Quality assurance (QA) involves all aspects of sample collection, analysis, data management, and reporting with the purpose of producing reliable and accurate data. QA is achieved by developing and following a project-specific QA plan. Quality control (QC) is specific to the measurement process and involves analysis of special samples that enable the project manager to assess the quality of the data. Some examples of QC samples:

- replicates
- splits
- spikes
- blanks.

QA is especially important in water quality sampling because of the reliance on few samples to evaluate a complex system. You must write a QA plan before sampling begins. Anyone interested in developing an appropriate QA plan should read Washington State Department of Ecology Publication #91-016 (1991, rev. 1999) *Guidance and Specifications for Preparing Quality Assurance Project Plans.*

Designing a Water Quality Assessment Project

There are many issues to deal with when developing a water quality monitoring design. One major issue is defining the problem. You must first complete the first four steps listed under "Planning A Watershed Monitoring Project" before sampling can begin (i.e., developing a problem statement, defining objectives, defining areas of interest, and collecting available background information). This will help to clearly define the problem related to the project objectives. Otherwise the collected data may not be useful in addressing the problems.

Once problems are identified, you should develop a set of specific objectives for the sampling program and prioritize them based on the resources available. Afterwards, the sampling design can be developed.

Sampling designs must provide answers to four fundamental questions:

- What to sample?
- Where to sample?
- When to sample?
- How many samples?

The answer to the first question, "What to sample?" is a list of parameters you will measure based on the problem statement and specific objectives. You should measure the conventional parameters even with the most basic of watershed monitoring projects. For example:

- temperature
- pH
- conductivity
- dissolved oxygen

In addition to the typical conventional parameters are the parameters based on the specific objectives of the project. For example, an agricultural problem may need data on:

- fecal coliform
- nutrients
- TSS (total suspended solids), and
- BOD (biological oxygen demand)

whereas, a toxic problem from an industrial discharge may require results from:

- priority pollutant sediments
- hardness
- total organic carbon
- grain size, and
- percent solids.

Ideally, the when, the where, and the how many samples to collect would also be based on meeting the program objectives. However, they are often affected by the size of budget, personnel availability, and other logistics.

There are a number of points to consider in this aspect of a program: spatial and temporal variability of the parameters of interest; hydrologic conditions; and other physical variables that might affect the results. An in-depth discussion of these issues is beyond the scope of this document. The following subsections list some of the considerations for designing a water quality monitoring project.

Planners interested in developing a monitoring project should review Ecology Publication #95-307 Guidelines for Conducting Water Quality Assessments and Watershed Characterizations Under the Nonpoint Rule (Chapter 400-12 WAC); and Ecology Publication #91-078 Technical Guidance for Assessing the Quality of Aquatic Environments. These documents discuss technical methods for conducting water quality studies. The manuals also describe survey planning, study design, report writing, and data management, as well as assessment techniques for water, biota, sediment and the riparian corridor. In addition, the manuals provide an annotated bibliography and extensive reference section of water quality related publications.

Field Survey Design

Once the goals and objectives of the program have been set, designing an appropriate monitoring scheme can begin. Listed below are some general guidelines for designing a water quality monitoring program:

Establish your resource limits:

- Budget
- Equipment
- Staff (Who can help? What are their levels of experience? When are they available?)
- Field time (Ranging from the length of a survey day, to length of daylight hours, to the seasonal period of critical conditions.)

Set the physical boundaries of the study area:

- Try to clearly isolate as many sources as possible. Try to keep the "unknown source" category as small as possible.
- Define the upstream limit of the study area by establishing a control station. The site should have fully mixed water quality outside the influence of target sources.
- Define the limits on source identification depending on the objectives. For tributaries either put a site at the mouth, or one at the mouth and one upstream at a control station above the area of impacts. Nonpoint sources can be defined by careful station placement. Instream inputs (like sediments, algae, macrophytes, bacteria, and aquatic biota) which cause changes in water quality can be measured or estimated.
- Define the downstream limit where your measurements and data analyses end.

Establish data capabilities:

- Previous studies in similar watersheds provide a way of estimating variability of data. With the resources available, will the sampling design detect a change in water quality? A statistical method called power analysis (Cohen, 1988) enables calculating the number of samples needed to detect a specific interval water quality change, based on the variability in the data.
- Which element of your analysis has the greatest degree of error? Does the level of precision you want for other elements make sense relative to this margin of error? For example, if you wanted to determine mean monthly phosphorus loading, it would not make sense to measure discharge by timing a stick floating downstream, and then request a low level phosphorus analysis.

Mass balance:

- Calculations should be used for evaluating pollutant sources, transport mechanisms, and sinks (e.g., a water balance equation):

$$q_{\text{inflow}} + q_{\text{tributary}} - q_{\text{evaporation}} - q_{\text{diversion}} \pm q_{\text{groundwater}} = q_{\text{outflow}}$$

- The design of a survey should ensure mass balance data are available. Usually mass balance calculations are set up for several parameters. You first start with the water balance, and then you proceed to a conservative parameter balance (e.g., chlorides or solids), and finally to the more complex parameters (e.g., metals or nutrients) balance.

How are contaminants transported:

- The investigator must have a clear understanding of probable transport mechanisms and sinks for a particular contaminant to place sampling stations, make parameter lists, and decide which media to collect. For example, for several toxic substances it is important to sample suspended sediment and organic carbon concentrations to accurately estimate the fate of the toxic material. In addition, sediments are often the only medium where some toxicants can be detected.
- The investigator must also be knowledgeable about ancillary parameters necessary to evaluate a contaminant against water quality standards. For example, to evaluate ammonia concentrations against water quality criteria, temperature and pH values are needed. For comparison of some metals against water quality criteria, hardness values are required and sediment analyses need grain size, total organic carbon (TOC), and percent solids.

The station placement and timing of sample collection within the study area are important:

- Sample collection should be scheduled to best characterize the water quality problem. Specifically, the critical period needs to be defined. For example, nonpoint source impacts may be related to wet weather or storm events, agricultural activities, or construction schedules. Seasonal sampling designs are useful when a study area has a mix of point and nonpoint source impacts. With seasonal designs, samples collected during different periods can address different types of problems.
- There are several sampling designs to choose from once the general sampling period is established. A routine sampling schedule (same site at same time of day, at set intervals) may be appropriate for basic water quality characterization or long-term trends. A random sampling schedule can address station variability, but may not be effective in describing critical events.

- The investigator needs to decide how samples will be collected over the survey period. Grab, continuous, composite, and sequential sampling methods have all been used. However, grab samples are the most common. They are normally hand dipped and can usually be collected quickly, with minimal equipment and processing needs.
- Continuous monitoring using data-logging and probes is usually limited to a few parameters, (e.g., discharge, temperature, pH, dissolved oxygen (D.O.), and conductivity).
- Automatic composite and sequential samplers can be used to monitor parameters that once collected, are stable over the sampling period. Both types of samplers can be set to collect on a time interval or flow-paced basis. Compositor samples provide good average concentration. Sequential samples can provide excellent information on changes in concentration, especially over a storm event or industrial waste process cycle.

