Component X
Watershed Condition Evaluation

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Component X
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INTRODUCTION

The Watershed Condition Evaluation will help you summarize the information collected in the other components of the assessment process. Using the process outlined in this component, you will accomplish all of the following:

1. Identify missing or unavailable information.
2. Summarize information collected for each of the manual components.
3. List issues that may require additional assessment or data-gathering.
4. Evaluate the condition of the aquatic–riparian system, fish populations, and water quality.
5. Describe watershed areas and issues that should be the focus for action, including habitat restoration/protection opportunities.

The condition evaluation process links summaries from each assessment component to the fish distribution and Channel Habitat Type (CHT) information. The final products will include a table summarizing key findings from each of the manual components and a map showing the distribution of factors limiting productive aquatic habitat, fish populations, and water quality. Appendix X-B provides an example of products from a completed watershed conditions evaluation.

The watershed condition evaluation process will help the watershed council understand how past and current resource management and land uses are impacting aquatic resources. This process will conclude with a list of general issues and specific areas in the watershed that should be priorities for action, including protecting key areas and restoring areas of degraded habitat. For example, actions that will protect existing healthy fish populations or high-quality habitat will typically be ranked as a higher priority than activities to restore degraded habitats in other portions of the watershed.

Critical Questions

1. What are the information and data gaps identified in the assessment process?
2. What were the historical conditions of the aquatic–riparian areas within the watershed?
3. What are the historical changes (legacies), and land uses and resource management trends, that have contributed to impacts in habitat quality, and fish presence and abundance?
4. What ongoing resource management/land use activities are contributing to continued impacts on the watershed resources?
5. What are important issues and key aquatic–riparian areas that need to be addressed to restore and protect watershed resources?

Assumptions

- The cumulative effects of human activities across the watershed and through time have had an impact on the aquatic habitat, fish populations, and water quality (see What Are Cumulative Effects? sidebar, below).

Materials Needed

- Project Base Map or Mylar overlay the size of the Base Map (from Start-Up and Identification of Watershed Issues component)
- Sharp pencil, colored pencils, thin permanent markers (optional: colored adhesive dots)
- The summary tables and maps from the assessment components

Necessary Skills

Evaluating the condition of a watershed is not an easy or straightforward process. It will take time to review and understand the products from each assessment component. It takes careful consideration to integrate the assessment results and determine how resource use through time is interacting with watershed processes. It is important to keep in mind that there is no easy way to complete this evaluation and it will, at times, be difficult to interpret the results. Watersheds are complicated systems, and you can never fully understand how all of the processes and management activities will interact. This complexity makes it important to involve a wide range of perspectives when evaluating the conditions in a watershed. In addition to all of the analysts directly responsible for the assessment components, the project manager should include in the evaluation process a range of key individuals, including watershed council representatives, landowners, and resource management personnel. **It is recommended that technical specialists who have expertise in each of the assessment components review the assessment results and the watershed condition evaluation.**

WHAT ARE CUMULATIVE EFFECTS?

Cumulative effects can be defined as the changes to the environment caused by the interaction of natural ecosystem processes with the impacts of human activities, distributed across the watershed and through time. According to this definition, individual actions that are relatively minor in isolation may disrupt the function of the watershed when coupled with other impacts depending on where and when they occur.

This assessment addresses the location of human activities through a mapping process. The map products illustrate the relationship between factors limiting productive habitat/water quality and the CHTs. The assessment addresses how the watershed has been affected by changes through time by identifying and mapping the following: (1) historical activities that may have resulted in ongoing channel habitat modification (for example, splash dams and channelization), and (2) current activities that limit productive fish populations or habitat (for example, riparian management that is resulting in reduced wood inputs to stream channels).

Final Products of the Watershed Condition Evaluation

- Summary of data and missing assessment pieces (Form CE-1)
- A table summarizing important assessment results, and recommended further assessment or monitoring needs for each subwatershed (Form CE-2)
- A map showing resource condition and management/land use impacts associated with fish use and CHTs
- A table describing key issues for each subwatershed, and listing recommended restoration actions and monitoring needs (Form CE-3)
- A map depicting the locations of recommended restoration actions

METHODS

The watershed condition evaluation is completed with the steps illustrated in Figure 1. The final evaluation focuses on summarizing the key historical and current factors that influence fish habitat and water quality. This information is used, in consultation with key stakeholders in the watershed, to identify opportunities for habitat protection and restoration.

