Pacific Northwest Rivers Study

Assessment Guidelines: Washington

State of Idaho
State of Montana
State of Oregon
State of Washington

NW Indian Tribes

USDA Forest Service
USDI Bureau of
  Land Management
USDI Fish and
  Wildlife Service
USDI National
  Park Service
NW Power Planning
  Council
Bonneville Power
  Administration

December 1986

PACIFIC NORTHWEST
RIVERS STUDY

PACIFIC NORTHWEST RIVERS STUDY

ASSESSMENT GUIDELINES: WASHINGTON STATE

December 1986

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INTRODUCTION

OVERVIEW

This document describes the process that participants followed to complete the Pacific Northwest Rivers Study. It identifies assessment methods for each river resource categories, the types of data collected, and the criteria for the evaluation and ranking of river reaches.

The Rivers Study was designed to produce a consistent and verifiable river resource data base. While this information may prove useful for a variety of applications, the purpose of the project was to identify resource considerations which might affect hydropower development. The intent is to use this information to identify areas where minimal impact can be anticipated and thus where development might be appropriate. The study responds to the expressed need for resource information for the following:

1. Energy Supply Forecasting -- Bonneville Power Administration (BPA) and Northwest Power Planning Council (NPPC)
2. Protected Areas -- NPPC: 1984 Columbia River Basin Fish and Wildlife Program §1204(c)(1).
3. Site Ranking -- NPPC: Northwest Conservation and Electric Power Plan §14.2.

It was not the intent of this study to circumvent the existing management responsibilities of any participating agency. The study was undertaken as cooperative planning effort which will benefit all participants. Results do not constitute official policy and by themselves imply no specific action by any participant.

In order to effectively respond to existing policies and programs as well as to reflect differences in river character, data availability, and public concerns, the project was organized into four state level studies. In Washington the project was coordinated by the Washington State Energy Office with active participation from federal land management agencies, Indian tribes, and other state agencies.

The Rivers Study was an 18 month regional effort with funding of approximately 1.0 million dollars provided by the Bonneville Power Administration (BPA). Concurrently, the Northwest Power Planning Council (NPPC or Council) provided $540,000 to evaluate anadromous fish resources and Indian cultural/archeological values. Rivers Study activities and goals, budgets, and time schedules are listed in the September 1984 Pacific Northwest Rivers Study Plan available from BPA. The actual assessment was conducted between May and December of 1985. Review of preliminary findings was completed by May 1986 and information entered into a computerized information system by October 1986.

RIVER ASSESSMENT PROCESS

The goal of the study was to evaluate and document the significance of individual river segments and systems for a variety of natural resource. Comparative assessment was a major feature of this process. The process did not, however, result in rivers being ranked in numerical order. Rather, each stream reach was given one of four significance ratings for each of five resource categories along with ranking of land-use restrictions which would affect hydroelectric development.

Field survey was kept to a minimum. The study relied on currently available information and evaluation by recognized resource experts. Study conclusions are the responsibility of these resource specialists. The states, Tribes, and federal agencies were represented in the evaluation process commensurate with their legal authorities and management duties.

The following is a summary description of the assessment process.

Step 1: Identification of River Resource Categories

Categories were chosen to:

1) reflect the overall value of rivers and streams as natural resources;
2) reflect the interests of public agencies and private interest groups;
3) acknowledge the resource responsibilities of the Tribes, states, and Federal agencies; and
4) reflect the priorities of the Pacific Northwest Electric Power Planning and Conservation Act, (Regional Act) P.L. 96-501.

The categories selected included resident fish, wildlife, natural features, recreation, cultural features, and institutional constraints. Anadromous fish and tribal cultural and archeological values were included through a separate NPPC contract.

A senior resource expert and cooperating experts were designated in each state to oversee activities related to each resource category. Cooperating experts provided the senior resource expert.

Step 2: Inventory of Information and Identification of Experts

Each state task force inventoried the availability of expertise and information for each of the resource categories. Agencies, groups, individuals, or other sources that had or could produce useful data within the study period were identified.

Step 3: Criteria and Standards Development

For each river resource category, evaluation criteria and standards were developed. An effort was made to standardize criteria for all state level studies in order to ensure region wide consistency. Criteria were, however, refined at the state level to meet the specific circumstances of each state. The development of criteria and standards was the responsibility of regional and state project staff. Review and commentary was provided by participating federal agencies and Indian tribes as well as the interested public. The following chapters describe in detail the criteria and standards used in the state of Washington.

In order to standardize the assessment process amoung resource categories, a list was developed of all river segments that would be included in the assessment. The list included all major rivers and significant tributaries. In Washington, 1414 river reaches were included. This list of stream reaches was computerized and provided to all study participants.

Step 4: Individual Resource Category Evaluation

An independent inventory was undertaken for each resource category. Under the direction of designated senior resource experts, rivers and streams meeting minimum standards were assessed by field level specialists using the criteria and assessment procedures noted in Step 3.

Resource experts assigned a value class to each river segment on maps and data forms. The terms "outstanding", "substantial:, "moderate", "limited", and "unclassified" or "unknown" were noted. River segment descriptions and rules governing treatment of tributaries were determined by the state level project management staff. The number of river segments to be included in each value class was determined by resource experts. No regionwide guidelines were given.

Results were compared for consistency, and river segments were grouped according to overall significance. The final result of the resource assessment was the identification of: all river areas which possess a particular fish, wildlife, natural, recreational, or cultural value and the relative significance of each area. The final result of the institutional constraint assessment was an identification of rivers and streams where existing legal designations or administrative programs might constrain the development of new hydropower facilities.

Step 5: Display and Review of Resource Category Findings

For each resource category a set of data forms was completed with the final significance ratings given to individual river segments and the documentation used to substantiate these ratings. Final ratings were also depicted on color coded 1:100,000 scale maps. Information from the data forms was subsequently entered into a computer.

Findings were then reviewed by designated senior resource experts and agency and Tribal participants. Results were revised as appropriate by the senior resource experts in consultation with regional project management. A chance to review results and provide comments was given to private groups and citizens through a series of public meetings. A special effort was made to document the significance of reaches and streams found to have high and/or unique resource values, as well as those reaches reflecting the priorities of the Regional Act.

Step 6: Information Synthesis

Ranking from resource categories were combined in order to display all resource values of a given stream segment. This synthesis was achieved by means of a computerized data management system. Using this system a matrix can be created which lists all river segments in a given basin and depicts all final resource ratings associated with each segment.

<u>Step 7</u>: Presentation and Documentation

An information packet was prepared which summarized findings for all resource categories. This information, as well as printouts from the study's computerized information system, were made available to interested persons. Graphic representations of data were prepared using computer mapping techniques. Examples of these computer maps were also made available. Public meetings and agency briefings were conducted to further inform interested parties regarding study findings.

In the future, technical information will be distributed by means of information system printouts and/or machine readable discs. A system users guide will also be made available. General information will be made available through a final report describing findings from the Washington State portion of the study.

GUIDELINES

In order to standardize the assessment process and the resulting products, a number of regionwide production guidelines were established. Included were the following:

1. Factors to be Evaluated

    o   Resident Fish
        -   cold water game and non-game fish
        -   warm water game and non-game fish
        -   spawning, rearing, and migration areas
        -   Indian subsistence fishery
        -   threatened and endangered species
        -   species of special concern

    o   Wildlife
        -   migratory birds
        -   resident birds
        -   big game
        -   fur bearers
        -   small mammals
        -   endangered and threatened species
        -   species of special concern

    o   Natural Features
        -   endangered and threatened plants
        -   unique plant communities and other recognized natural areas
        -   undeveloped and free flowing segments
        -   sensitive riparian wetlands
        -   gorges, waterfalls, rapids, miscellaneous geologic features

    o   Cultural Features
        -   historic trails and sites
        -   archeological sites
        -   river related architectural sites

    o   Recreation
        -   white water boating
        -   flat water boating
        -   river camping
        -   river related shoreline activities
        -   public use sites

    o   Legal Constraints
        Federal, including
        -   wild and scenic rivers
        -   wilderness areas
        -   research natural areas
        -   national parks
        -   roadless areas
        -   national fish hatcheries
        -   national wildlife refuges
        State, as applicable
        Local, as applicable

Each river resource category was to be evaluated separately. Assessments were to be conducted independently without reference to other resource values. For example, river reaches were evaluated for recreational boating without reference to their value for wildlife or historic features.