Representative samples:

- It is important to obtain a representative sample from the waterbody. A station located where complete mixing or homogeneous water quality exists will require fewer samples than one located at the intersection of several sources. Conductivity or temperature measurements can be quickly performed as a depth profile and/or transect across a waterbody at a preliminary station location. The depth profile may indicate stratification, so that upper and lower layer sampling may be necessary. The transect may suggest an influence from an unknown upstream source, so that the station must be moved farther downstream, or samples must be taken across the waterbody and averaged together.

Quality Assurance/Quality Control (QA/QC):

- QA/QC procedures must be designed into each survey. The number of QC samples taken is directly related to the level of confidence an investigator wants in the results. There are no hard and fast rules for how many QC samples are enough. One general "rule of thumb" is: 10% to 20%; or a minimum of one blank, one field replicate, and one lab split per sampling day. The level of QC is also dependent upon the parameters analyzed, media sampled, and project budget.

Sediment, Biological and Riparian Surveys

Consider a special study of priority pollutants for initial watershed characterization if such data do not exist and potential sources are present. Priority pollutants are a list of 137 organic compounds and metals considered potentially toxic or carcinogenic. These compounds require careful collection procedures and are expensive to analyze in the laboratory.

Concentrations of many priority pollutant compounds are usually below detection limits in the water column, even when there is a known source affecting water quality. Because these pollutants are typically associated with particulate matter, the best way to measure them is often by analyzing sediment samples. Because they may show the impact of long-term, chronic pollutant doses, sediments should be analyzed as a screen to check for the presence of priority pollutants. Samples should be collected from depositional areas (e.g., pools) below potential sources or at the base of catchment areas.

An analysis of the sediment sample for priority pollutant screening should include the following groups of compounds:

- Acid Extractable Compounds
- Base-Neutral Extractable Compounds
- Pesticides
- Herbicides
- Polychlorinated biphenyls (PCBs)
- Priority Pollutant Metals

The cost of a full priority pollutant scan at detection limits applicable to water quality standards can be very high. It may be appropriate to do a screening for compound groups initially, based on the watershed characteristics and known pollutant sources. If concentrations are acceptable (i.e., below detection, or similar to published concentrations measured at unimpacted sites), sediments need only be sampled occasionally. Results of the screening can focus further analyses at lower detection limits for pollutants that were identified but unquantified in the initial screen. Grain size, total organic carbon (TOC), and percent solids should be measured in each sediment sample to aid in data interpretation.

Biological assessments use insects and other groups of organisms like fish and algae. Evaluations are based on the community of organisms living in the stream. Their abundance and diversity are an indicator of water quality because different species have different tolerances to water pollution.

Riparian corridor assessments use visual observations to evaluate the physical and biological conditions of the water, stream channel, and habitat adjacent to the stream corridor. They provide a method to evaluate the

health of the riparian corridor and in effect the ability of the waterbody to support beneficial uses.

Biological and riparian corridor assessments examine the biological and physical components of freshwater ecosystems that may be important in evaluating habitat condition, trends, and cumulative impacts of pollutants. The use of biological and physical information in an environmental assessment integrates water quality over time and provides an evaluation of existing beneficial uses, while water samples provide information for a more discrete time interval. Guidance on sampling procedures for biological assessments can be found in Ecology Publication #91-078 *Technical Guidance for Assessing the Quality of Aquatic Environments.* Information on the riparian corridor assessment is contained in Ecology Publication 95-307 *Guidance for Conducting Water Quality Assessments and Watershed Characterizations Under the Nonpoint Rule (Chapter 400-12 WAC).*

Chapter 9. Evaluate and revise

Definition: *From the data collected through monitoring, decisions can be made regarding progress toward mission, goals, and objectives.*

Evaluation is an essential ingredient in the watershed planning process. After implementation of recommended actions, you need to determine whether they solved the problems you initially identified, or whether the problems are still getting worse. Evaluating the success of the actions, and ultimately the plan, requires constant attention and coordination with implementing agencies.

Successful restoration takes time and money. Do not expect to see successes in the short term. Some actions will have immediate benefits, but the overall restoration of a watershed's water quality, riparian areas, or functioning wetlands will take years. For an impatient community or legislature who wants success stories and numbers generated quickly, some type of reporting system is essential.

The practice of evaluation helps you determine whether the recommended actions are helping you reach plan goals and objectives.

After the water quality monitoring is complete, the evaluation process begins in earnest. Before that, however, there are several types of information that can be collected to help you determine plan success. They should relate directly to an assessment of the success or failure of action items identified and implemented in the watershed plan. Each method should relate to different action categories of the plan. Action categories of the plan might include education, BMPs, habitat restoration, and increased coordination among resource agencies. Of course, there are others. The practice of evaluation helps you determine whether the recommended actions are helping you reach plan goals and objectives.

Implementation Review Committee

Several watershed planning efforts have created a review process consisting of membership from the original Watershed Management Committee plus other members of the community willing to participate. The review committees oversee implementation of the action plans, evaluate the status and results of the plan's implementation, recommend revisions to the plan as needed, and provide public outreach and participation.

The Padilla Bay/Bayview watershed planners even set up the structure, membership, and responsibilities of the Implementation Review Committee. Some of the major responsibilities included:

- overseeing implementation of the plan
- evaluating the overall effectiveness of the plan
- recommending revisions to the plan

- developing a newsletter to provide information to the watershed community, and
- helping the lead agency compile the annual progress report.

In addition, the planners understood the importance of determining methodology for assessing the relative success of the action plan. Determining the review and evaluation methods you use, and receiving agreement from the committee, are important for the overall review and revision strategy.

Evaluation Methods

Every action must be evaluated to determine whether it worked or did not work to solve the problem it was intended to solve. The three methods that have been used successfully in evaluating plans and actions are public awareness, agency implementation efforts, and long-term water quality assessment:

Public Awareness

This may be the most important type of information gathered in the evaluation process. It may also be the most difficult information to get. Ultimately, the health of a watershed will depend on the actions of the people who live, work, play, or have some special interest there. Major changes in thinking are a measure of success.

There are several ways to measure public interest, awareness, and participation. The most obvious way is to conduct a survey. Measuring the percentage of responses can let you know if the public is getting the message, or if they are even interested in watershed protection. There are also other ways of measuring public interest. Some of these are:

- holding public workshops
- planning tasks that require volunteers
- participation in community organizations, such as Adopt-A-Stream

Public participatory events are good indicators for whether your plan is successful or not. A good point to remember in watershed implementation efforts is that ultimately, the public will be the key since they will be required to implement actions, at some level.

Social issues are difficult to address in a survey. Some local watershed planners have acquired the help of social scientists, community colleges, or universities. However, if you want to find the answer yourself, there are models and efforts that have been successful. For instance, several local watershed planning efforts have determined the extent of public knowledge about their watershed, and have tailored their public education programs based on survey results. Some of the questions include:

1. Can you trace the water you drink from precipitation to tap?
2. Do you know the watershed you live in?

3. What is the land use history of where you live?
4. Can you identify the soil series in your watershed?
5. What is the general quality of water in your watershed?
6. What is nonpoint source pollution? Name the causes of nonpoint pollution in your watershed?

This type of survey question can help you find out if residents have a sense of watershed awareness. Surveys before and after you implement watershed education efforts will be a great measure for evaluating watershed implementation successes.