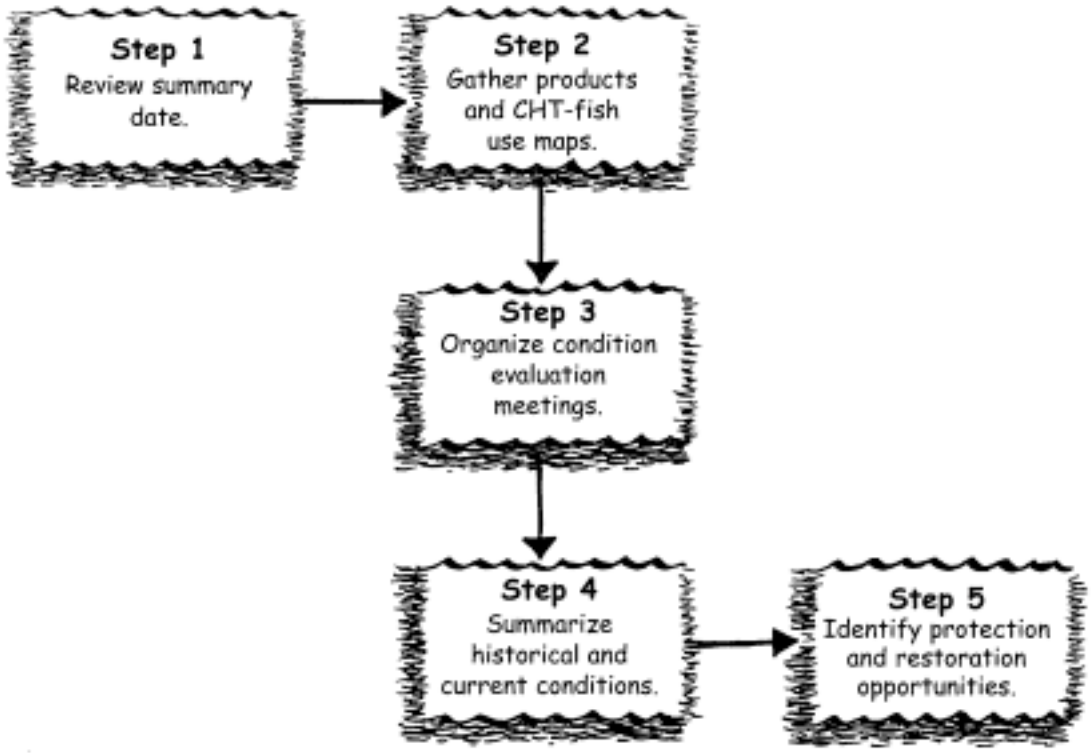

Figure 1. This flow chart illustrates the steps used to complete the watershed condition evaluation, which focuses on summarizing the key historical and current factors that influence fish habitat and water quality.

Step 1: Review Summary Data and Identify Missing Pieces

The project manager will be responsible for compiling and reviewing all of the assessment information. Form CE-1 (Appendix X-A) lists the summary products from each assessment component, which are necessary to complete the watershed condition evaluation. Check that each form from the assessment has been completely filled out, and then check off the form in the checklist. If there are notes on any of the forms, be sure to read these and determine if there are any problems or circumstances that need to be considered in this overall evaluation. Pay special attention to the Confidence Evaluation forms—these should identify data gaps, additional information that may be collected, and recommended monitoring. Information gaps and recommendations for further analysis/monitoring will be summarized and used in the Monitoring Plan component. Complete Form CE-2, which summarizes the assessment results, data gaps, and monitoring recommendations. This information will help you develop a monitoring plan.

Step 2: Gather Assessment Products and Produce Channel Habitat–Fish Use Map

The completed assessment provides two types of information that will be used to evaluate the condition of the watershed. Sort out the information gathered from the assessment components into these two categories:

1. A *characterization* of resources and human uses that describes the watershed, how it functions, asnd how it has changed through time.

2. An *assessment* of the current status of important watershed resources.

The characterization and assessment products are as follows:

Characterization Products

- Watershed Setting—ecoregion information
- Watershed Description—land uses, tributaries, stream miles, watershed hydrology
- Channel Habitat Types and Distribution
- Historical Characterization
- Channel Modification Map
- Location of Wetlands
- Fish Distribution
- Road Network
- Landslide Maps

Assessment Products (listed on Form CE-1)

- Channel Modification—degree of impact interpretation
- Riparian Conditions
- Fisheries Habitat Data Summaries
- Fish Migration Barriers
- Water Quality Status
- Water Use Impacts
- Land Use Impacts on Hydrology
- Sediment Sources

It is important to come to the watershed condition evaluation meeting with all of the results from the assessment components, including summary tables and maps. Maps will help illustrate the issues in the watershed and show where possible impacts may be associated with areas of fish use and important aquatic–riparian habitat.

To provide an overview of channel habitat and fish use associations, combine the information from the Channel Habitat Type and Fish Use Distribution maps on the Base Map. This "Channel Habitat–Fish Use Map" will provide the base for mapping issues that are impacting fish habitat/water quality, and will show proposed watershed action opportunities.

Step 3: Organize Watershed Condition Evaluation Meetings

The assessment information and maps will be used to summarize the condition of the watershed. The final evaluation of the watershed's condition should be done through extensive consultation with key stakeholders, including all of the individuals responsible for the assessment, council members, landowners, resource managers, and government agency personnel. It is suggested that the assessment team organize a meeting (or series of meetings) at which the assessment results can be discussed. These meetings provide an interactive opportunity for analysts to tell what they learned about the watershed, for them to ask questions of each other, and for others who live and work in the watershed to provide their insights. These meetings will take one to several days; be sure to keep the meeting format informal and allow plenty of time for discussion.

Step 4: Summarize Historical and Current Watershed Conditions

The condition evaluation meetings will provide the information to fill out Form CE-2. This table is used to concisely summarize the results from each assessment component, including information gaps that will require further assessment or monitoring. You should make copies of this form and fill it out for each subwatershed; in this way you will obtain information on how one subwatershed differs from other subwatersheds in the entire watershed. The form includes the questions from each assessment component to help guide the discussions and highlight areas that should be summarized.

The questions on Form CE-2 provide guidance on issues that should be placed on the Channel Habitat–Fish Use Map. The condition evaluation meetings will provide a forum for participants to discuss and map historical resource management and land use issues that are impacting aquatic–riparian habitat, fish populations, and water quality. Placing these impacts on the Channel Habitat

Type–Fish Use Map provides an overview of where and how activities through time may be limiting habitat quality, fish productivity and ranges, and the maintenance of water quality.