2. Geographic Scope

As a guide, participants were asked to evaluate rivers and streams which appear on 1:100,000 scale maps. In practice, any river segment with a significant resource value could be included. Stream segments not evaluated included:

a. Intermittent streams;
b. Small tributaries;
c. Federal institutional constraints (e.g., National Parks, etc.);
d. Stream segments currently impounded for hydropower or other purposes.

In addition, a corridor width of 1000 feet was recommended for those resources categories associated with riparian areas.

3. River Reach Determination

A standardized list of river reaches was designated for use within the state of Washington. This system was based on hydrologic configuration though some physical and/or social landmarks were used. While a given resource category could deviate from this reach system, every effort was made to adhere to this system. (The state reach system was also cross referenced to the EPA/USGS river reach system in order to standardize at the regional level.)

4. Value Classes

Value class refers to the resource significance rating assigned to each river segment for a given resource category. All resource category findings were to be reported using the same value class system as follows:

1   Unique of Outstanding Resources
2   Substantial Resources
3   Moderate Resources
4   Limited Resources
U   Unknown or Unclassified
N   Resource Not Present

5. Data Presentation

o   Data Entry Forms

In order to facilitate the assessment process as well as to document findings, rating forms were prepared for each resource category. In most instances forms followed a matrix format with river reaches arrayed along one axis and evaluation criteria arrayed along the other. Using these forms individual river segments could be evaluated for each specific criterion and a final rating determined based upon the sum of individual criterion ratings. As appropriate additional descriptive information could also be displayed.

o   Maps

Maps were used to graphically display river values. Sets of 1:100,000 scale maps and a supply of 1:500,000 scale hydrologic unit maps were provided by BPA. Labels were supplied for each map to be used as legends. Colored pens also were supplied.

One set of 1:100,000 scale maps was used to depict findings for each resource category. Value significance was recorded in colored pen using the following color scheme.

- Outstanding or Unique -- Red
- Substantial -- Orange
- Moderate -- Gray
- Limited -- Green
- Unclassified or Unknown -- No mark
- Resource Not Present -- Brown

The Unknown or Unclassified designations predominated on any one map. Participants did not color stream segments in this category. Uncolored segments can be assumed to be either Unknown or Unclassified.

To decrease production time, an arrow at the upstream terminus of a colored section was used to signify that all segments above that point are a consistent value. Upstream exceptions were noted in the appropriate color.

Hand drawn 1:500,000 scale maps were prepared for some resources for ease of presentation and review. Following completion of the study display maps were produced using computer mapping techniques.

Resident Fish
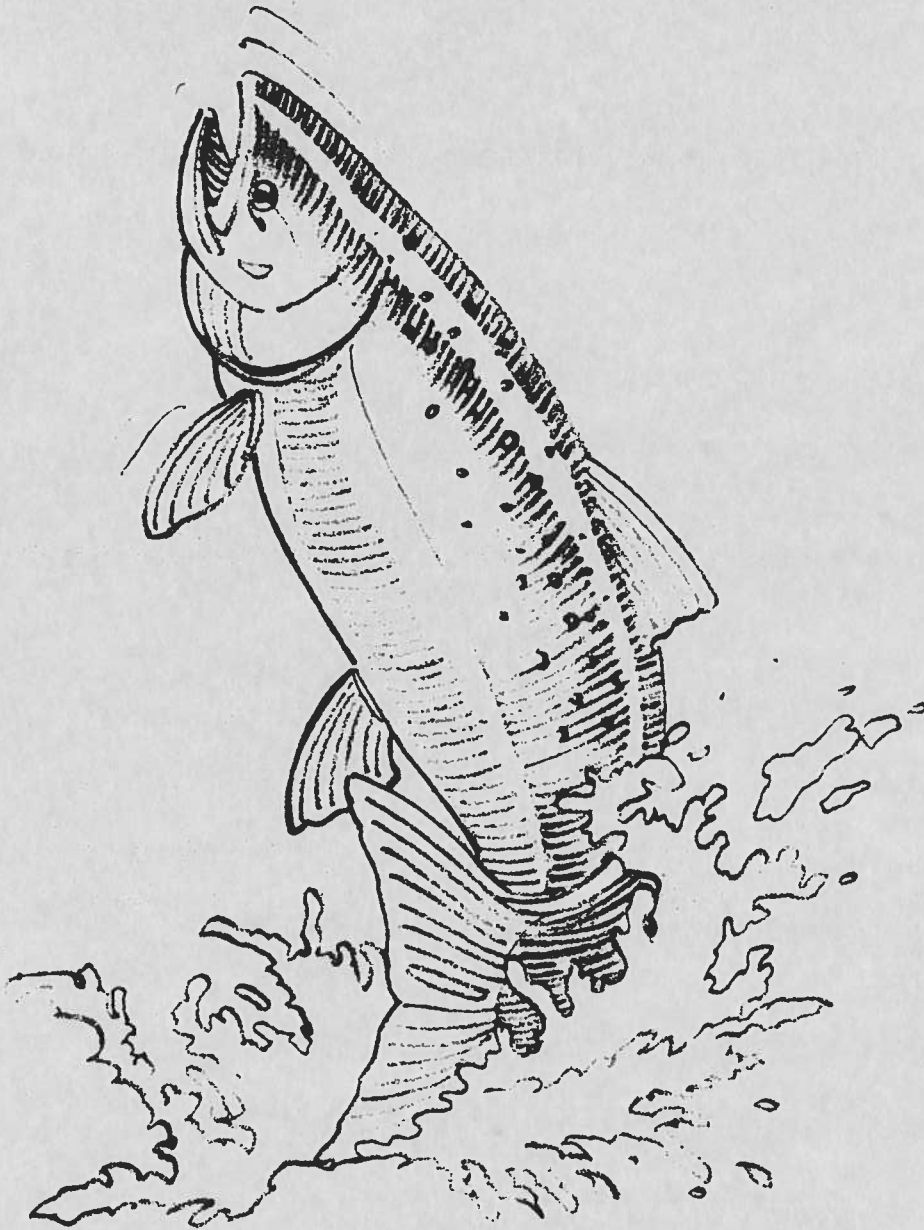
PACIFIC NORTHWEST RIVERS STUDY

RESIDENT FISH RESOURCES IN WASHINGTON

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INTRODUCTION

The Pacific Northwest Rivers Study was initiated to assess the significance of river segments and systems for a variety of fish, wildlife, natural, recreational, and cultural resource values, as well as institutional constraints on hydropower development. The Washington Department of Game was designated as the lead agency in assessing the value of rivers for resident fish resources. The study covered those river reaches in the state of Washington that are free flowing and have 35 cubic feet per second mean annual flow.

This report summarizes the method which was used to complete this assessment. It identifies the value classes to which river segments were assigned, the criteria which were used to determine the value of river segments, the standards used to apply these criteria, and the process by which decisions were made.

CATEGORY DESCRIPTION

The following components were included in the resident fish resource assessments: habitat quality, gamefish species, angler effort, abundance of catchable fish, migration corridors, research sites, rare species, and quality of the angling experience.