Agency Implementation Efforts

Each agency or organization responsible for implementing the recommended source control measures should submit a status report to the lead implementing agency. The purpose of the reports is to provide internal audits on how many actions are implemented, actual costs of implementation, parties involved if more than just the implementing agency staff, and when the implementation activity took place. The reports should also identify how many actions have not been implemented and why. These are important to give the watershed planners a feedback mechanism on the watershed planning strategy. If the strategy is not working, the implementation reports will act as an indicator.

This is also a good way to increase coordination efforts. In these times of fiscal constraints, combining efforts can help each agency reach their watershed goals. Reports should have the following type of information:

- agency name
- action agreed to implement
- action implemented
- dates of implementation
- problems encountered
- successes measured

In addition, information about the amount of money spent, dollars needed to complete the work, photographs, slides, names of volunteers and cooperating agencies are useful for implementation reports. If there are problems with implementation, the Lead Agency can undertake conflict resolution efforts to determine why and initiate a course correction.

Implementation reports, if done properly, will yield watershed baseline data regarding both social awareness and water quality. Agency implementation reports are an excellent tool for compiling data.

In addition to receiving reports, holding quarterly or twice-yearly meetings yields good results. Round table discussions and feedback about implementation activities foster coordination among the players.

Habitat Assessment

Habitat monitoring strategy will provide information on trends relating to land use, water quality, habitat, and biological conditions of your watershed. The main objectives of this strategy are:

- to determine whether implementation of the recommended source control programs has been effective in protecting water quality and beneficial uses from point and nonpoint source pollution
- to detect impacts caused by human activities
- to measure water quality improvements or degradation following changes in those activities
- to increase public awareness and knowledge of the water quality problems, needs, and potential solutions in your watershed.

Land use mapping can give you visual information on the trends in forest conversions, wetland loss, and increases in impervious surfaces. By understanding land use trends, it is relatively easy to understand the increased impacts to surface water quality and quantity. For example, increased impervious surface will increase runoff from the landscape into the receiving bodies of water. Stormwater runoff carries pollutants. Of course, there are numerous models that can help determine this type of information. However, the visual trends are helpful in determining plan successes or failures.

Revising the Plan

What if the evaluation shows that goals and objectives are not being met? Going through a revision process should not be viewed as plan failure. Rather, revision should be viewed as "testing the waters." Not all actions will get the job done, and that is okay. You will never know what works or doesn't work until you try it. The evaluation reports will tell you whether to continue on the prescribed path or try other actions. In any event, reconvening the committee is the first step. After that, follow the process outlined in this guidebook, but at a minimal level. You may need more information, and the original committee members may not all agree to participate. However, the revision process does not need to be difficult or time consuming. Often, you can brainstorm new ideas and apply them to your decision making criteria. Receiving agency concurrence on new actions is also essential. It is advisable to make sure all the players are involved in the revision process from the start.

Watershed planning as process is one way for communities to empower themselves. Making decisions on their own, especially on those actions that affect the watershed and its members, increases community well-being. This is a process communities can take to become self-reliant and create for themselves a sustainable future. Plenty of help is available from government and non-government organizations.

Bibliography

1. "The Nisqually River Management Plan". Douglas J. Canning and William A. Hashim. Paper presented at the 5th Symposium on Coastal and Ocean Managment, May 1987, Seattle, Washington

2. Watershed Resources Management: an integrated framework with studies from Asia and the Pacific. Edited by K. William Easter, John A. Dixon, and Maynard M. Hufschmidt. Boulder: Westview Press, 1985.

3. All chapter definitions come from Watershed Planning: an educational process. Peggy Paradise and Ellen Winiarczyk. Paper written for Watershed Management course, The Evergreen State College, summer 1995.

4. Managing Nonpoint Pollution: an action handbook for Puget Sound Watersheds.
   Revised June 1993. Puget Sound Water Quality Authority.

5. Describing Ecosystems in the Field. Edited by Luttinerding, Demarchi, and Lea. Ministry of Environment Manual 11, Victoria B. C., 1990.

6. Building Local Partnerships. Know Your Watershed Campaign. 1220 Potter Drive, Room 170. W. Lafayette, IN 47906. Tel: (317) 494-9555.

7. William F. Lincoln, Leroy J. Tornquist, Robert J. O'Donnell, and L. Randolph Lowry. The Course in Collaborative Negotiation; a participants workbook. Prepared by National Center Associates Inc. and the Center for Dispute Resolution, Willamette University College of Law, Salem, OR. 1986.

8. Nancy Hansen, Claire Dyckman, and Sheila Kelly. Effective Use of Public Involvement, Education, and Decision Making Techniques in Nonpoint Pollution Control. Staff report to the Puget Sound Water Quality Authority, 1989.

9. Lincoln et al. Course in collaborative negotiations.

12. Standard methodology for conducting Watershed Analysis, Chapter 3 Synthesis. Washington Forest Practices Board, version 3, 1995

13. Lyle S. Raymond Jr. Watershed Conflict Resolution: some guiding principles. Cornell Cooperative Extension, Local Government Program Center for the Environment. Cornell University

14. Managing Conflict: a guide for watershed partners. A publication of the Know Your Watershed campaign. Conservation Technology Information Center. 1220 Potter Drive, Room 170. W Lafayette, IN 47906

15. McDonalds Communication. 2960 SW 89th Ave. Portland, OR. 97225. (503) 297-3969

16. Nonpoint Source Pollution Control Decision Making: Choosing Nonpoint source controls with citizen committees. Handbook prepared by Herrera Environmental Consultants for Washington State's Department of Ecology.

17. Esther Lev, Wetlands Conservancy. Portland, OR. Information presented at Riparian Restoration Workshop, Corvallis, OR. August, 20, 1997

18. Strategy: formulation, implementation, and control. James Higgins. Dryden Press, 1985.

Appendix A. Water Quality Monitoring References

APHA et al. (American Public Health Association, American Waterworks Association, and Water Pollution Control Federation), 1992. Standard Methods for the Examination of Water and Wastewater. 18th ed., Washington, DC.

Cohen, Jacob, 1988. Statistical Power Analysis for the Behavioral Sciences. Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey. 567 pages.

Ecology Publication #91-016, 1991. Revised 1999. Guidelines and Specifications for Preparing Quality Assurance Project Plans. Ecology, Quality Assurance Section, Manchester, WA, 17 pp.

Ecology Publication #91-078, 1991. Technical Guidance for Assessing the Quality of Aquatic Environments, EILS (Environmental Investigations and Laboratory Services Program), Report 91-78. Revised February 1994.

Ecology Publication #95-307, 1995. Guidance for Conducting Water Quality Assessments and Watershed Characterizations Under the Nonpoint Rule (Chapter 400-12 WAC), EILS (Environmental Investigations and Laboratory Services Program), Report 95-307. February 1995.

EPA/PSEP (EPA/Puget Sound Estuary Program), 1990. Recommended Protocols for Measuring Conventional Water Quality Variables and Metals in Fresh Waters of the Puget Sound Region Draft Report. Seattle, WA.

Gaugush, R.F., 1986. Statistical Methods for Water Quality Investigations, Environmental and Instruction Report E-86-2, Waterways Experiment Station, Corps of Engineers, 3909 Halls Ferry Rd., Vicksburg, MS 39180-6199, 214 pp.

Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company, New York, 320 pp.