The watershed condition evaluation process will provide information that will characterize conditions that are not conducive to supporting native fish and the maintenance of water quality. It is important to examine the different subwatersheds to identify the range of issues. For example, some subwatersheds will have limited fish use and water quality, while other subwatersheds will support a high diversity of fish species and high water quality. While it is important to examine all areas in the watershed, special emphasis should be placed on stream channels that are responsive to inputs of sediment and wood (See the Channel Habitat Type Classification component). For example, low-gradient stream channels with floodplains provide critical habitat for salmonids; these habitats are sensitive to watershed-wide disturbance.

Step 5: Identify Watershed Protection and Restoration Opportunities

The summarized watershed conditions are used to identify issues and areas in the watershed that should be priorities for action. By using the guidance outlined below, you will be able to place the watershed condition evaluation results into three groupings:

1. Areas with relatively high-quality aquatic–riparian habitat, fish populations, or water quality conditions

2. Areas with low-quality aquatic–riparian habitat, limitations on fish presence or production, or water quality concerns; the impacts and sources are identified

3. Areas where the aquatic–riparian condition, fish populations, or water quality cannot be accurately determined and/or the links to impacts are not clear

All of this information can be used in the development of a watershed action plan that describes how your council will address issues identified in the assessment. The following guidance provides a framework that can help you plan for watershed restoration actions. The assessment results will give you an idea of the issues that are important in your watershed and general areas in which to focus projects. Implementing watershed protection or restoration projects will require more detailed evaluation, usually involving field investigations.

Action Opportunity 1

Protect stream reaches that are in relatively good condition.

Protecting aquatic–riparian habitat that is supporting good habitat, healthy fish populations, and has good water quality is an excellent strategy. It is usually much more efficient and less costly to protect an area that is functioning in a healthy way than it is to restore conditions once they have been degraded. Protection of watershed resources can be accomplished through many different approaches, including encouraging good stewardship of private lands. Other methods that watershed councils have employed to protect high-quality habitat include conservation easements and land acquisitions.

Determining what portions of the watershed warrant protection is based on a synthesis of information on water quality, fish populations, and channel habitat condition, and requires answering a number of questions. Is the area of interest:

1. Meeting or exceeding water quality standards?
2. Supporting healthy populations of native fish?
3. Characterized by high-quality channel and/or riparian habitat?
4. Protected by existing planning or regulatory requirements?

Action Opportunity 2

Restore stream reaches with habitat or fish populations that are currently in degraded condition but have the potential to support high-quality habitat and fish populations.

This category provides a working list of stream reaches for which passive and active restoration should be considered. Passive restoration involves stopping an action that is contributing to limited fish populations (such as using culverts that do not support fish passage) or poor channel habitat, or is linked to water quality problems. An example of a passive restoration strategy is limiting grazing in a riparian area where there are obvious impacts on the vegetation and the stream reach has elevated water temperatures. Over time, with the removal or reduction of grazing, the riparian vegetation should recover. Active restoration involves manipulating or modifying stream or riparian habitat. An example of an active restoration strategy is planting riparian trees to increase shade and placing logs in the channel to improve habitat complexity.

Determining the type of restoration project for each watershed location requires answering some key questions:

1. Where is the location of the stream reach with fish population limitations, or degraded habitat or water quality?

   Information on the location should include important data for interpreting the potential quality of the site, such as CHT.

2. What is the habitat or water quality issue for the reach?

   Issues can include, for example, one or a combination of factors, such as high-quality fish habitat that is blocked by barriers, high water temperatures, limited wood in the channel, limited riparian shade, excessive sediment, and others.

3. What are the factors that are contributing to degraded habitat or water quality?

   Factors can include, for example, culverts, streamside roads, vegetative removal, urbanization, and others. It is important to note whether the issue contributing to the impact is adjacent to the area, upstream (for example, water pollution contributed by a source several miles upstream), or up the hill slope (for example, a road that is contributing excessive sediment to the stream).

4. What is the best strategy for addressing the factors that are contributing to the problem?

For example, the restoration strategy should evaluate whether to pursue passive or active restoration, or some combination of the two. Whether to adopt a passive or active restoration approach requires that you think about the rates of recovery for the system. For example, a riparian area impacted by grazing may recover in a decade, while a stream channel that has lost boulders from log drives and blasting will probably take centuries to recover habitat-forming structures. There will be conditions (e.g., some urban situations) in which the factors contributing to the problem are so severe and pervasive (e.g., extensive pavement of riparian areas) that restoration should not be pursued in that area, especially if there are other opportunities for restoration in the watershed.

Action Opportunity 3

Survey stream reaches where there is insufficient data to assess stream habitat quality or fish population status.

It is important to identify those areas where more investigation is necessary to provide a clear picture of fish population limitations, habitat conditions, or water quality for a stream reach. Additional information should be collected for those stream reaches where conditions are known but the factors contributing to the problem are not. For example, information should be collected for those stream reaches that have potentially high-quality habitat (for example, low-gradient, unconstrained reaches) but where there are no data on fish populations and/or habitat quality.

Identifying portions of the watershed with limited information can help in developing a plan for implementing monitoring projects and field assessments.