"Resident fish" included all non-anadromous game and non-game fish plus searun cutthroat trout and anadromous Dolly Varden char. These last two, while not considered "resident" fish by WDG, were included in this study in October 1985, when it became apparent that the anadromous fish assessments (then underway as a separate study) would be considering only steelhead trout and the five Pacific salmon species in their evaluations.

The stream reaches identified by Lomax, et al., 1981 ("An Assessment of Potential Hydroelectric Power and Energy for the State of Washington" available from the Washington Water Research Center in Pullman) were chosen as the basis for the study in this state. All of these 1,400 stream reaches have an estimated mean annual flow of greater than 35 cubic feet per second (cfs), which would theoretically support hydropower

projects of 200 to 300 kilowatts and greater. We excluded from consideration those reaches located mostly or wholly within any National Park, tribal reservation, Wilderness Area, or National Monument.

VALUE CLASSES

Value classes were used to characterize each river reach in terms of its relative significance to resident fish:

Value Class	Definition
1	Outstanding resident fish resource
2	Substantial resident fish resource
3	Moderate resident fish resource
4	Limited resident fish resource
U	Unknown or unclassified resident fish resource
N	No resident fish resource

CRITERIA

Two criteria were used to determine the overall resident fish value of an individual river segment: 1) the habitat and species value of the river segment; and 2) the sport fishery value of the river segment.

A value was determined for each of the two criteria above: the higher value was assigned to the river segment as the overall value of the reach. If one or both criteria could not be evaluated due to insufficient personal knowledge of the reach on the part of the rating biologists, an overall value of "5" was assigned. Two exceptions to this methodology are noteworthy:

1. If one criterion was assigned a value of "1" and the other a value of "5", the reach was assigned an overall value of "1". This follows logically from the methodology above, since even a low value for the missing criterion would not lower the overall value.

2. Where searun cutthroat or Dolly Varden used a particular river reach as a migration corridor, the overall value for the reach was adjusted one class upward.

STANDARDS

Criterion 1: Habitat and Species Value

--Species Value

The value for Criterion 1 was based on habitat quality and the relative significance of resident fish species present in the reach.

Resident fish species were assigned a value of high, intermediate, or low. Species of high concern included all Washington gamefish species (Appendix 1A) as well as three non-game "species of concern": the sandroller (Percopsis transmontana), the Olympic mudminnow (Novumbra hubbsi), and the pygmy whitefish (Prosopium coulteri). There are no threatened or endangered fish species in Washington State.

Species of intermediate concern included Washington non-gamefish species known to be of ecological significance (e.g., a sculpin population that serves as a forage base for a species of high concern).

Species of low concern included all Washington non-gamefish species except the sandroller, Olympic mudminnow, pygmy whitefish, and species of local ecological significance as noted above.

Note that no attempt was made to rank any one gamefish species above the others; all gamefish were assigned a high value. Trout are indisputably the most popular gamefish statewide, but spinyrays such as perch, bass, crappie, catfish, and walleye are increasingly attracting anglers. More importantly, their presence in running water is so limited as to make them a valuable sport fishery resource wherever they occur.

Similarly, no attempt was made to value the various trout differently (e.g., ranking native trout higher than the progeny of hatchery trout or introduced Eastern brook trout). Only in rare cases does WDG have the historical data and experimental means to make these distinctions. More importantly, the average angler is usually unable to make these distinctions, or is completely indifferent to them.

--Habitat Value

Once the list of important species present in a given river reach was established, habitat for those species was assessed as either of high, intermediate, or low quality. Habitat quality for all trout and char was judged using guidelines (adapted from Binns, N.A., and F.M. Eiserman. 1979. Quantification of fluvial trout habitat in Wyoming. Transactions of the American Fisheries Society 108(3):215-228.):

Habitat quality assessments in the few spinyray waters were left up to the rating biologists' discretion, augmented with published file data on the reach in question.

--Combined Habitat and Species Value

The habitat and species value for a given reach was made using the matrix shown in Table 1. If, for example, Reach X contained rainbow trout (a species of high concern because it is a gamefish) and suffered from heavy siltation and limited streambank cover (judged to be habitat of intermediate quality for trout), then using Table 1, we assigned Reach X a habitat and species Value of "2." If other species with different habitat requirements were also present in Reach X, additional habitat and species values would be assigned, with the highest one taken as the final habitat and species value.

Table 1. "Habitat and Species Value" of river segments, as determined by habitat quality and the relative significance of resident fish species present.

HABITAT QUALITY	SPECIES OF ...		
	HIGH CONCERN	INTERMEDIATE CONCERN	LOW CONCERN
HIGH	1	2	4
INTERMEDIATE	2	3	4
LOW	3	4	4

Three exceptions to the methodology for Criterion 1 are noteworthy:

1. Species of Concern: If a river reach provided low or intermediate quality habitat for either the sandroller, Olympic mudminnow, or pygmy whitefish, the habitat and species value was adjusted one class upward.

2. Research Sites: If a river reach was the site of resident fish research, particularly long-term research, a habitat and species value of "1" was assigned.

3. Potential Value: If environmental conditions in a river reach were expected to improve or deteriorate in the near future, "potential" habitat quality was used in Table 1.

Criterion 2: Sport Fishery Value

The value for Criterion 2 was based on angler use and the relative abundance of resident gamefish (Appendix A) present in the reach.

The first step was to note the most important species in the creel. Often (but not always), these were the same species listed under the habitat and species value assessment.

Quantitative data on resident fish abundance (e.g., electroshocking estimates or catch-per-unit-effort data) exist for only a small percentage of the stream reaches. Rating biologists, therefore, were asked to make a qualitative assessment of resident gamefish abundance (particularly of catchable-sized fish), assigning values of high, intermediate, or low to each reach. The biologists were asked to rate abundance in a given reach in relation to other streams within their jurisdiction. In most cases, reaches containing large runs of steelhead and/or salmon were automatically assumed to contain only "low" or "intermediate" numbers of resident fish. Published information (especially WDG's fish and wildlife appendices to river basin studies in the early 1970's) and file data were also consulted for this assessment.

Data on angler use are even less abundant than those dealing with fish abundance. Again, biologists were asked to qualitatively rate angler use (for resident fish only) in a given river reach as high, intermediate, or low. Wherever available, published information and file data were also consulted for this assessment. It was recognized that angler use levels on a particular river reach depend heavily on how close the reach lies to major population centers. We therefore asked biologists to rate angler use with a regional "yardstick," placing the most heavily-fished stream within their jurisdiction at the top of this relative scale, and their least-fished streams at the bottom, assigning the middle 50 percent a rating of "intermediate."

Access plays an obvious role in angler use, and stream reaches not readily accessible by road were never assigned a "high" value. Stream reaches which were mostly or entirely on private land were likewise assumed to support either low or intermediate angler use at best. Naturally, reaches closed to fishing received an automatic low value.

The sport fishery value for a given reach was made using the matrix in Table 2. If, for example, Reach X contained a high abundance of cutthroat trout, but was situated in a steep and virtually inaccessible canyon (low angler use), then using Table 2, Reach X was assigned a sport fishery value of "4."

Table 2. "Sport Fishery Value" of river segments, as determined by angler use and the relative abundance of resident gamefish present.

FISH ABUNDANCE	ANGLER USE		
	CONCERN	INTERMEDIATE	LOW
HIGH	1	2	4
INTERMEDIATE	2	3	4
LOW	3	4	4

Two exceptions to the methodology for Criterion 2 deserve mention:

1. Quality of Angling Experience: If exceptional aesthetic qualities, low fishing pressure, or the occurrence of uncommonly large fish significantly enhanced the angling experience in a stream reach, the sport fishery value was adjusted one class upward. Conversely, if poor aesthetic qualities, high fishing pressure, or the occurrence of stunted fish populations detracted from the angling experience in the reach, the sport fishery value was lowered one class.