Hammer, M.J. and K.A. MacKichan, 1981. Hydrology and Quality of Water Resources. John Wiley and Sons, New York, 486 pp.

Mills, W.B., G.L. Bowie, T.M. Grieb, K.M. Johnson, and R.C. Whittemore, 1986. Stream Sampling for Wasteload Allocation Applications. EPA Report 625/6-86/013, Washington, DC.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes, 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. EPA Report 444/4-89-001, Washington, DC.

PSEP (Puget Sound Estuary Program), 1986. Puget Sound Protocols. Seattle, WA.

Reckhow, K.H. and S.C. Capra, 1983. Engineering Approaches for Lake Management, Volumes 1 and 2. Butterworth Publishers.

Sanders, T.G., R.C. Ward, J.C. Loftis, T.D. Steele, D.D. Adrian, and V. Yevjevich, 1983. Design of Networks for Monitoring Water Quality. Water Resources Publications, Littleton, CO, 328 pp.

Striplin, P., 1988. Puget Sound Ambient Monitoring Program Marine Sediment Quality Implementation Plan. Ecology, Olympia, WA.

Ward, R.C., J.C. Loftis, and G.B. McBride, 1990. Design of Water Quality Monitoring Systems. Van Nostrand Reinhold, New York, 231 pp.

Preliminaries to Planning

Step 1. Establish Citizens and Agency Participation Process

Since flood hazard management is a broad based planning effort and not solely an engineering exercise, it is important that a wide range of interests and backgrounds be incorporated in the process. A planning committee should be formed that includes a representation of public groups and property owners.

Define Public Participation Process

Develop a program for public participation that includes workshops, presentations, and hearings.

Step 2. Set Flood Hazard Management Short- and Long-term goals and objectives

Without carefully thought out comprehensive goals and objectives, the flood hazard management plan would lack an organized framework for solving problems and issues. Unless basic project goals are agreed upon, disagreement can easily arise regarding fundamental issues throughout the process, and there will be no set criteria on which to evaluate alternative measures.

Step 3. Inventory and Analysis of Physical Conditions.

Description of planning area characteristics

1. Planning area boundaries with map and a statement describing how the study areas was defined and the boundaries determined
2. Climate: precipitation, temperature, etc.
3. Topography, soils, geology, mineral resources.
4. Hydrology, including surface drainage patterns, channel morphology, geohydrology
5. Biological resources including fisheries and wildlife resources, forests, vegetation, and habitat
6. Water resources including water quality, watershed, hydrology, and groundwater systems
7. Land use including forestry, recreation, agriculture, aquaculture, and residential, commercial, and industrial uses. Describe current land use,zoning and projected development trends
8. Population, current and projected trends
9. Transportation and utility systems including navigation characteristics of area

10. Scenic, aesthetic and historic/cultural resources

Description of Relevant Regulatory and Capital Improvement Programs

1. Local

a. Comprehensive land use plan; open space, parks, and trail plans; construction and improvement plans; and zoning of relevant jurisdictions
b. Flood damage prevention or reduction ordinance
c. Shoreline Master Program
d. Wetland ordinance/sensitive areas ordinance
e. Local building code
f. Stormwater management ordinance
g. Dikes/drainage districts

2. State

a. Flood Plain Management Act
b. Department of Natural Resources (DNR) lease or permit
c. Shoreline Management Act (SMA)
d. Centennial Clean Water Fund
e. Stormwater Management
f. State Environmental Policy Act (SEPA)
g. Section 401 permit (Ecology)
h. Washington State Hydraulic Code
i. Growth Management Act
j. Forest Practices Act

3. National

a. Army Corp of Engineers
    1. Section 10 permit
    2. Section 404 permit
b. National Environmental Policy Act (NEPA)
c. National Flood Insurance Program (NFIP)
d. National Pollutant Discharge Elimination System (NPDES)
e. Forest Practices Act

Flood Damage History, Flood frequency Patterns and Current and Projected Problems

1. Record of historic flood events

2. Damage cost estimates by land use type, if available (e.g. commercial, residential, agricultural)

3. Prior flood control investigations and actions
4. List of current and past problem areas and maintenance needs as well as a summary of implemented projects with cost and funding. Include environmental and resource utilization problems as well (The problems and maintenance areas should be identified on a map)
5. Potential problems due to projected land development or resource utilization trends (this item is not explicitly called out in WAC 173-145-040 but it makes sense to plan for the future as well as current conditions)

Step 4. Determine Need for Flood Hazard Management Measures

This is the step that documents the need for "flood control work" as required by WAC 173-145-040(1). The scope of this step should be extended to identify the need for environmental protection, development of resource management protection, development of resource management regulations, emergency response capabilities, and coordinated planning activities as well as structural flood control measures.

Step 5. Identify Alternative Flood Hazard Management Measures

Here should be described structural and non-structural options for addressing the problems and issues identified above. The location and extent of each measure should be defined and illustrated on a map. Also, it should be noted which problems each measure would address, and the extent of its effectiveness. Both non-structural and structural solutions should be described in specifics. Alternatives combining structural and non-structural measures should be explored. Department of Ecology has prepared a guidebook on flood hazard planning that identifies numerous structural and non structural alternatives.

Step 6. Evaluation of Alternative Measures

For each alternative measure the following information should be provided:

A. Potential environmental impacts to:
   1. Fish resources
   2. Wildlife resources
   3. Scenic, aesthetics and historic resources
   4. Navigation
   5. Water quality
   6. Hydrology
   7. Existing recreation
   8. Other as applicable

B. Consistency with applicable regulations and policies

C. Cost and method of payment

Costs for operations, maintenance, administration and land acquisition should be factored into the estimates. The funding sources for each alternative should be identified.

D. Scheduling and Term of Benefit

The proposed schedule for implementing each alternative should be discussed and the potential term of benefit projected. The intent of this is to identify which are short term, remedial actions and which are longer term, comprehensive solutions.

E. Conformance to Public Goals and Objectives

A brief statement or summary table should be provided to indicate how each alternative responds to the individual objectives stated in Chapter III.

Step 7. Develop and Recommend A Flood Hazard Management Plan

Contents of the plan:

Executive Summary

1. Statement of goals, problems, and issues
2. Brief Description of project methodology and public agency participants
3. Description of proposed solutions listed in an action plan with estimated costs, timing, participating agencies and priority for each recommended action.

Introduction, Authority, and Scope

1. legal authority under Chapter 86.26 RCW
2. Sponsorship of local government

Background

1. Need for plan
2. Description of Flood Control Assistance Account Program FCAAP
3. Historical background

Planning Process and Methodology

1. Role of project committee
2. Public participation process
3. Agency, tribal, and special interest coordination
4. Overview of technical planning methods

Short- and Long-term goals and objectives

See Step 2.

Description of Planning area characteristics

See Step 3.

Description of Relevant Regulatory and Capital Improvement Programs

See Step 3.

Flood Damage History, Flood frequency Patterns and Current and Projected Problems

See Step 3

Alternative Flood Hazard Management measures

See Step 4 and 5

Evaluation of Alternative Measures

See Step 6.