Step 6: List Action Issues and Map Watershed Protection and Restoration Opportunities

The information from Step 5 should be used—in consultation with technical specialists, the watershed council, and key stakeholders—to help guide the initial listing of issues and restoration action opportunities for your watershed. Use Form CE-3, Identification of Watershed Issues and Action Opportunities, to describe watershed issues and list protection and restoration needs for each subwatershed. The form also includes space for listing areas that require field monitoring or assessment in order to gage aquatic–riparian habitat quality, fish populations, or water quality. Appendix X-B contains examples of completed forms describing watershed issues and action opportunities.

Use the following guidance when filling out Form CE-3.

Subwatershed: Name of the subwatershed.

Location: Describe the location of the area or steam segment that is the focus of the summary.

Map symbol: It is important to locate and draw the action opportunity area on a base map for the watershed. This map will provide a general overview of action opportunities in the watershed and can be used for guiding the field investigations that are necessary for developing the detailed project plan.

Channel Habitat Type: If appropriate, list the Channel Habitat Type (or types) for the stream area summarized in the form.

Stream size: If appropriate, list the stream size (or sizes) for the stream area summarized in the form.

Fish use: If appropriate, list the resident and anadromous fish use for the stream area summarized in the form.

Summary: In one sentence, concisely summarize the watershed issue or opportunity.

Habitat/water quality concerns: Concisely describe the issues and concerns for the area or stream reach summarized by the table. Describe all of the relevant factors, such as resource management over time, characteristics of the hydrology, erosion and sediment sources and impacts, floodplain and riparian conditions, historical fish use, fish passage issues, channel habitat quality, water quantity, water quality, and others.

Contributing factors: List the factor (or factors) that are limiting fish production, aquatic/riparian habitat, or the maintenance of water quality. If the factors are not known, list "unknown," which will provide guidance for further investigation.

Recommendation: Describe any recommended actions that will address the factors limiting fish production, aquatic–riparian habitat, or the maintenance of water quality. If there is insufficient information to make a recommendation on a protection or restoration approach, then describe the need for further investigation.

Monitoring/assessment needs: Describe any field monitoring or assessment work that should be completed to understand the nature of the issue or contributing factors. This information will be used to plan field investigations necessary to guide detailed project planning, or to provide background information that will be used in the Monitoring Plan component.

REFERENCES

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Kauffman, J.B., R.L. Beschta, N. Otting, and D. Lytjen. 1997. An Ecological Perspective of Riparian and Stream Restoration in the Western United States. Fisheries 22(5):12-24.

Federal Interagency Stream Restoration Working Group. 1999. Stream Corridor Restoration: Principals, Processes, and Practices. USDA, Natural Resources Conservation Service, Washington, DC Pacific Rivers Council. 1996. A Guide to the Restoration of Watersheds and Native Fish in the West. 2nd edition. Pacific Rivers Council, Eugene, Oregon.

Williams, J.E., C.A. Wood, and M.P. Dombeck, editors. 1997. Watershed Restoration: Principles and Practices. American Fisheries Society, Bethesda, Maryland.

Appendix X-A
Blank Forms

Form CE-1: Checklist of Assessment Component Summary Products

Form/ Map	Title	√
Historic Conditions		
	Historical Condition Report	
CHT Classification		
Form CHT-1	Channel Habitat Type Field Verification	
Form CHT-2	CHT Summary Sheet	
Form CHT-3	Confidence Evaluation for the CHT Classification	
Map CHT-1	Channel Segments	
Map CHT-1	Preliminary Channel Habitat Types	
Map CHT-1	Final Channel Habitat Types	
Hydrology and Water Use		
Form H-1	General Watershed Characteristics	
Form H-2	Land Use Summary	
Form H-3	Annual Peak Flow Summary	
Form H-4	Forestry Worksheet	
Form H-5	Agriculture and Range Land Worksheet	
Form H-6	Forest and Rural Road Worksheet	
Form H-7	Urban and Rural Residential Worksheet	
Form H-8	Hydrologic Issue Identification Summary	
Map H-1	Potential Risks of Land Use on Hydrology	
Form WU-1	Water Rights Summary	
Form WU-2	Water Availability Summary	
Form WU-3	Consumptive Use Summary	
Map WU-1	Water Rights and In-Stream Flow Rights	
Form HW-1	Confidence Evaluation for Hydrology and Water Use	
Riparian/Wetland Conditions		
Form R-1	Riparian Condition Unit Information: This will be most helpful at this point of the process if it is in a spreadsheet format that can be queried as the team develops the Watershed Condition Evaluation Summary.	
Form R-2	Riparian Recruitment Situation Description	
Form R-3	Confidence Evaluation for Riparian Conditions	
Map R-1	Riparian Condition Unit map	
Map R-2	Riparian Recruitment Situations Map	
Map R-3	Riparian Shade Map	
Form W-1	Wetland Attributes	
Form W-2	Confidence Evaluation for Wetlands Assessment	
Form W-3	Wetland Functions Table (optional)	
Map W-1	Wetland Locations	
Sediment Sources*		
Form S-1	Screen or Sediment Topic Sources in a Watershed	
Form S-2	Information on Existing Road-Related Instability	

* Review the sediment source screen to determine which potential sources were evaluated in the sediment source assessment; also obtain the associated maps.

Form CE-1: page 2.

