

# Introduction to Watershed Assessment

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# Introduction to Watershed Assessment

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## WHAT IS “WATERSHED ASSESSMENT?”

A watershed assessment is a process for evaluating how well a watershed is working. This process includes steps for identifying issues, examining the history of the watershed, describing its features, and evaluating various resources within the watershed.

The assessment outlined in this manual requires a lot of interaction between people interested in the watershed, so that means lots of meetings, right from the start. People who conduct the assessment get to “collect data” and develop maps. Even more interesting are the field trips to the watershed that will be required. The assessment will require help from resource specialists to plan surveys, interpret results, and analyze the information and data that has been collected. Finally, the assessment concludes with a report or record of the assessment, so the results can be put to good use.

## WHY CONDUCT A WATERSHED ASSESSMENT?

Most readers, by the time they pick up this manual, have a pretty good idea of the reasons for conducting watershed assessments. Of the many reasons and benefits we could name, a few stand out. Our overall reason is to find out where, within in a given watershed, we need to restore natural processes or features related to fish habitat and water quality. Specifically, watershed assessments help us accomplish the following goals:

- Identify features and processes important to fish habitat and water quality.
- Determine how natural processes are influencing those resources.
- Understand how human activities are affecting fish habitat and water quality.
- Evaluate the cumulative effects of land management practices over time.

In other words, the assessment helps us determine which features and processes in the watershed are working well and which are not. An assessment can't give us site-specific prescriptions for fixing problems, but it can, and should, tell us what we need to know to develop action plans and monitoring strategies for protecting and improving fish habitat and water quality.

## HOW THIS ASSESSMENT WORKS

This assessment is designed to be used by local citizen groups such as watershed councils and soil and water conservation groups, with some assistance from technical experts. It contains the information needed for a broad-scale screening that can be used on any landscape in Oregon, from coastal rain forest to Great Basin desert.

Oregon has many different kinds of landscapes, of course, each with its own characteristic geology, climate, topography, and natural disturbances (such as storms, fires, and so on). To help identify

these large-scale characteristics, the assessment incorporates the use of **ecoregions**,<sup>1</sup> that is, landscapes that share fundamental characteristics. The use of ecoregions also helps identify and interpret regional watershed patterns. (For more information about ecoregions, see Appendix A.)

Although the assessment begins by looking at characteristics and processes of the entire watershed, it bridges the gap to specific conditions within portions of individual streams by stratifying the stream network into **Channel Habitat Types** (known to fish biologists and hydrologists as “CHTs”). The CHTs are determined by the slope of the channel bottom (from shallow to steep, known as **channel gradient**) and the width of its valley (from wide to narrow). This helps us determine which portions of the stream network have high potential for fish production and which are sensitive to disturbance. This information, along with knowledge of the areas currently used by fish, leads to identifying the following:

- Areas with the highest potential for improvement
- High-priority areas for restoration
- The types of improvement actions that will be most effective

The thinking behind the assessment is that streams and their channels are the result not only of surrounding landform, geology, and climate, but of all upslope and in-stream influences as well. The assessment is directed at broad-scale patterns. It uses aspects of water quality and fish habitat as indicators of watershed health. To identify potential problems, the assessment relies on existing data, local knowledge of land managers, and field surveys. This approach reveals which natural and human-altered processes are influencing a watershed’s ability to produce cold, clear water and to support native fish populations.

In a way, the assessment is like a screening for human health. Doctors screen our tendencies for heart disease by considering our family histories, lifestyles, and test results for cholesterol and so on. The results of the screenings don’t tell us whether or not we have heart disease, but rather help the doctor (and us) determine if further tests are warranted. That’s what this watershed assessment does: It identifies potential problems that need further investigation.

How big is a watershed? For the purposes of this assessment, we have settled on watersheds of about 60,000 acres. We use the watershed boundaries established by the US Geologic Survey. (For those who are familiar with their system of delineating and coding the basins and watersheds in the United States, this assessment is aimed at “5<sup>th</sup> field” watersheds, which are usually between 40,000 and 120,000 acres.) The assessment procedures would not be valid for evaluating large river or ocean conditions, although it may be possible in the future to aggregate compatible data from adjacent watersheds within an ecoregion.