List recommended actions

1. For this item, the preferred alternatives should be compiled into a management strategy which serves as the basis for the comprehensive Flood Hazard Management Plan. The strategy should include a list of actions, the priority, cost and time frame for each, and the coordination activities with adjacent governments, related agencies, and associated programs.
2. Map illustrating actions
3. Diagrams and/or sketches of proposed actions

Complete SEPA documentation

Appendices

- **A.** Certification from the Washington State Department of Community Development that the local emergency management organization is administering an acceptable comprehensive emergency operations plan.
- **B.** Environmental assessment documentation according to SEPA and/or NEPA regulations
- **C.** Technical hydrological data and analysis
- **D.** Other maps and information as applicable
- **E.** Other exhibits as applicable.

Step 1 - Characterize the Area of Influence

The Area Characterization should provide information on existing water quality, habitat, physical and biological conditions of the Groundwater Management Planning Area.

Characterize Physical Conditions

- Area description
- Topography
- Climate
- Surface water hydrology
- geology
- hydrogeology
- ground water recharge
- ground water resources
  - quality
  - quantity

Characterize Land Use

- jurisdictions
- existing land use
- future land use
- land use impacts on ground water quality
  - agriculture
  - quarries
  - underground storage tanks
  - highway and residential development and roadside weed control
  - hazardous materials spills
  - septic tanks
  - miscellaneous land use

Characterize Water Use

- jurisdictions
- municipal water withdrawal
- agricultural withdrawals
- total water demand
- water rights

Characterize Sensitive Areas

- identify, characterize, locate, and map sensitive resources such as lakes, streams, wetlands, riparian zones, wildlife and habitat;
- delineate, designate and assess wetland functional values for the project area;
- evaluate changing land use patterns;
- conduct fish and wildlife habitat inventory;
- develop base maps of the information;
- identify critical aquifer recharge areas.

Step 2 - Water Quality Assessment

Establish groundwater quality and quantity monitoring and data management program. Use any information and data collected under an approved quality assurance/quality control plan

Monitoring program

- Use an approved quality assurance plan that directs the sample collection, treatment, and analysis of data.
- The sampling plan should be comprehensive and provide a 3-dimensional picture of ambient seasonal conditions for groundwater and surface water bodies. The data management plan should incorporate current groundwater standards.
- Contract or perform appropriate lab analyses to determine groundwater quality conditions, including potential for seawater intrusion.
- Compile/collect all monitoring data for community wells including distribution and total consumption. Use Department of Health data base or use a data management system in coordination with them.
- Acquire appropriate software, hardware, and data storage capabilities for complete management of groundwater monitoring data, and selected well log data. (Consider ENVIS, Access, Paradox, and dBase 3 environments.) System should be capable of exporting to GIS or other graphic package for 3- and/or 2-dimension representations of the subsurface geology.
- Continually interpret monitoring information in order to determine effectiveness of existing program, make adjustments, and to set policy guidelines, if warranted.
- Develop water quality maps for nitrates, chlorides, and bacteria.

Intensive monitoring

- Once monitoring has started and you get an indication of threats to water quality, consider doing targeted, incident-related monitoring for conditions (such as elevated nitrates) to determine

3-dimensional extent of contamination, rate and direction of movement, and probable pollutant sources.

Data Management

- Compile any existing and new hydrogeologic, water quality and water resource data in a relational database. Analysis of the existing data will help determine additional data requirements. Develop a data management plan (DMP) according to applicable state standards.
- Acquire appropriate software, hardware, and data storage capabilities for complete management of groundwater monitoring data, and selected well log data. System should be capable of exporting to GIS or other graphic package.

Assessment Report

- Prepare a water quality assessment report, based on the above information and a review of any other available data.

Step 3 - Hydrogeology

Refine the description of watershed geology and hydrogeology and surface and groundwater interactions. Define hydrostatigraphic unit location and thickness of hydrostratigraphic units, hydraulic characteristics, water quality, ground water levels, flow directions, recharge/discharge areas, and aquifer interactions

Examine existing geologic and soils information and examine new well log data to further develop an overall understanding of your aquifer, especially their boundaries and recharge areas. Determine the extent and thickness of "restrictive" layers.

Develop a groundwater budget and conceptual model which quantitatively and geographically describes the flow between surface water bodies and groundwater in the study area. Estimate the geographic variation and influence of precipitation, interception by plants, and evapotranspiration to recharge and runoff.

STEP 4. Problem Assessment and Threat Identification

The characterization report, water quality assessment, and hydrogeology should allow you to estimate the extent and the significance of the potential threats to groundwater quality. The reports will allow you to identify the type, location and relative hazard of existing and potential sources of contamination present in the area and their relationship to groundwater quality.

Potential threats

- Drywells and catchbasins
- Businesses and land uses (e.g. dairy farms, old neighborhoods, etc.) known to generally be highly threatening to groundwater
- Underground storage tanks
- Dry cleaning establishments and similar sites
- Transportation routes (roads, streets, and parking lots, airports, etc.) of hazardous materials
- Various physical and biological factors contributing to groundwater contamination
- On-site sewage disposal practices;
- Construction activity;
- Household, yard, and garden chemical use;
- Commercial/industrial chemical use
- Agricultural runoff
- Erosion and sedimentation
- Spill containment;

Once these sites are identified, determine the relative significance of all identified factors contributing to the potential for groundwater contamination. Apply nitrate loading model and refine its use as a continuing predictive tool for location of significant threats. Enter locations of known threats into land use inventory on county GIS, for purposes of groundwater protection and land use planning.

Step 5 - Groundwater Management Committee

Once characterization and monitoring are started, form a Groundwater Management Committee (GWMC), which will be responsible for developing and ensuring the implementation of the Plan. The GWMC shall be comprised of agencies with responsibility and/or involvement in the GWMA, concerned public and private citizens, and others interested in the basin.

Form a Technical Advisory Committee if needed.

Step 6 - Groundwater Management Plan

Develop a Groundwater Management Plan to be consistent with any state and federal regulations and guidelines

Develop Goals and Objectives.

Management Strategies

Evaluate management strategies and corresponding alternatives:

- Cost and effectiveness;
- Environmental impact;
- Practicality;
- Ability of cooperating entities to complete necessary work;
- Consistency with applicable laws, policies, plans, etc; and
- Short vs. long-term solutions.

Implementation Strategies

Develop a funding and implementation element to prioritize water quality goals and management strategies for implementation. The element may propose adoption of regulatory programs, capital improvement plans, establishment of surface water utilities, cost-sharing programs, and other activities.

The strategy should include the following:

- Define the agencies responsible for implementing each element of the Plan;
- Demonstrate that the responsible agencies have or will acquire sufficient authority to complete each action including operation and maintenance of facilities;
- Demonstrate that responsible agencies have or will acquire adequate funding to complete each action identified for implementation. This shall include approximate budget and methods of financing;
- Develop an implementation schedule for each action and concurrence from each agency responsible for each action
- Describe interagency coordination arrangements which will ensure effective implementation of the Groundwater Management Program; and
- Develop ordinances to implement the final groundwater management plan.

Chapter 400-12 WAC

Local Planning and Management of Nonpoint source Pollution

Preparation for Watershed Action Planning

Lead Agency - WAC 400-12-400

The county is assumed to be the lead agency for each watershed management committee. However, another entity may serve as the lead agency if it has geographic jurisdiction and/or responsibilities that wholly or mostly encompass the watershed and can demonstrate that it has the ability to perform the duties of a lead agency. Those abilities include: 1) possessing financial and staff resources; 2) be a governmental agency or subdivision of state government with the power to pass resolutions, enact ordinances, and appropriate funds; 3) be an Indian Tribe recognized as such by the federal government with territory or usual and accustomed fishing grounds within waters in or adjacent to the county; or 4) be a conservation district, a metropolitan municipal corporation, or a council of governments.