Form/ Map	Title	√
Sediment Sources* (continued)		
Form S-3	Culvert Capacity and Risk for Large Amounts of Sediment Entering Stream	
Form S-4	High-Risk Road Segments for Existing Roads	
Form S-5	Summary of Information on Road Instability	
Form S-6	Current Landslides Not Related to Roads	
Form S-7	Potential for Debris Flows	
Form S-8	Summary of Information on Slope Instability (not related to roads)	
Form S-9	Basic Information on Road Segments Close to Streams With Steep Slopes	
Form S-10	Summarized Runoff-Related Information for a Single Road	
Form S-11	Summary of Information on Road Runoff - Basic Assessment	
Form S-12	Information on Urban Runoff Polygons	
Form S-13	Database for Tracking Field Observations and Mapped Information on Crop Land and Range Land	
Form S-14	Summary of Crop Land and/or Range Land, Grazing Erosion Observations	
Form S-15	Database for Tracking Field Observations and Mapped Information on Burned Areas	
Form S-16	Summary Of Areal Extent Of Erosion Classes Within Burns	
Form S-17	Confidence Evaluation for Sediment Sources Assessment	
Channel Modification		
Form CM-1	Channel Modification Inventory Form	
Form CM-2	Channel Modification Summary	
Form CM-3	Confidence Evaluation for Channel Modification Assessment	
Map CM- 1	Channel Modification Map (showing current and historic modifications)	
Water Quality		
Form WQ-1	Beneficial Uses and Water Quality Issues	
Form WQ-2	Summary of Percent Exceedance Criteria	
Form WQ-3	Summary of Water Quality Impairment	
Form WQ-4	Confidence Evaluation for Water Quality Assessment	
Fish and Fish Habitat		
Form F-1	Fisheries Information Summary	
Form F-2	Habitat Condition Summary	
Form F-3	Fish Passage Summary	
Form F-4	Confidence Evaluation Form for Fisheries Assessment	
Map F-1a	Resident Fish Distribution	
Map F-1b	Anadromous Fish Distribution	
Map F- 2	Migration Barrier Identification Map	

Form CE-2: Summary of Key Findings by Assessment Component

Watershed: **Page _____of_____**

Analyst's Name: **Date:**

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Historical Conditions • What were the characteristics of the watershed's resources at the time of European exploration/settlement? • What are the historical trends and locations of land use and other management impacts in the watershed? • What are the historical accounts of fish populations and distribution? • Where are the locations of historic floodplain, riparian area, channel, and wetland modifications, and what was the type and extent of the disturbance?			

Form CE-2: page 2.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Channel Habitat Type Classification • What is the distribution of CHTs throughout the watershed? • What is the location of CHTs that are likely to provide specific aquatic habitat features, as well as those areas which may be the most sensitive to changes in watershed condition?			

Form CE-2: page 3.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Hydrology and Water Use • What land uses are present in your watershed? • What is the flood history in your watershed? • Is there a probability that land uses in the basin have a significant effect on peak flows? • Is there a probability that land uses in the basin have a significant effect on low flows? For what beneficial use is water primarily used in your watershed? • Is water derived from a groundwater or surface-water source? • What type of storage has been constructed in the basin? • Are there any withdrawals of water for use in another basin (interbasin transfers)? Is any water being imported for use in the basin? • Are there any illegal uses of water occurring in the basin? • Do water uses in the basin have an effect on peak flows? • Do water uses in the basin have an effect on low flows?			

Form CE-2: page 4.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Riparian/Wetlands • What are the current conditions of riparian areas in the watershed? • How do the current conditions compare to those potentially present or typically present for this ecoregion? • How can the current riparian areas be grouped within the watershed to increase our understanding of what areas need protection and what the appropriate restoration/enhancement opportunities might be? • Where are the wetlands in this watershed? • What are the general characteristics of wetlands within the watershed? • What opportunities exist to restore wetlands in the watershed?			

Form CE-2: page 5.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Sediment Sources • What are important current sediment sources in the watershed? • What are important future sources of sediment in the watershed? • Where are erosion problems most severe and qualify as high priority for remedying conditions in the watershed?			

Form CE-2: page 6.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Channel Modification • Where are channel modifications located? • Where are historic channel disturbances, such as dam failures, splash damming, hydraulic mining, and stream cleaning, located? • What CHTs have been impacted by channel modification? • What are the types and relative magnitude of past and current channel modifications?			

Form CE-2: page 7.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Water Quality • What are the designated beneficial uses of water for the stream segment? • What are the water quality criteria that apply to the stream reaches? • Are the stream reaches identified as water quality limited segments on the 303(d) list by state? • Are any stream reaches identified as high-quality waters of Outstanding Resource Waters? • Do water quality studies or evaluations indicate that water quality has been degraded or is limiting the beneficial uses?			

Form CE-2: page 8.

Assessment Component Questions	Summary of Key Findings (impacts/changes in ecosystem, processes affecting habitat quality/quantity, fish populations, water quality)	Missing or Incomplete Information	Locations of Impacts Currently Constraining Habitat, Populations, or Water Quality (add locations to map)
Fish and Fish Habitat • What fish species are documented in the watershed? Are any of these currently state- or federally listed as endangered or candidate species? Are there any fish species that historically occurred in the watershed which no longer occur in the watershed? • What is the distribution, relative abundance, and population status of salmonid species in the watershed? • Which salmonid species are native to the watershed, and which have been introduced to the watershed? • Are there potential interactions between native and introduced species? • What is the condition of fish habitat in the watershed (by sub-basin) according to existing habitat data? • Where are potential barriers to fish migration?			

Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: **Page ____of_____**

Analyst's Name: **Date:**

Subwatershed:	
Location:	
Map symbol:	
Channel habitat type:	
Stream size:	
Fish use:	
Summary	
Habitat/water quality concerns	
Contributing factors	
Field observations	
Recommendation	
Monitoring/ assessment needs	

Appendix X-B
Examples of Watershed Issues and Action Opportunities

EXAMPLES OF WATERSHED ISSUES AND ACTION OPPORTUNITIES

The Big River watershed is a 60,000-acre watershed characterized by forest management in the headwaters and agricultural land uses along the river and the lower tributary valleys. The valley areas along Big River and most of the larger tributaries were cleared of trees in the 1880s when the area was homesteaded. There is one small town, Elk City, in the upper portion of Big River and some growing suburban developments in the lower watershed. Most of the stream channels start in steep headwater areas, with the tributary streams occupying low-gradient narrow valleys with limited floodplain development. Anadromous fish use in the watershed includes chinook salmon in the Big River and lower tributaries, coho salmon, and steelhead trout in most of the larger tributaries. Resident fish include rainbow and cutthroat trout.

Figure X-1 (page 2) is a map illustrating the Big River watershed, including subwatersheds, channel habitat types, and example stream segments used to illustrate watershed issues and opportunities (see the Example Form CE-3).

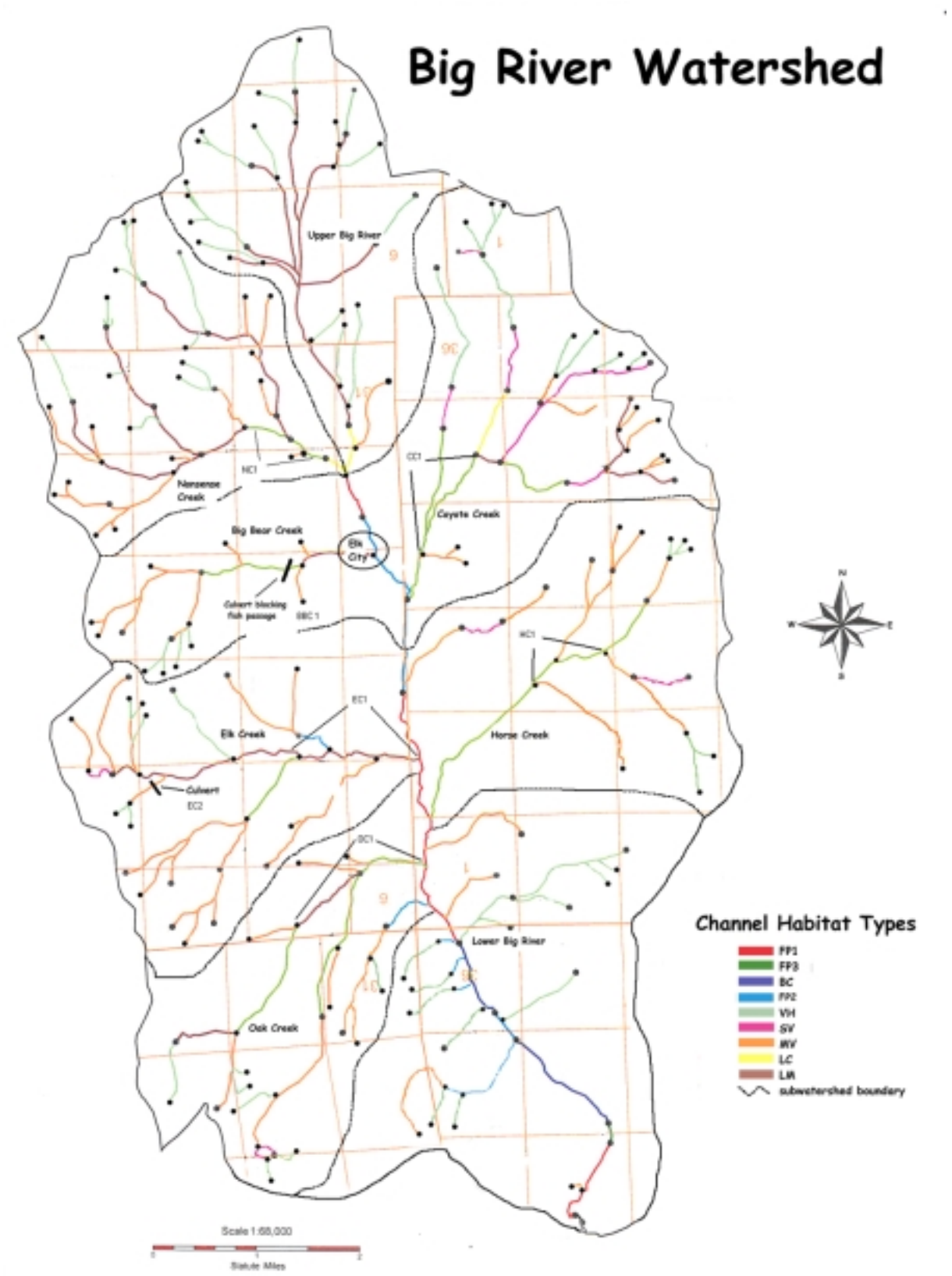

Figure X-1. This example map illustrates the Big River watershed, including its subwatersheds and CHTs. Example stream segments show watershed issues and opportunities.