2. Potential Value: If the sport fishery in a stream reach was expected to improve significantly in the near future (e.g., through improved access or special regulations), "potential" abundance of catchable fish or "potential" angler effort was used in Table 2. Conversely, if the sport fishery was expected to deteriorate in the near future, "potential" levels of abundance or angler use were used to determine the sport fishery value of the reach.

STUDY PROCESS

Assessments were made on the basis of information provided by local fisheries biologists and habitat managers, as well as published reports and file data. As the first step in the study, we conducted a detailed literature search and recorded applicable data for each river reach that was represented in the literature or files. All of WDG's 16 Area Fish Biologists charged with managing resident fish in state waters under consideration were then interviewed individually. The biologist was presented with one or more 1:100,000 scale quadrangle maps with the river reaches drawn in and was asked to rank the reach, if possible, in terms of habitat quality, species present, angler use, and abundance of resident fish. Where appropriate, WDG's Area Habitat Biologists were also interviewed, and biologists from each of the seven United States Forests in the state were individually contacted for the same type of information.

Letters outlining the study were mailed to all 28 federally recognized Indian tribes with ceded lands in the state, and other public agencies, utilities, private firms, and citizens groups. Tribal biologists who responded to our requests for information were interviewed as outlined above.

Draft assessments were reviewed (and some are still in the review process) by all of WDG's Regional and Area Fish Biologists for accuracy. Additional review of the draft assessments took place with the United States Fish and Wildlife Service and representatives of the Northwest Indian Fisheries Commission.

PROJECT EVALUATION

Despite the limitations discussed below, the study gives a rough, "broad-brush" picture of relative stream-reach values for resident fish. Two important features of the study should be discussed with regard to reliability.

First, it was unavoidable that the study should focus on resource values as they are presently known. That is, the values represent a "snapshot" in time which may not remain valid in the years to come. Some allowance for this limitation was made by considering "potential" changes in habitat, management, and angler use. But these potential changes necessarily included only those which resource experts could predict with reasonable certainty. A wide variety of natural and man-induced phenomena, all unpredictable at this time, could change resource values in the present study.

Secondly, the assessments are qualitative in nature. Hard, quantitative data regarding these resources exist for relatively few well-studied reaches in the state. The most obvious information gap occurred when evaluating angler use; except in a few scattered reaches, no quantitative, site-specific data are available. There is a similar lack of information on resident fish population sizes in the vast majority of reaches and basins. Hence, most of the data are anecdotal and "soft." The use of a standard set of assessment guidelines, however, did provide a measure of statewide consistency in the results (i.e., all rating biologists were asked to use the same "yardstick" in assigning values to habitat quality, angler use, and fish abundance).

While the stated and primary goal of the Rivers Study was to provide Bonneville Power Administration and the Northwest Power Planning Council with resource information that could by incorporated in long-range energy supply forecasting and planning, several other uses of the study suggest themselves as well:

1. WDG plans to use the study as a readily accessible data source for initial help in evaluating Hydraulic Permit Applications and other development proposals.

2. Developers of non-hydro projects can benefit from the study, since it allows them to incorporate resident fish resource values in their plans from the outset.

3. The study provides the framework for a more exhaustive, quantitative statewide stream reach inventory that has a wide variety of inter- and intra-agency applications. Montana built upon a similar framework when developing their model resident fish resource inventory.

USE CONSIDERATIONS

In view of the two limitations mentioned earlier, WDG reserves the right to modify assessments as conditions become altered or better data become available. Furthermore, nothing in this study precludes the necessity of abiding by the National Environmental Policy Act, State Environmental Policy Act, or FERC regulations regarding project site evaluations.

PARTICIPANTS

(Level of participation indicated by postscript letters; see key below).

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Tacoma City Light, Tacoma (g,j)
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Douglas County P.U.D., Wenatchee (g,j)
Grant County P.U.D., Ephrata (g,j)
Puget Power, Bellevue (g,j)

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Vancouver Chapter, Northwest Steelheaders (h,i)
Friends of the Columbia (h,i)
South King County Chapter, Trout Unlimited (h,i)
Hood Canal Environmental Council (h,i)
Overlake Fly Club (h,i)
Northwest Water Resources Committee (g,h)
Seattle Audubon Society (g,h)
Washington State High-Lakers (g)
Audubon Council of Washington State (g)
Friends of the Earth (g)
Nature Conservancy (g)
Non-Game Advisory Council (g)
Northwest Steelhead and Salmon Council of Trout Unlimited (g)
Sierra Club (g)
Spiny-Ray Club of the Northwest (g)
Washington Bass Association (g)
Washington Council of the Federation of Fly Fishers (g)
Washington Environmental Council (g)
Washington State Federation of Bass Clubs (g)
Washington State Sportsmen Council (g)
Wilderness Society (g)

Key to postscripts indicating levels of participation:

a — sent March 28 letter (Howerton, WDG) containing study information and requesting review and recommendations.

b — sent April 15 letter (Howerton, WDG) containing methodology, inventory of existing information and expertise, report of progress to date, and request for review, recommendations; via Northwest Indian Fisheries Commission.

c — sent June 3 letter (Howerton and Mongillo, WDG) containing proposed study criteria and request for information.

d — sent July 18 letter (Howerton and Mongillo, WDG) containing proposed study criteria and request for information.

e — sent August 9 letter (Zubalik, WSEO) requesting tribal attendance at August 27 meeting to discuss Rivers Study.

f   -   attended August 27 meeting at WDG's Region 4 headquarters to discuss Rivers Study.

g   -   sent April 15 letter (Howerton, WDG) explaining Rivers Study and requesting interested groups to return User Group Reply Form to WDG.

h   -   returned User Group Reply Form to WDG.

i   -   sent letter (Bradbury, WDG) reviewing progress to date, study methodology, reaches to be assessed.

j   -   sent April 26 letter (Kendra, WDG) requesting additions to the inventory of expertise and information.

k   -   sent April 15 letter (Howerton, WDG) requesting additions to the inventory of expertise and information.

l   -   provided information used in river reach assessments.

m   -   reviewed draft assessments by May 31, 1986.