## ABOUT THE MANUAL

This manual is a rather thick, heavy document, because it contains so much information about watersheds and their processes. But don’t be discouraged by its size. The discussions, instructions, and procedures are well within the grasp of the average citizen interested in watersheds, water, and

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<sup>1</sup> Terms found in bold italic throughout the text are defined in the Glossary at the end of this Introduction.

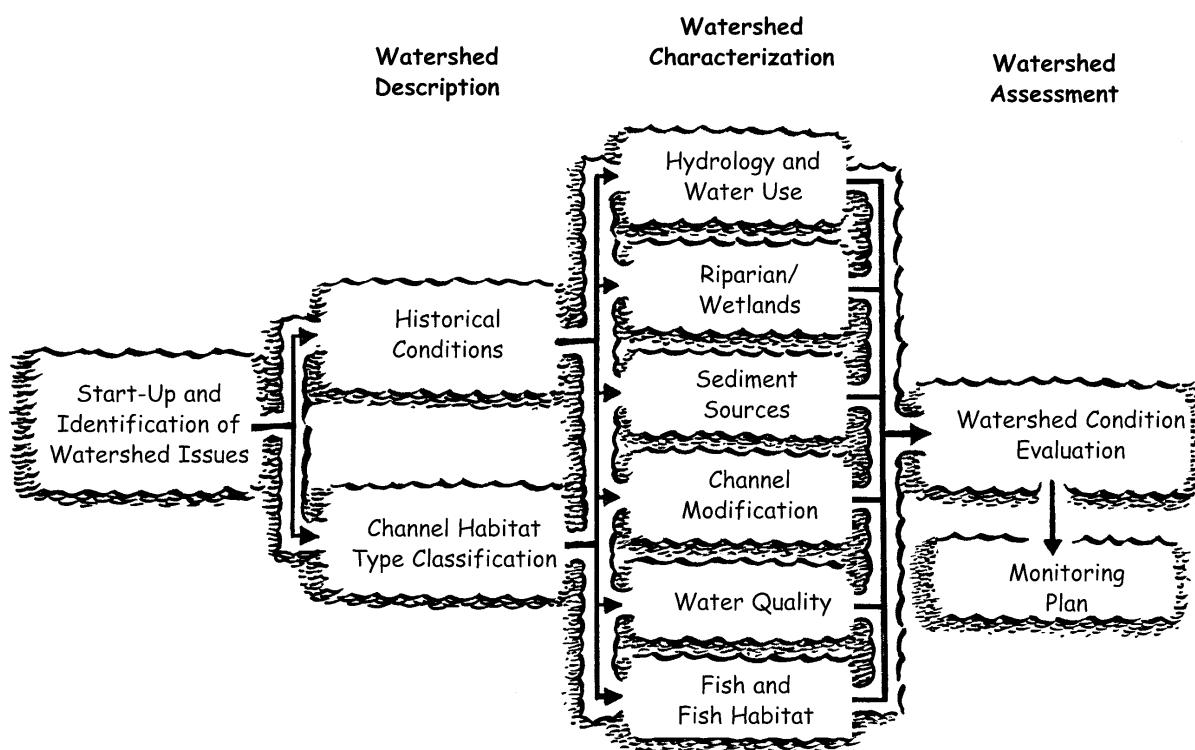
fish. In fact, the State of Oregon developed this manual specifically to help watershed councils navigate through an evaluation of their watersheds, especially those councils participating in the *Oregon Plan for Salmon and Watersheds*.