Watershed Management Committee Formation WAC 400-12-410

The lead agency shall establish a Watershed Management Committee. The committee make up and the process of formation shall be in accordance with WAC 400-12-410. This will include notifying by letter all local government legislative authorities, conservation districts, and Indian tribes with jurisdiction in the watershed, inviting them to participate on the watershed management committee; publicizing the formation of the watershed management committee to recruit members; and consulting with affected parties and jurisdictional entities to determine size and structure for the Committee to provide for balanced representation.

After the committee is formed, the Lead Agency shall:

- educate the committee as to its role and responsibility; committee orientation and education may occur concurrently with preliminary committee decisions on study requirements, watershed characterization and problem identification.
- assure the preparation and recording of ground rules;
- guide the development of a decision making process; and
- assist in establishing a dispute resolution process;

- draft and secure committee approval of a schedule and an initial work plan
- A strategy for public education and involvement

Technical Advisory Committee

Having a technical advisory committee is not a requirement of WAC 400-12, but they have proven extremely useful in the planning process. Usually, the committee assists in identifying the watershed boundary for the study area, identifying existing and needed information for the project area, reviewing and commenting on the development of the monitoring and sampling plan, and providing guidance in the development of conclusions and recommendations.

Phase 1 – WAC 400-12-515

Watershed characterization, and goals and objectives development

The purpose of Phase 1 is to gather and evaluate water quality information in order to define nonpoint source problems and to develop goals and objectives for the watershed action plan.

Watershed Characterization –515(2)

Prepare a biophysical description of the watershed that includes topography, geology, climate, existing population, beneficial uses of water, water quality trends, existing land use patterns, and anticipated population and land use trends. Discuss existing federal, state, and local water quality plans and programs applicable to the watershed. Prepare a watershed map showing all surface and ground water resources and jurisdictional boundaries.

Include in the characterization:

- a description of the biophysical environment;
- a description of the built (human) environment;
- existing land use and projected trends; forest lands, crop lands, and concentrated animal keeping;
- known sensitive habitats, including wetlands, riparian areas, and geologic hazards;
- a map showing jurisdictional boundaries;
- a map showing all water ways and water bodies;
- a discussion of existing federal and state water quality programs currently going on in the Watershed;
- maps delineating watershed boundary.
- hydrology
- discussion of water use and diversions

This information, combined with the available water quality information, will allow the watershed management committee to development a water quality assessment of the watershed. Subsequently, this will allow the preparation of a problem statement with a well-defined set of goals and objectives.

The intent of the water quality assessment is to provide the watershed management committee, other decision-making bodies, and the public with the most accurate current information on the types of nonpoint sources in the watershed and their relative impacts on water quality and beneficial uses. This needs to include and initial assessment which will be used in developing the pollution control program in the action plan

Problem Definition –515(3)

Describe the extent of nonpoint source water quality problems, including:

- threats to beneficial uses, wetlands, and groundwater;
- violations of water quality standards in relation to all potential sources,
- forestry,
- agriculture,
- mining,
- land clearing,
- boats and marinas,
- landfills, and
- other sources the Committee will identify.

Action Plan Goals and Objectives –515(4)

The Committee will develop water quality goals and objectives which identify the desired results for correcting and preventing nonpoint sources of pollution.

Phase 2 – WAC 400-12-525

Action plan nonpoint pollution control strategy

The purpose of Phase 2 is to develop strategies for controlling and preventing nonpoint pollution, protect beneficial uses, and to enhance water quality.

Nonpoint pollution source categories –525(4)

The watershed management committee shall evaluate the following probable sources of nonpoint pollution:

- farm practices
- forest practices
- on site sewage disposal

- storm water and erosion
- land use impacts, including construction and stormwater
- marinas and boats
- other nonpoint sources which can include household practices, landfills, mining, septage disposal, pesticides, etc.

Even though these programs are not in the rule, they have been used successfully in the 400-12 planning process. Identify preventive and corrective control strategies for each nonpoint pollution source category in the watershed, identified in the Phase 1 report. Consider:

- maintenance programs
- code/regulatory changes
- capital projects
- enforcement actions
- public education
- technical assistance
- incentives/financial assistance
- voluntary participation
- inventories

These source control measures shall be evaluated for their technical feasibility, legality, ability to implement, effectiveness in achieving water quality benefits, cost and cost efficiency, practicality, willingness of necessary parties to assure full implementation, and consistency with other local plans and programs. The Committee shall select specific source control measures for each problem to incorporate in the plan.

Phase 3 – WAC 400-12-535

Action plan implementation strategy

The purpose of Phase 3 is to identify the requirements for the development of the strategy for implementing the action plan.

- The implementation strategy for the watershed action plans should include:
- A description of the specific actions required of each implementing agency and local government;
- A schedule that includes annual milestones for implementing nonpoint pollution control strategies;
- Estimated implementation costs and budget, including a financing element that identifies existing and potential local, state, and federal funding sources;
- Identification of lead agency;
- A dispute resolution process;

- A process and strategy for coordination and integration with ongoing planning and management programs within the watershed that impact water quality;
- Provisions for public involvement in the preparation and adoption of implementation plans, policies, and/or ordinances;
- A method of evaluation the overall effectiveness of the action plan in preventing and correcting ground and surface water quality. This element includes:
- A long-term monitoring program
- A process for annual review

Even though long-term monitoring requirements are not in the rule, Department of Ecology Publication No. 95-307, *Guidance for Conducting Water Quality Assessments and Watershed Characterization Under the Nonpoint Rule (Chapter 400-12 WAC)*, February 1995, was developed to help the 400-12 planning process. A water quality monitoring and quality assurance project plan (QAPP) should be developed first. Include in the QAPP:

- Title page with provision for approval signature
- Table of contents
- Project description
- Project organization and responsibility
- Data quality objectives
- Sampling procedures
- Analytical procedures
- Data reduction, validation and reporting
- Quality control
- Performance and systems audits
- Preventative maintenance
- Data assessment procedures
- Corrective action
- Quality assurance reports

Consider the following parameters for your monitoring program:

- flow
- fecal coliform
- total suspended solids
- turbidity
- dissolved oxygen
- temperature
- ph
- total phosphorus
- ammonia nitrogen
- nitrites
- nitrates
- conductivity
- salinity

Most of these can be used to determine trends, and can also be used to evaluate the success of implemented actions to control nonpoint pollution.

Phase 4 WAC 400-12-545

Action plan review and approval

The purpose of Phase 4 is to allow the action plan to be reviewed by the Department of Ecology as the responsible agency, the public , and other interested entities and agencies and to assure that comments are addressed by the watershed management committee.

Public and Agency Review –545(2)

The draft action plan documents are submitted to planning and implementing entities, the public, and the Department of Ecology for review and comment. Review and comment period is 60 days. The lead agency consolidates the result of the reviews and present them to the Watershed Management Committee. The committee shall consider recommended revisions and make changes to the draft action plan as needed.

Within 30 days hold a public hearing.