Wildlife
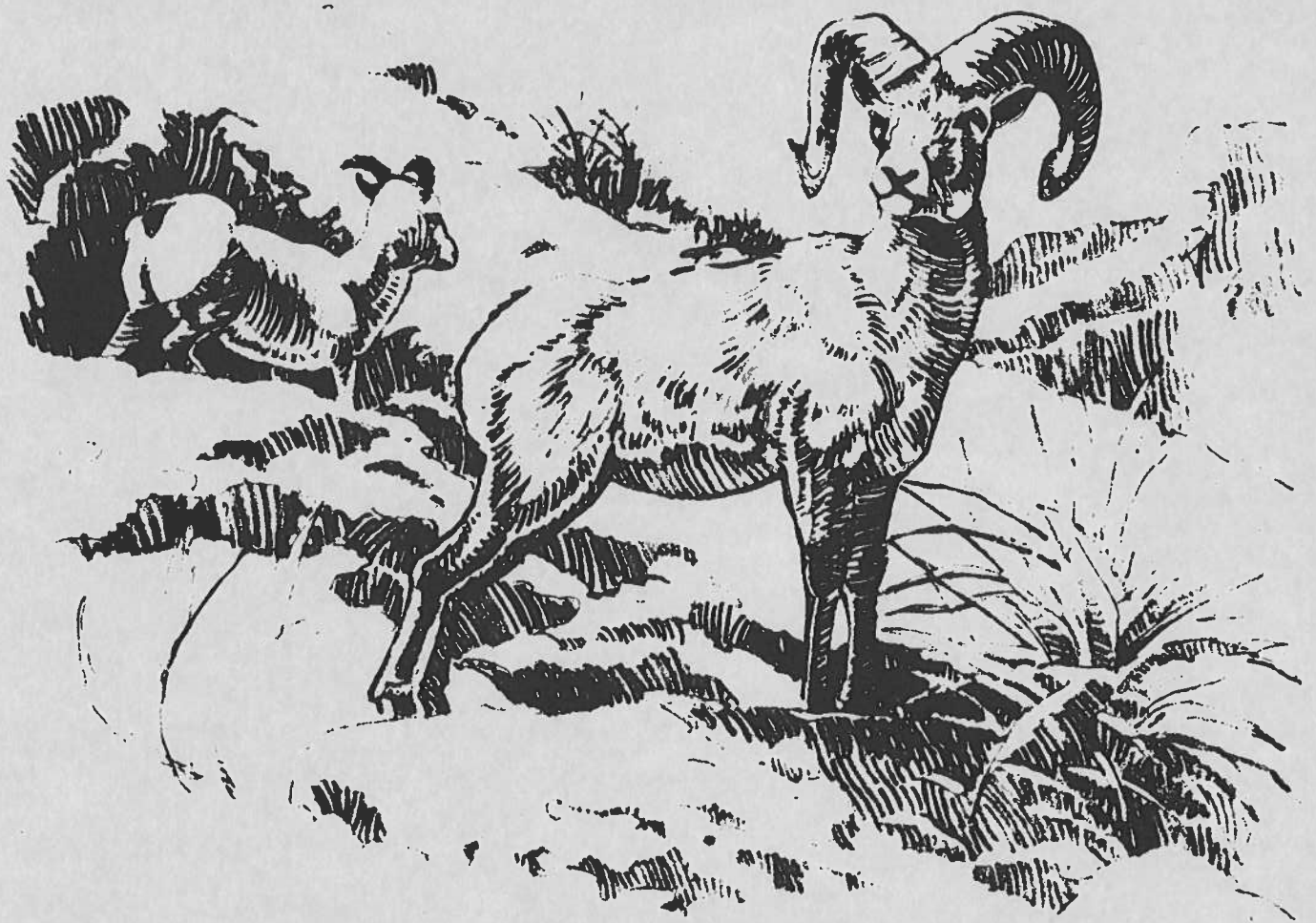
PACIFIC NORTHWEST RIVERS STUDY

WILDLIFE RESOURCES IN WASHINGTON

LEAD AGENCY

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INTRODUCTION

The Pacific Northwest Rivers Study assessed the value of a variety of fish, wildlife, natural feature, recreational, and cultural resources in and adjacent to the region's rivers. The Washington Department of Game (WDG) was the lead agency for the evaluation of the wildlife resources. The study included free-flowing river reaches in the state of Washington identified as having mean annual flows greater than 35 cubic feet per second (cfs) and the potential for hydropower development.

This report summarizes the method used in this assessment. It identifies the value classes assigned to the river reaches, the criteria used to determine the value of the river reaches, the standards used to apply those criteria, and the process by which decisions were made.

CATEGORY DESCRIPTION

The concept of "wildlife resource" used in this report refers to those game and non-game species of birds and mammals occurring generally within a 1,000 foot corridor on both sides of a stream reach, as well as the habitat within that corridor. Other wildlife (i.e., reptiles, amphibians, and invertebrates) and their habitats were included in the assessment process where information was available.

VALUE CLASSES

The following five value classes were used to characterize stream reaches within the state:

Value Class	Definition
1	Outstanding value wildlife resource
2	Substantial value wildlife resource
3	Moderate value wildlife resource
4	Limited value wildlife resource
U	Unknown or unclassified value wildlife resource
N	No wildlife resource value

CRITERIA

Three criteria were used to determine the overall wildlife resource value of the river reaches. These were: 1) habitat value; 2) species value; and 3) recreation value. Habitat standards were based upon the quality and quantity of a particular habitat, on its importance to species of special concern or rarity, and on the degree to which the habitat has been altered or disturbed by man.

Species standards were determined by the rareness or sensitivity of the species, the local and regional significance of game species, population sizes, and priorities of the wildlife management program at WDG. Recreation standards were based upon the actual or potential amount of consumptive or non-consumptive use by the public and the economic impact that that use has on local communities.

The initial intent in this study was to assess each reach for all the criteria, i.e., habitat value, species value, and recreational value. As the study progressed and more and more reaches were evaluated, it became apparent that information on recreational use by hunters, trappers, birders, wildlifers, etc., for most reaches was sorely lacking. Big game harvest figures in the state were broken down only by game management units, which often contained 50 to 75 reaches. Similarly, harvest information from trappers operating in the state was not in a specific enough form to be applied to individual reaches. Therefore, while the need for precise harvest data and non-consumptive wildlife recreation data was recognized, the paucity of this information caused the recreation criterion to become an additive value rather than the principal criterion in the assessment process. The final wildlife resource value for any reach was the higher of either the habitat value or species value. The recreation value, when available, served to enhance the overall rating process.

Value designations of Outstanding, Substantial, Moderate, and Limited were based on management objectives of WDG and judgment decisions of resource experts. If criteria could not be evaluated due to insufficient data or a biologist's reticence to make a judgment call, the value class "U" was assigned the reach. This value class was also applied to tribal reservations, National Parks, the Mt. Saint Helens National Volcanic Monument, and reaches in Wilderness Areas within the National Forests. This was done to help bound the study in areas where institutional constraints were seen as the major barrier to hydropower development. No reach was assigned value class "N", no resource value.

STANDARDS

Criterion 1: Habitat value

Habitat values of stream corridors were judged by the type of habitat present, and its quantity, quality, and importance to species of special concern. Biologists from Department of Game, the Forest Service, and the tribes were instrumental in the development of lists of key habitats.

A.   Outstanding value habitats were identified as:

    1.   Rare habitats or habitats for species identified by federal or state agencies as threatened or endangered, e.g., peregrine falcon nesting habitat, or western pond turtle habitat.

    2.   Critical and important habitats for species of special concern, such as grizzly bear habitat, or seasonal habitats such as big game winter range.

    3.   Vegetative communities of special concern such as well developed riparian habitats, old growth tracts, or estuarine/intertidal areas, and habitats with rich plant and animal species diversity.

    4.   Areas set aside by the Department of Game as Habitat Management Areas (HMAs) or dedicated by state or federal agencies as mitigation properties.

B.   Substantial value habitats were defined as:

    1.   Habitat important for species of concern but not of a critical nature, e.g., big game summer range; or critical habitat of lesser quality or quantity, e.g., moderate quality/quantity big game winter range.

    2.   Vegetative communities such as hardwood bottoms, or riparian habitat of moderate quality or quantity.

    3.   Habitats such as beaver ponds, oxbows, etc.

C.   Moderate value habitats were characterized as having some degree of human disturbance and yet retaining obvious value as wildlife habitat, e.g., areas with moderate agricultural or residential development, or corridors with a moderate amount of logging activity.

D.   Limited value habitats were those that are severely affected by human activities such as logging, agriculture, industry, or residential development, and supporting few, if any, wildlife species.

A complete listing of these key habitat types broken down by value class is contained in Appendix 2A.

Criterion 2: Species value

The initial approach to determining species value was to look for any species occurrences in, or use of, corridors along the reaches in question. The problem with that approach was that the occurrence of a single individual of an endangered species would be sufficient to

raise a reach's score to outstanding. A matrix was then developed so that species values became a function of both species type and population size. The species value matrix is as follows:

Population Size Estimate	Species Type		
	Outstanding(1)	Substantial(2)	Moderate(3)
High #'s	1	2	3
Intermediate #'s	2	3	4
Low #'s	3	4	4

Precise information on population size was rarely available, except for bald eagle census data and rare big game herd data. Generally, the best source available was impressions and judgments of the local biologists, though the estimates were somewhat subjective. For the most part, the species values derived from estimates of population sizes versus species types were consistent state-wide.