In addition, the manual is a valuable tool that can be used as:

1. A *textbook* to learn and teach about watersheds
2. A *cookbook* on how to compile and evaluate information about watersheds
3. A *reference* of procedures for watershed assessment

The manual is organized into three main sections:

1. An overview of *Watershed Fundamentals* that provide a background on watershed processes and ways human actions can change those processes. (Read through this section to build your mental muscles for thinking and talking about watersheds. Or, skip it for now and sneak back occasionally later on to review a hot topic under discussion).
2. A “*cookbook*” containing specific assessment components, illustrated in Figure 1. Each component can be completed separately and then brought together in a workshop format with a Watershed Technical Team.



**Figure 1.** The Watershed Assessment Manual is divided into components so that watershed councils can identify and use those components that meet their needs. Different people can work on different components at the same time.

3. A concluding *Watershed Condition Evaluation* and *Monitoring Plan*. These components bring it all together after the other components have been completed. With this effort, you'll make sense out of all the maps and information you've worked on to this point.

As mentioned above, the main body of the manual is divided into *components* (see Figure 1) so that watershed councils—and others who conduct the assessment—can plan and allocate their resources and time. Different people can work on different components at the same time.

1. The first component, *Start-Up and Identification of Watershed Issues*, sets the stage for the assessment, and helps the assessment team compile background information needed later in the assessment.
2. The next two components, *Historical Conditions* and *Channel Habitat Type Classification*, involve developing basic maps and gathering background information.
3. Then there are six procedural components for watershed characterization and assessment; these are the guts of the assessment, what makes it work.
4. Finally, the last two components, *Watershed Condition Evaluation* and *Monitoring Plan* bring it all together, revealing which areas need protection and which have high potential for restoring water quality and fish habitat.

Each component begins with a set of standard topics:

1. A list of *critical questions* to guide the approach used in each component and let you know what's coming
2. The *assumptions* behind the component and its procedures to help you understand what's going on
3. The *skills needed* to complete the component, to help you figure out who should be working on this part, and whether or not you'll need additional technical expertise

How many components will be needed for an assessment? *The manual was developed so that watershed councils could identify and use those components that meet their needs.* The number of components that will be used will depend on the watershed in question and on resources available to conduct the assessment. Small watersheds with a history of little human activity may require only a few components for an assessment, while larger, more complex watersheds will require more. Likewise, for watershed councils that are just getting started and have few resources, only a few essential components may be possible, just enough to give them an idea of what they need to do next. Other watershed councils, those that have been in existence for some time and have more resources, may be able to complete a full complement of the components they need (although not necessarily all the components in the manual) for their assessment. Our advice: Get organized first, identify your human resources for the assessment, and get advice from resource experts before you decide how many components to use in your assessment.

Where did all the information come from to develop the manual? Many references and sources of expertise were used. Scientists usually include the sources of information they use within the body

of their texts, but to maintain readability, the references used to develop this manual are shown at the end of each component.

Like any watershed assessment, the manual is a work in progress. We think we used the best current information available, but as new information becomes available, we'll be revising the manual. If you're using the manual to learn more about watersheds, or as a tool to teach others about watersheds, we hope you find it useful. If you are a member of a watershed council—using the manual as your guide, your cookbook, and your constant reference—we hope you wear it out soon. Good luck.

## GLOSSARY

**channel gradient:** The slope of the stream channel floor (or the water surface) with respect to the horizontal, measured in the direction of flow.

**channel confinement:** Ratio of bankfull channel width to width of modern floodplain. Modern floodplain is the flood-prone area and may correspond to the 100-year floodplain. Typically, channel confinement is a description of how much a channel can move within its valley before it is stopped by a hill slope or terrace.

**Channel Habitat Types (CHT):** Groups of stream channels with similar gradient, **channel pattern**, and **confinement**. Channels within a particular group are expected to respond similarly to changes in environmental factors that influence channel conditions. In this process, CHTs are used to organize information at a scale relevant to aquatic resources, and lead to identification of restoration opportunities.

**channel pattern:** Description of how a stream channel looks as it flows down its valley (for example, braided channel or meandering channel).

**ecoregion:** Land area with fairly similar geology, flora and fauna, and landscape characteristics that reflect a certain ecosystem type.