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 1 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Elk Creek***
Location:	Cedar Creek upstream from FS road 1292
Map symbol:	EC2
Channel habitat type:	MV: Moderately steep narrow valley channel
Stream size:	Small
Fish use:	Cutthroat trout
Summary	Impassable culvert is preventing upstream movement of cutthroat trout.
Habitat/water quality concerns	The culvert has a 3-foot drop onto bedrock with no jump pool. It appears that fish cannot move upstream, although there is a population (perhaps isolated) of cutthroat trout above the culvert. The stream above the culvert has about 0.25 miles of marginal fish habitat (shallow pools, little wood) and then the gradient of the stream increases to 10 percent and fish use ends. The culvert appears to be adequately sized to pass peak flows.
Contributing factors	Culvert on FS Road 1292 is a fish passage barrier.
Field observations	Culvert information, including fish habitat data above and below, were collected by a forest service crew on Aug. 23, 1996. The upper-extent fish use information was collected by an ODFW crew on May 2, 1997.
Recommendation	Because there is very little fish habitat above this culvert, this is not a high priority for council action at this time. The council should encourage the landowner to replace the culvert next time there is forest management in the area.
Monitoring/ assessment needs	None

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 2 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Big Bear Creek***
Location:	Upstream from county road 33
Map symbol:	BBC1
Channel habitat type:	FP3: Low gradient small floodplain, unconfined channel
Stream size:	Medium
Fish use:	Cutthroat trout and sculpin, potential coho
Summary	Impassable culvert is preventing passage of coho salmon into this section of stream.
Habitat/water quality concerns	The culvert has a 3 foot drop onto bedrock with no jump pool. It appears that fish cannot move upstream, although there is a population (perhaps isolated) of cutthroat trout above the culvert. The stream above the culvert has about 0.25 miles of marginal fish habitat (shallow pools, little wood) and then the gradient of the stream increases to 10 percent and fish use ends. The culvert appears to not be adequately sized to pass peak flows.
Contributing factors	Impassable culvert on county road 33 at mile post 14.
Field observations	Culvert information, including fish habitat data above and below, were collected by a county crew on Sept. 10, 1997.
Recommendation	Consider consulting with agency personnel to replace this culvert with a bridge or another culvert that is appropriate for peak flows and fish passage.
Monitoring/ assessment needs	If possible, monitor fish passage after the culvert is replaced.

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 3 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Elk Creek***
Location:	Lower 2 miles
Map symbol:	EC1
Channel habitat type:	LM: low gradient moderately confined channel
Stream size:	Large–medium
Fish use:	Steelhead and rainbow trout
Summary	Large amounts of sediment have been deposited on the channel bottom throughout this section.
Habitat/water quality concerns	Elk Creek passes through farms for the first mile and then drains private forest lands. In comparison to similar streams in this area, there appears to be large amounts of fine sediments deposited on the channel bottom, sometimes filling up shallow pools. Historically, this was a very productive steelhead stream, with population counts decreasing dramatically over the last 10 years. This section of stream has fair fish habitat, though somewhat entrenched. It is not known where the sediments are coming from; the increase in sediments has been noted to corresponded to the increased truck traffic over the last two years. There may be increased turbidity associated with the sedimentation.
Contributing factors	Not know at this time, although road-related sediment is suspected.
Field observations	Sediment deposits were noted in the 1997 ODFW stream habitat survey.
Recommendation	Assess the roads in the area to determine if they are contributing fine sediments.
Monitoring/ assessment needs	Monitor turbidity levels, especially during wet-weather truck traffic on the roads. Assess roads for delivery of sediment. (*See turbidity parameter in Appendix XI-A, Component XI.*)

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 4 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Oak Creek***
Location:	Lower 2 miles
Map symbol:	OC1
Channel habitat type:	LM-FP3: low gradient moderately confined, and small floodplain, unconfined
Stream size:	Large–medium
Fish use:	Cutthroat trout and juvenile chinook salmon rearing
Summary	Land uses in the area contribute to lack of wood in the channel and increases in peak flows, which is resulting in channel entrenchment.
Habitat/water quality concerns	This section of Oak Creek passes through a suburban area, with many homes bordering the stream. Channel simplification due to the channel incision caused by the various land uses (suburban along the stream and urban in the tributaries) and lack of wood in the channel have resulted in this section being very sensitive to increases in peak flows. The channel cannot dissipate stream flow energy during storms, resulting in further confinement of the channel. Historically, this channel was moderately confined. Planned housing developments in the watershed will result in further increases in peak flows more removal of riparian vegetation.
Contributing factors	Lack of wood in the channel due to removal of riparian trees and increases in peak flows resulting in channel incision.
Field observations	Channel entrenchment, stream wood counts, and riparian vegetation noted in 1998 student survey.
Recommendation	Work with the city to control future storm water discharges; identify areas for riparian improvement projects.
Monitoring/ assessment needs	None

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 5 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Coyote Creek***
Location:	Lower 1.5 miles
Map symbol:	CC1
Channel habitat type:	FP3: Low gradient small floodplain, unconfined channel
Stream size:	Large–medium
Fish use:	Coho salmon, cutthroat and steelhead trout
Summary	There is very little information on the habitat quality and fish use for this stream section.
Habitat/water quality concerns	According to 1939 Fish Commission reports, Coyote Creek supported large numbers of spawning coho salmon and some steelhead. There are no recent surveys of stream habitat or fish use in this stream. The assessment information, based on maps and aerial photographs, appears to indicate the potential for high-quality fish and wildlife habitat: low-gradient channel, with a small floodplain and some large riparian conifers. This area was recently proposed for a recreational development, including building small cabins in potential floodplain habitat.
Contributing factors	No information.
Field observations	There are no recent fish or habitat surveys of the area. Floyd Jones, a landowner on Big Bottom Creek, said that he saw spawning coho in this section of the stream in 1997.
Recommendation	This area should be a high priority for field assessments of habitat quality and fish use.
Monitoring/ assessment needs	Assess channel and riparian habitat using ODFW protocols. Determine the upper extent of fish use and conduct snorkel surveys to assess use by salmonids, including juvenile coho and steelhead.