Species types were defined as follows:

A. Outstanding value species were:

1. Species identified by state or federal agencies as threatened or endangered, or proposed for threatened or endangered status.

2. Species identified by state or federal agencies as species of special concern.

B. Substantial value species were:

1. Game and non-game species of local significance.

2. Local healthy populations of non-game species that are uncommon elsewhere in the state.

C. Moderate value species were primarily those game and non-game species not belonging to the previous two categories, such as the skunks, the porcupine and the coyote.

D. Limited value species were those exotic non-native species that were considered to be nuisances and/or competitors with native wildlife.

A complete list of outstanding and substantial value species appears in Appendix 2B. These lists were compiled with the assistance of game and non-game program managers at WDG.

Criterion 3: Recreation value

As noted earlier, there is a little data on wildlife recreation use on individual stream reaches in the state. Where information was available, estimates of high, intermediate, and low use, or potential use, and local community importance, were made by agency biologists interviewed.

A.   Wildlife use or use potential

Class Description

1.	High	Stream section receives or has potential to receive high use by wildlife recreationists
2.	Intermediate	Stream reach receives some use by wildlife recreationists, or has the potential to receive a moderate amount of use.
3.	Low	Stream section receives little or no use and has low use potential by wildlife recreationists.

B.   Local community importance

Class	Importance
1	High
2	Intermediate
3	Low

An overall recreation value was determined on the basis of these two criteria using the following matrix:

Wildlife Use or Potential	Local Community Importance		
	High	Intermediate	Low
High	1	2	3
Intermediate	2	3	4
Low	3	4	4

The final step in the assessment process, after determining habitat values, species value, and recreational value (when possible) was assigning the higher of the habitat or species value as the overall value of the stream reach.

STUDY PROCESS

Meetings/Information Sources

After developing the preceding methodology, a series of working meetings was arranged with WDG and Forest Service biologists intimately associated with the wildlife and habitat in the state. A complete list of meetings and personnel appears in Appendix C.

Each meeting consisted of an overview of the Rivers Assessment Study and its purpose, an explanation of the criteria and standards, and the evaluations of the streams and corridors.

Meetings were also held with the 28 federally recognized tribes in the state were invited to participate in the assessment process. A list of these tribes is contained in Appendix D. Each was the preliminary criteria and standards developed by WDG and was invited to an orientation meeting on the resident fish and wildlife resource assessment process. Eight tribes sent representatives. These also are indicated in Appendix D. Seven of these eight, in addition to two other tribes, subsequently provided information for the wildlife resource assessment, on reaches in tribal ceded lands, or usual and accustomed lands.

A user group outreach was also implemented. Information was solicited from 59 environmental and recreational groups in the state with a form letter and questionnaire. Eight responses were received, and two respondents provided information on habitats, species use/types, or recreational use on specific reaches in this study. Appendix E contains a complete list of these groups, in addition to a copy of the initial outreach letter and questionnaire.

In addition to the data gathered from interviews and working meetings with biologists, and information obtained from user groups, data on specific reaches were obtained from published literature sources. A bibliography of relevant publications was compiled, but time limited the extent of the literature review.

RESULTS

The results of the individual assessments may be found in the attached data sheets. These include assessment of habitat value, species value, and recreational value, as well as the overall wildlife resource value of each reach under consideration. In addition, the data sheets list abbreviations of agencies and individuals providing information relating to particular streams. Appendix F contains a key to these abbreviations. The overall wildlife resource values are displayed on a set of 46 USGS 1:100,000 scale quadrangle maps and a single 1:500,000 scale mylar overlay of the entire state. On each of these maps is a key to the color-coding scheme used on it.

Of the 1421 reaches, comprising nearly 7,500 linear miles of stream, identified in "An Assessment of Potential Hydroelectric Power and Energy for the State of Washington," Claude Lomax, et al., 1981, 314 reaches (1,222 stream miles) were excluded from consideration due to their being wholly or in greater part within National Park, National Monument, Wilderness Area, or tribal reservation boundaries. These were assigned a value of "5," Unclassified. Of the remaining 6,275 linear miles of assessed stream, 59.2 percent (3,718 stream miles) was considered to be Outstanding from a wildlife resource standpoint, 27.7 percent (1,739 stream miles) was Substantial, 10.6 percent (664 stream miles) was Moderate, and 2.5 percent (154 stream miles) was considered to be of Limited value as a wildlife resource. The results of this tally are displayed in Table 1.

TABLE I

	VALUE CLASS	NUMBER OF REACHES	NUMBER OF STREAM MILES	% OF ASSESSED REACHES
1.	Outstanding	625	3,718	59.2
2.	Substantial	336	1,739	27.7
3.	Moderate	113	664	10.6
4.	Limited	33	154	2.5
U.	Unknown	0	0	0.0
	Unclassified	314	1,222	N/A
TOTAL		1,421	7,49	100.0

PROJECT EVALUATION

This distribution of scores was expected in light of the fact that such a large percentage of riparian corridors in the state have been subjected to intense agricultural and hydroelectric developments, logging activities, and other human disturbances. Perhaps 70 or 80 years ago, the distribution of scores may have been more nearly normal, but the encroachment of man has caused serious adverse impacts on wildlife habitats and populations. Thus, most remaining riparian corridors truly are of Outstanding or Substantial value as wildlife resources.

Two important aspects of the study should be discussed in reference to the primary purpose of the Rivers Study, which was to provide Bonneville Power Administration (BPA) and the Northwest Power Planning Council (NPPC) with resource information that could be incorporated in long-range energy supply forecasting and planning.

First, it was unavoidable that the study should focus on resource values as they are presently known. That is, the values represent a "snapshot" in time which may not remain valid in the years to come. Some allowance for this limitation was made, in that "potential" changes in habitats, management objectives, ownership, and hunter/trapper use were considered. But these potential changes necessarily included only those which resource experts could predict with reasonable certainty. For example, a massive ski recreation area development proposed at Early Winters Creek did not reduce resource values along the creek since it was only considered a 'proposed' development.

Secondly, the wildlife resource assessment is necessarily qualitative in nature. Hard, quantitative data regarding wildlife resources exist for only a few well-studied reaches in the state. The most obvious information gap occurred when evaluating hunter, trapper, and recreational use; except in a few scattered reaches, no quantitative, site-specific data are available. There is a similar lack of information on wildlife population sizes in the vast majority of reaches and basins. Hence, most of the data are anecdotal and "soft." The use of a standard set of assessment guidelines, however, did provide a measure of statewide consistency in the results.

USE CONSIDERATIONS

In view of these two limitations, WDG reserves the right to modify assessments as conditions become altered or better data become available. The obvious recommendation is that funding be provided to update, revise, and enhance this study's data base on a regular basis, in order that it may become and remain a useful tool in making planning, management, and development decisions for years to come.

It must be stressed that nothing in this study precludes the necessity of abiding by the National Environmental Policy Act, the State Environmental Policy Act, or FERC regulations regarding project site evaluations. It is anticipated that this data base will provide the foundation for a comprehensive wildlife habitat, population, and use inventory with broad applications, both within and outside of the Department of Game. WDG perceives this as the single most important long-term application of the Rivers Study.

PARTICIPANTS

See listing in Resident Fish Section (page 7).

Natural Features

PACIFIC NORTHWEST RIVERS STUDY

NATURAL FEATURES IN WASHINGTON

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INTRODUCTION

The Pacific Northwest Rivers Study assessed the value of a variety of fish, wildlife, natural, recreational, and cultural resources, as well as institutional constraints on hydropower development, in and adjacent to the region's rivers. The Washington Natural Heritage Program (WNHP) was the lead agency for the evaluation of selected natural features. The study covered free-flowing river reaches in the state of Washington identified as having mean annual flows greater than 30 cubic feet per second (cfs) and the potential for hydropower development. This report summarizes the methods which were used to complete this assessment. It identifies the value classes to which river segments were assigned, the criteria which were used to determine the value of river segments, the standards used to apply these criteria, and the process by which decisions were made.