Statements of Concurrence –454(3)

During this time, work closely with implementing entities listed in the plan to work out details of their participation. Once these details are agreed to solicit official letters of concurrence from implementing entities and resolve any further issues of nonconcurrence.

Action Plan Submittal and Approval –545(4) and –545(5)

After the SEPA review and public hearings, the revised final action plan shall be submitted to Ecology for approval. Ecology will approve either the total plan or parts of the plan.

SEPA Review WAC 400-12-555

After the plan has been revised develop SEPA documents in accordance with Chapter 43.21C RCW and submit them to the appropriate agencies

Step 1 - Characterize the Basin

Drainage Area Characterization

The Drainage Area Characterization should provide information on existing water quality, habitat, physical and biological conditions of the Stormwater Management Area (SMA).

The drainage area characterization should identify:

- Topography;
- Soils, especially highly erodible soils and soils with high runoff potential;
- Climate;
- Sensitive areas including wetlands, flood plains, and fish and wildlife habitat areas, steep slopes, riparian corridors, groundwater recharge areas, potential, municipal drinking water sources;
- Waterbodies and waterways;
- Drainage area basins, including hydrologic features;
- Existing stormwater conveyance system and drainage areas;
- The regulatory environment and a map of jurisdictional boundaries;
- Existing and future land use;
- Delineation of pervious and impervious surfaces;
- Maps of outfalls;
- Flood plains and floodways;
- Other information needed to complete an accurate description of the basin.

Characterize Sensitive Areas

In addition to the above, an inventory should be made of existing environmental resources within the plan area. Field surveys of the plan area should be conducted to verify existing data and to survey potential critical habitat areas. The inventory should:

- identify, characterize, locate, and map sensitive resources such as lakes, streams, wetlands, riparian zones, wildlife and habitat;
- delineate, designate and assess wetland functional values for the project area;
- evaluate changing land use patterns and urban growth boundary for their potential impacts to the stormwater management area (SMA);
- conduct fish and wildlife habitat inventory;

- develop base maps of the information.

Urban Area Specific Inventory

- General characterization of industrial and commercial sites;
- Residential density;
- % impervious surface;
- Inventory of industrial and commercial sites in the city;
- Description of current stormwater and erosion conditions and threats;
- Description of solid and hazardous waste conditions and trends in the city;
- Wetlands in the city - general characterization, existing information, inventory, functions and values, review of wetland regulations and Shoreline Master Program, data analysis, conclusions and recommendations; and
- Existing city stormwater management, evaluation of current system and planned changes, recommendations for stormwater control in new developments, summarize stormwater runoff model results.

Step 2 - Water Quality Assessment

Assessment Report

Prepare a water quality assessment report, based on review of any available data of the SMA that characterizes the following features:

1. existing stream beneficial uses;
2. existing stream water quality and water quality standards;
3. any sampling results;
4. contributory surface runoff pollutant loadings including projects that the County or other entity is involved in that may adversely impact water quality;
5. surface water quality management strategies; and
6. existing water quality of the receiving waters within the SMA.

Monitoring Program

Develop a quality assurance/quality control program to help guide any monitoring activities.

Develop an ongoing and long-term monitoring program to be used to evaluate:

1. any water quality goals; and
2. management strategies identified in the stormwater plan.

Step 3 - Hydrologic Analysis

Modeling

Perform hydrologic modeling of the SMA and establish existing storm-water conveyance capacities. This work should first include:

1. the development of design hydrographs to compute volume and flow
2. input parameters
3. development of assumptions
4. validation of the model

Current Condition Analysis

Prepare a pollutant loading evaluation of the current conditions for the major sub-basins of the planning area. Sub-basin pollutant loadings will be estimated from the compilation of sub-basin areas according to land use and the corresponding pollutant loadings which have been determined to be associated with such land uses. The pollutant loading estimates will be used in conjunction with assessment report and monitoring results to identify sub-basin areas of greatest concern for water quality protection.

Future Condition Analysis

A planning level or future condition analysis of pollutant loads should include the following elements:

1. Estimates of target pollutant loads from different pollution sources for historic, existing, and future conditions;
2. Estimate load reduction levels which are achievable using source control, runoff control, and runoff treatment Best Management Practices (BMP); and
3. Description of specific BMPs which will be used to achieve the load reduction levels.

Within the Puget Sound Region, both the hydrologic analysis and the pollutant loading evaluation should conform to the guidelines of the DEPARTMENT'S Stormwater Management Manual for the Puget Sound Basin and shall address water quality as a first priority.

Step 4 - Stormwater Management Committee

Once characterization and modeling are started, form a Stormwater Management Committee (SMC), which will be responsible for developing and ensuring the implementation of the Plan. The SMC shall be comprised of agencies with responsibility and/or involvement in the SMA, concerned public and private citizens, and others interested in the basin.

Form a Technical Advisory Committee if needed.

Step 5 - Problem Identification And Alternative Analysis

Problem Identification

Once a characterization and hydrologic modeling is completed, then identification of flooding areas, surface water quality, and pollutant source problems and impacts to sensitive resources within the SMA can be made. Review existing reports, solicit, public input regarding surface water problems, interview city or county staff, and results of the hydrological analysis and pollutant loading evaluation shall be analyzed to identify existing and potential future surface water management problems.

Categories of pollutant source problems to be identified should include:

- On-site sewage disposal practices;
- Construction activity;
- Household, yard, and garden chemical use;
- Commercial/industrial chemical use and runoff;
- Illicit discharges;
- Illegal dumping;
- Agricultural runoff;
- Roads, streets, and parking lots, airports, etc;
- Erosion and sedimentation;
- Spill containment;
- Excessive streambank erosion due to magnitude and frequency of bankfull stormwater discharges;
- Illicit connections to stormwater sewers;
- Combined sewer overflows; and
- Disposal of stormwater sediment, including street waste.

Existing and potential future drainage system problems shall be identified and include at least the following elements:

- Flooding;
- Erosion;
- Problems from lack of maintenance;
- Inadequate pipe or channel capacity;
- Safety problems;
- Growth;
- Impacts to sensitive resources and resultant problems shall also be identified.

Develop pollution control management strategies for existing stormwater problems. Management strategies shall include the following recommendations from the Puget Sound Water Quality Management Plan:

- Erosion and sediment control for construction sites;
- Source control to prevent the transport of pollutants in stormwater runoff;
- Runoff treatment to remove pollutants from stormwater runoff;
- Streambank erosion control by reducing the magnitude and frequencies of stormwater discharges;
- Protection of sensitive areas identified in sub-task 2;
- Operation and maintenance strategies for stormwater treatment facilities;
- Stormwater conveyance system alternatives.

Within the Puget Sound Region, Ecology has developed a Stormwater Management Manual for the Puget Sound as a guide to evaluate pollutant source control alternatives for incorporation into the surface water management plan. Such alternatives shall include residential BMPs, commercial and industrial BMPs, agricultural BMPs, maintenance of roadway or drainage facilities, construction site erosion control, and roadway spill containment.

Step 6 - Stormwater Management Plan

Develop a Stormwater Management Plan to be consistent with any state and federal regulations and guidelines. Within the Puget Sound Region, the recommendations of the Puget Sound Water Quality Management Plan Elements SW-1 and SW-2, and the technical manual, model ordinances, and guidance developed in SW-3 and SW-4 should be followed.