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 6 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Big River***
Location:	Lower 10 miles between the mouth and Elk City
Map symbol:	Red line along lower Big River
Channel habitat type:	Variable
Stream size:	Large
Fish use:	Cutthroat trout, rainbow trout, steelhead, coho and chinook salmon
Summary	There are indications that of *E. coli* bacteria levels may exceed state standards.
Habitat/water quality concerns	During a rainstorm in 1996, the high school collected water quality grab samples from Big River at the mouth and just above Elk City. All of the water quality parameters were normal with the exception of *E. coli* bacteria. The *E. coli* counts were 30/100 ml above Elk City and 800/100 ml at the mouth. No other samples have been collected. The land uses in the watershed, especially below Elk City, are primarily farms and pastures with livestock. There are increasing numbers of homes and hobby farms. A recent Council of Government study found that the soils in the lower watershed have a high potential for septic tank failure and recommended limits on new septic tanks.
Contributing factors	Not determined at this time, although a combination of septic tanks and farm animals may contribute to the increased *E. coli* counts.
Field observations	The only known *E. coli* samples were collected in 1996.
Recommendation	Monitor *E. coli* counts and assess possible causal factors such as leaky septic tanks and/or contributions from livestock.
Monitoring/ assessment needs	Using DEQ protocols, monitor *E. coli* counts during rain events at a range of sites along Big River and at key tributaries to assess major source areas. (*See E. coli parameter in Appendix XI-A, Component XI.*)

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 7 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Horse Creek***
Location:	The 1-mile section between Fly Creek and Knot Creek
Map symbol:	HC1
Channel habitat type:	FP3: Low gradient small floodplain, unconfined channel
Stream size:	Medium
Fish use:	Cutthroat trout and coho salmon
Summary	This section, which has the potential for high quality habitat, lacks habitat complexity, especially wood in the channel.
Habitat/water quality concerns	Horse Creek supports relatively large numbers of spawning coho salmon, with most of the production in the upper watershed on Forest Service land. Historically (based on a 1939 Fish Commission survey), this section of the stream had good habitat, with a low-gradient channel, abundant side-channels, and large amounts of wood in the stream. Wood was removed from this section of channel in repeated operations between 1946 to 1972. Aerial photos from this period show that almost all of the trees along the stream were removed, which limited recruitment of wood to the stream. Information from recent habitat surveys in this section show that there is very little complex habitat, with few deep pools and almost no side-channels, which limits winter rearing habitat for juvenile coho salmon. The riparian trees are mostly 25-year-old conifers, so there is little riparian vegetation improvement potential.
Contributing factors	Wood removal from the channel and little potential for short-term recruitment of large trees into the channel.
Field observations	Stream and riparian habitat information is from a 1995 ODFW survey. There are annual spawning surveys on the Forest Service land in the upper portion of the watershed.
Recommendation	Investigate, in consultation with ODFW and other agencies, the potential for placing large wood in the channel to improve habitat.
Monitoring/ assessment needs	Field assessments will be necessary to assess restoration potential.

Example Form CE-3: Identification of Watershed Issues and Action Opportunities

Watershed: Big River **Page 8 of 8**

Analyst's Name: Steve Jones **Date: 3/19/99**

Subwatershed:	***Nonsense Creek***
Location:	Lower 1.3-mile section
Map symbol:	NC1
Channel habitat type:	FP3: Low gradient small floodplain, unconfined channel
Stream size:	Large – medium
Fish use:	Cutthroat and rainbow trout
Summary	There is very little riparian vegetation along this section and high water temperatures have been observed.
Habitat/water quality concerns	This portion of Nonsense Creek flows through farm lands, with a mixture of crops and grazing. The upper watershed is forested. This stream has a good population of rainbow trout. Historical information indicates that the lower watershed was densely forested until land was cleared for homesteads in the 1880s. Information from current aerial photos and a recent stream habitat survey all indicate that there is very limited cover over the stream and few riparian trees. The stream habitat survey noted water temperatures in this section of stream as high as 72 degrees F in August. There is no other water temperature information. As far as can be determined, there is limited water removal from the stream, with most of the water rights in the lower 0.5 miles of the stream.
Contributing factors	Not determined at this time, but limited riparian cover over the stream (and possibly water removal) may be contributing to increases in water temperatures.
Field observations	Stream and riparian habitat information and water temperature data are from a 1997 ODFW survey.
Recommendation	Characterize current water temperature patterns in the watershed and assess riparian canopy cover over the stream. Assess possible grazing and other management impacts on riparian vegetation. Use this information and data on to determine the potential for riparian restoration projects with willing landowners. The riparian projects can use, where appropriate, riparian fencing and tree planting.
Monitoring/ assessment needs	Using DEQ monitoring protocol, monitor water temperatures at key locations in the watershed and assess water use patterns. *(See temperature parameter in Appendix XI-A, Component XI.)*