CATEGORY DESCRIPTIONS

Two major categories of natural features were addressed: 1) botanical features; and 2) hydrological/geological features. The botanical features of primary concern were endangered, threatened, and sensitive plant species found in river-related habitats, and exceptional examples of native plant associations found in riparian zones and adjacent uplands. An exceptional plant association is any relatively undisturbed stand with predominantly native vegetative cover in the overstory and understory. Hydrological and geological features included undeveloped river segments, water falls, gorges, caves, mineral springs, hot springs, fossil localities, rock formations, mineral exposures and other geological features of high scientific or educational value. Undeveloped river segments were defined as stretches of rivers without major hydrologic impoundments, diversions or cultural modifications.

VALUE CLASSES

A value class was assigned to each natural feature, and each river reach was ultimately assigned a class based on the value of the features with it. Classes used in the study are shown below.

Value Class	Definition
1	Outstanding natural features value
2	Substantial natural features value
3	Moderate natural features value
4	Limited natural features value
U	Unknown or unclassified natural features value
N	No natural features value

CRITERIA

Four criteria were used to determine the value of the natural features in the individual river reaches. These criteria were: 1) scarcity; 2) vulnerability; 3) quality; and 4) scientific value. Each natural feature had these criteria applied to it before overall river and stream segment values were assigned. Scarcity refers to the distribution of the feature both within the state and worldwide. Scarcity was the single most important factor in determining the relative value of any given natural feature. However, the other criteria were important, and a feature that was seriously vulnerable, of extraordinary quality, or of great scientific interest received a higher relative evaluation than it would have received based on scarcity alone. Vulnerability is the degree to which a natural feature is directly or indirectly susceptible to degradation or destruction. Vulnerability to specific possible hydropower projects could not be determined. The ranking of natural features included general vulnerability as part of the criteria. Quality refers to the relative physical condition of a natural feature in comparison to other known occurrences of the same feature. For example, the size and vigor of plant populations and the degree of disturbance of plant communities were considered. A site which was among the best known examples of its kind received higher evaluation marks than one which was marginal or low quality occurrence. The scientific value of a feature or a given site refers to its usefulness and importance as an educational resource. The historical, current and potential use, accessibility and taxonomic distinctness of the given feature or site was considered. Known type localities and areas known as quality study locations received the highest evaluation marks.

STANDARDS

Special Plants

The ranking of the special plants was based on WNHP's designation of state endangered (outstanding natural features value), threatened (substantial natural features value) or sensitive (moderate natural features value) status.

An endangered species is one in danger of becoming extinct or extirpated in the near future, if factors contributing to its decline continue to operate. These are species whose populations are at critically low levels or whose habitats have been degraded or depleted to a significant degree. A threatened species is likely to become endangered in the near future if factors contributing to its population decline or habitat degradation or loss

continue. A sensitive species is one with small populations or localized distributions within the state that is not presently endangered or threatened, but whose habitat will be jeopardized if current land use practices continue.

There are several historical occurrences of plants which may already be extinct in the state, and these were considered to be of outstanding natural features value. If rediscovered, they would undoubtedly be listed as endangered. (See Appendix 3A)

Plant Associations

Plant associations include terrestrial plant communities and aquatic natural communities. Ranking of these associations was based on the rarity of a given community type, the degree of threat (in this case, including flooding by a hydroelectric dam), and how adequately it is protected in designated managed areas.

Undeveloped River Reaches

Undeveloped segments in river reaches which have no other natural features were considered of unknown value. Lack of development is not a natural feature per se, although it has high aesthetic value. Lack of development does, however, enhance the other natural features. Therefore, when an undeveloped segment occurred in a river reach with other natural features, the undeveloped segment was considered of moderate natural features value.

Potential Managed Areas

Proposed Research Natural Areas (RNAs) were considered to be of outstanding natural features value and of equal quality to designated RNAs. Generally, proposed RNAs are awaiting management decisions on designation. In general, RNAs are considered to be of national significance.

Potential National Natural Landmarks (NNLs) were considered to be of substantial natural features value. There are more potential NNLs than proposed RNAs and the selection the selection process in generally less demanding.

Geological Features

The WNHP developed a geological ranking process specifically for the River Study. This was reviewed by professional geologists from throughout the state. Their modifications and suggestions were incorporated before it was used. It is as follows:

Final River Reach Values

An overall rank was assigned to each river reach. The minimum rank assigned to a reach was no lower than the highest rank of any particular natural feature on that reach. In many cases, reaches had clusters of occurrences, and a higher rank was assigned to recognize this outstanding natural diversity. The following system was designed by WNHP to acknowledge the higher value of such clustered features:

1. If the reach had two occurrences, each with a value of 3, it was assigned an overall value of 3.

2. If the reach had three occurrences, each with a value of 3, it was assigned an overall value of 2.

3. If the reach had more than three occurrences, each with a value of 3, it was assigned an overall value of 1.

4. If the reach had two occurrences, each with a value of 2, it was assigned an overall value of 1.

5. If the reach had two occurrences, one with a value of 2, one with a value of 3, it was assigned an overall value of 2.

6. If the reach had three occurrences, one with a value of 2, two with a value of 3, it was assigned an overall value of 1.

STUDY PROCESS

The study produced two products:

1. A set of maps identifying the natural features value of assessed river segments; and

2. A tabular summary of the natural features ordered by river segments with appropriate value ranks assigned.

Data Collection

Approximately 90 percent of the botanical information was collected from the WNHP data base. This data base consist of field information from WNHP and federal agency scientists, herbarium records, and contributions from professionals. This information is mapped on USGS 7.5' topographic maps. Both maps and field descriptions were consulted in the Rivers Study data gathering process. The rest of the botanical information was obtained from the U.S. Forest Service and from qualified individuals (See Participants and Appendix B). The geological information was obtained from USGS topographic maps and from written sources, particularly the Washington Environmental Atlas and National Natural Landmark Theme Studies. Forest Service geologists, state geologists, reference works, field guides and interested individuals (see References, Participants and Appendix B) were also consulted. The Nationwide Rivers Inventory (NRI) provided information on undeveloped river segments. The inventory was sponsored by the Heritage Conservation and Recreation Service (now part of the National Park Service) of the U.S. Department of the Interior. It assessed the level of river and river-corridor development on all rivers greater than 25 miles in length throughout the United States. Approximately 10 percent of all segments surveyed by the NRI in Washington were considered "undeveloped." If any part of an NRI segment was included in an assessed reach, it was noted as a natural features occurrence within that reach. Information on proposed Research Natural Areas (RNAs) came from the WNHP data base and from the U.S. Forest Service. Information on potential National Natural Landmark (NNL) sites was gathered from the National Natural Landmark Theme Studies published by the U.S. Department of the Interior. Only those sites formally proposed as PRNAs or PNNLs were included.

Data Sheet Tabulation

The definitions below apply to the numbered areas on the following sample data sheet (Figure 1).

1. River Reach I.D. and Name: The number refers to a reach within a given Water Resource Inventory Area. The WRIA is a hydrologic region that usually encompasses a major river and its tributaries. This is followed by the name of the river or stream that the reach is located on.

2. River reach value class: The value of a given river reach in terms of natural features.

Value Class	Definition
1	Outstanding natural features value
2	Substantial natural features value
3	Moderate natural features value
4	Limited to no natural features value
5	Unknown or unclassified natural features value

3. Feature value: The rank of a given natural feature. Usually this value reflects the scarcity, quality, scientific, or educational significance of the natural feature. The same definitions used in the river reach rank (above) are used for the feature value. In this case, they apply only to the feature and not to the entire river reach.