Develop Goals and Objectives.

Management Strategies

The management strategies and corresponding alternatives shall be evaluated for:

1. Cost and effectiveness;
2. Environmental impact;
3. Practicality;
4. Ability of cooperating entities to complete necessary work;
5. Consistency with applicable laws, policies, plans, etc; and
6. Short vs. long-term solutions.

Conduct rate study analysis for potential stormwater utility; develop User Charge System Methodology for stormwater utility; hold necessary

public review and comment meetings (based on interest); and revise the user charge system based on public comments.

Implementation Strategies

Develop a funding and implementation element to prioritize water quality goals and management strategies for implementation. The element may propose adoption of regulatory programs, capital improvement plans, establishment of surface water utilities, cost-sharing programs, and other activities.

The strategy should include the following:

1. Define the agencies responsible for implementing each element of the Plan;
2. Demonstrate that the responsible agencies have or will acquire sufficient authority to complete each task, including operation and maintenance of facilities;
3. Demonstrate that responsible agencies have or will acquire adequate funding to complete each task identified for implementation. This shall include approximate budget and methods of financing;
4. Develop an implementation schedule for each task and concurrence from each agency responsible for each task;
5. Describe interagency coordination arrangements which will ensure effective implementation of the Stormwater Management Program; and
6. Develop ordinances to implement the final stormwater management plan.

Planning for Total Maximum Daily Loads (TMDLs) For Nonpoint Sources of Pollution

Water bodies are polluted by diverse sources. Each source contributes one or more pollutants. However, there may be an accumulation of pollutants through multiple sources. One way to identify polluted streams is to find out if the pollutant exceeds state standards for water quality. The federal Clean Water Act requires each state to establish it's own water quality standards. When a pollutant in a water body exceeds one or more of these standards, a plan to reduce the pollutant so that the water is no longer in violation must be prepared and implemented.

The plan determines the amount of the pollutant that can be discharged through the various sources and still maintain adequate water quality. In other words, the carrying capacity of the stream, lake, or river is determined. This amount, which may be calculated on the basis of discharge per day, is referred to as a loading. The maximum allowable amount of a pollutant loading for all the sources is called the loading capacity. The set of actions needed to achieve the loacing capacity is called a total maximum daily load (TMDL).

The TMDL describes actions to reduce pollutant discharge from all sources to a level less than the limit. A TMDL becomes the basis for control activities in a watershed plan. The plan provides the vision and mechanism for controlling any combination of point sources and nonpoint sources.

The Environmental Protection Agency has accepted some watershed plans as fulfilling the requirements for nonpoint source TMDLs. To qualify, a watershed plan must contain:

- Watershed characterization and problem description
- Goals and objectives
- Technical information for TMDLs
- Proposed management measures
- Timeline for implementation and achieving water quality standards
- A list of implementing agencies
- A plan for monitoring and evaluation
- A public involvement plan
- A plan for maintenance of effort over time

A lead agency should be designated to prepare the TMDL and forward it to Ecology for review and submission to EPA for approval. The principals of TMDL development are very similar to those needed for sound watershed planning.

Step 1. Set up a public participation process

Compile and maintain a list of interested and affected parties. Notify them that a TMDL is being prepared. From this list create a watershed management committee. The committee may include representatives from:

- Federal
- State
- Local governments
- Tribes
- Citizens
- Business and trade associations
- Agricultural commodity groups
- Other interested parties

All information used in the development of the TMDL must be made available to the public-at-large. A process to access these materials and location(s) should be designated and publicized. Before the TMDL is finalized by the lead agency, there must be a public review.

Step 2. Problem Formulation and TMDL Determination

Identify the pollutants for which the TMDL is being prepared and describe the impacts of the pollutants on the water quality in the watershed.

Characterize current conditions:

- Describe the biological, physical, and social environments
- Identify beneficial uses that are impacted (swimming, fish spawning, shellfish collection, etc.)
- Describe applicable water quality standards, as well as any state and local regulations governing the use and disposal of the pollutant(s).
- Identify and describe sources of the pollutant(s) in the watershed
- Describe current efforts to control discharges of the pollutant(s) in the watershed

Perform the TMDL study

The loading capacity of the stream for the pollutant(s) may be determined using a variety of approaches. Often, computer models are used to predict the limits of pollution. In other cases, a more qualitative approach to pollution control is used that focuses on implementation of BMPs targeted to reduce pollution from the most significant sources first. Here the study focuses on determining the most likely sources of impairment and provides good documentation of where problems should be addressed. Such studies must be able to estimate the success of the BMP's in meeting water quality standards.

Some flexibility exists in the regulations on how to approach this study when dealing with nonpoint sources of pollution. Technical assistance should be sought due to the highly technical nature of the study. Loading capacity should include allocations for loads from point and nonpoint sources as well as a reasonable margin of safety.

Develop Goals and Objectives

Goals and objectives are developed as part of the TMDL study. In many cases, meeting water quality standards at specified sensitive areas can be the goal of the TMDL. Temperature, fecal coliform, and turbidity are typical parameters with set water quality standards. In other cases, goals for habitat characteristics may be included in the TMDL. Pool/riffle ratio, fine sediment concentration, and large woody debris are typical habitat characteristics.

In establishing goals for TMDLs you need to consider two important factors. First, there must be good scientific justification. Use of water quality standards as TMDL goal meets this test. Use of habitat characteristics necessitates a careful review of the needs of the biota present in the water body. The second factor relates to public review and support for the goal. Since the goal directs decision-making and program activities, all parties to the discussion must agree to the goals. This is fundamental to the long-term success of the TMDL and planning process.

Step 3. Designing and selecting programs for pollution control

Using the information on the current conditions and loading capacity, determine the management practices necessary to achieve and maintain compliance with the water quality standards.

Research various approaches to nonpoint source control programs for possible use in the watershed. You can adopt programs from other areas when applicable, or design a new one to fit the needs of the watershed. Sometimes improved implementation is all that needs to occur.

- Once you have identified the program elements, you need to draft a schedule for getting work done which should include:
- Starting dates and duration for each program activity for achievement of the TMDL objectives, and for the attainment of water quality standards.
- Intermediate and final milestones for water quality improvement
- Backup programs with triggers to be considered if milestones are not met
- Identification of responsible implementing agencies.
- To improve the likelihood of success, letters of concurrence should be signed by all parties committed to various implementation aspects of the TMDL The final outcome should be the establishment

of interim and target conditions for the waterbody. These are used by the lead agency and local committee to review progress once the study is completed.

Recovery time for water bodies will vary depending on the extent and type of problem. TMDLs help organize efforts which bring the greatest improvement in the shortest amount of time. Some water bodies will take years to recover, while others just months. The plan should allow a reasonable amount of time for recovery to be complete.

Step 4. Monitoring and Evaluation

A monitoring program and feedback loop is vital to the success of a TMDL. Since the effort of many people is involved, considerable time may be needed to improve water quality. It is important to design reliable data collecting and reporting process along with the TMDL. The planning group should plan annual reviews of progress including level of BMP implementation, effectiveness of BMPs, and measured water quality improvement. Where improvement is not occurring as predicted and scheduled, the local committee should evaluate why and make necessary changes to the programs, or to expectations.