4. Class: The type of natural feature presented; the features included are:

    SP (special plant): Any plant species designated as endangered, threatened or sensitive by the Washington Natural Heritage Program (WNHP). Included are all federal candidate species.

    PC (plant community): A terrestrial plant association recognized by WNHP and listed in the State of Washington Natural Heritage Plan.

    NC (natural community): An estuarine, riparian, or other wetland plant association recognized by WNHP and listed in the State of Washington Natural Heritage Plan.

    B (botanical): All botanical information obtained from sources other than the WNHP data base.

    G (geological): All geological information.

    PM (potential managed areas): All proposed RNAs and potential NNLs.

    UR (undeveloped reach): All National Park Service undeveloped river reaches with less than 10 development points.

    O (other): All occurrences which do not fall within other classes.

5. Natural features: A brief description of the natural feature, often a name.

6. Comments: Generally describes the source of the information. If no source is cited, then the information was obtained from WNHP records. Comments are defined below:

    Source: The source of the information.

    W.E.A.: The Washington Environmental Atlas. See References for full citation.

Recommendation: Information from private sources, usually individuals. See Appendix A.

USGS map: Information collected from U.S. Geological Survey 1:24000 topographical maps.

NNL Program (NPS): Information gathered by the National Park Service for use in their National Natural Landmarks program.

NRI (HCRS): Information obtained from the Nationwide Rivers Inventory, a study conducted by the Heritage Conservation and Recreation Service for the U.S. Department of the Interior.

2.2mi/3.4mi: used for undeveloped river segments. This means that 2.2 miles out of a total river reach length of 3.4 miles are considered "undeveloped" by the Nationwide Rivers Inventory.

7. Water Resource Inventory Area (WRIA): A hydrologic region that usually encompasses a major river and its tributaries.

Review

There were three major review periods during the project. After the initial WNHP data collection, the senior resource expert met with the Rivers Study Coordinator in each of the National Forests, with the exception of the Umatilla National Forest. The coordinators commented on the data sheets and supplied information from their own files. After all the data had been collected, classification began. When the data sheets were in their final form and the mapping was completed, copies of the data sheets were sent to all of the National Forest Rivers Study coordinators and to all tribal representatives in the state. During the same period, a public review was held in Olympia. Review comments were minimal.

PROJECT EVALUATION

Botanical Features

The information available for plants and plant associations was generally reliable and accurate, although somewhat limited to the areas of most concern to WNHP. Some of WNHP's records were old or of general populations. A particularly obvious gap in the botanical data was the lack of information on riparian associations. Fieldwork to locate such areas should be a priority for future study.

Geological and Hydrological Features

The geological portion of the study was weak. The geological information was very general, with little reference to the quality of specific sites. A more thorough and scientific inventory of geological features would improve the quality of the data.

The National Park Service used secondary sources in compiling information for undeveloped river segments, primarily USGS topographic maps. The degree of development was current only up to the time the maps were published.

Potential Managed Areas

The information for this portion of the study was accurate and well-researched.

Conclusion:

The study highlighted the need for fieldwork to accurately assess the river-related natural features. A large number of rivers and streams had no information on which to base an assessment.

USE CONSIDERATIONS

Because of the limited time for data collection, and the lack of fieldwork, the information gathered for the study and the river ran considered a preliminary outline of river-related natural features in the state. When evaluating specific sites, the study should not take the place of more detailed on-site surveys.


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*Individuals who provided information or reviewed data for WNHP.

Recreation
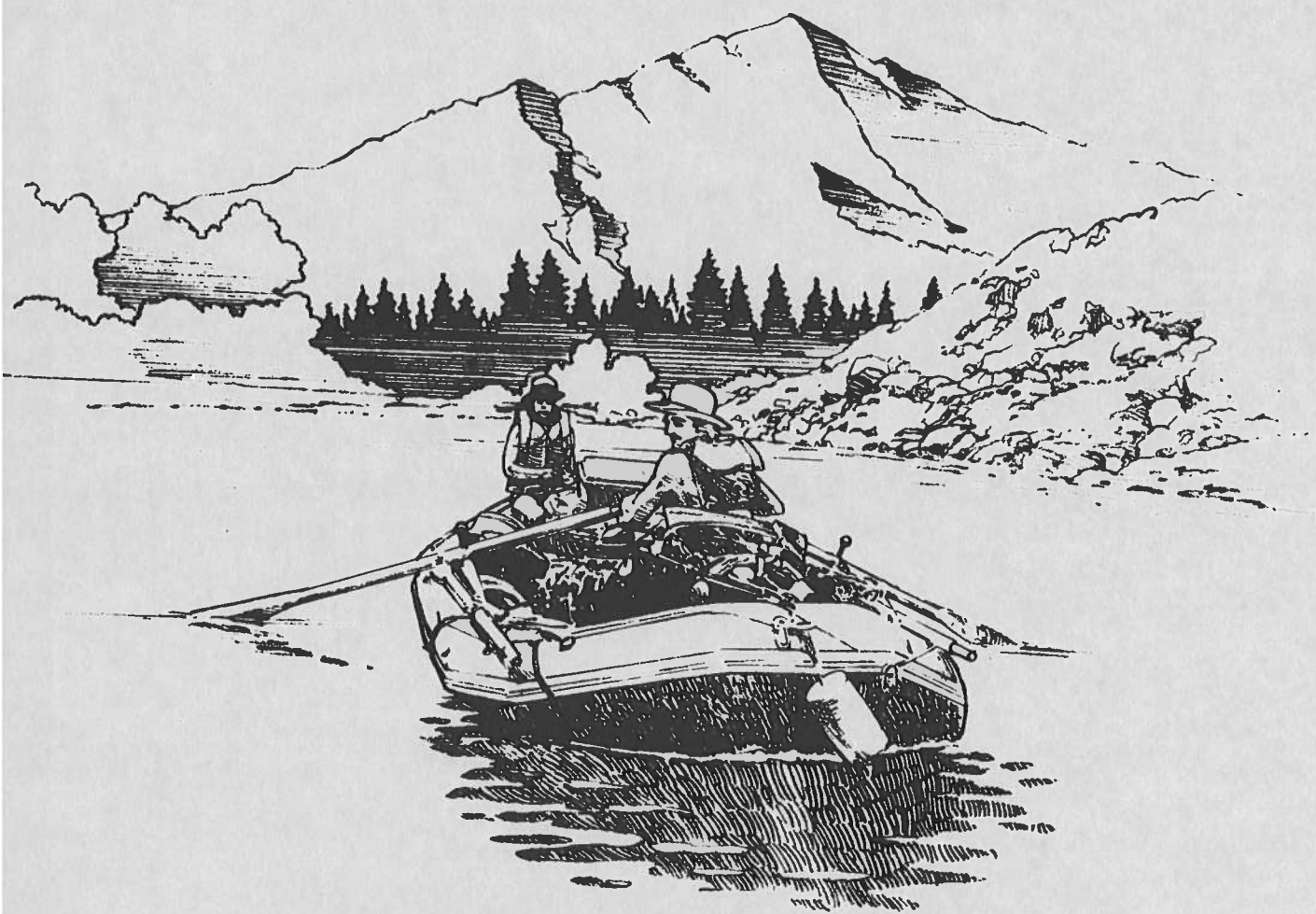
PACIFIC NORTHWEST RIVERS STUDY

RECREATION RESOURCES IN WASHINGTON

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INTRODUCTION

The Pacific Northwest Rivers Study assessed the value of a variety of fish, wildlife, natural feature, recreational, and cultural resources, as well as institutional constraints on hydropower development, in and adjacent to the region's rivers. The Washington State Parks and Recreation Commission was the lead agency for the evaluation of recreation values. The study included free-flowing river reaches in the state of Washington identified as having mean annual flows greater than 35 cubic feet per second (cfs) and the potential for hydropower development.

The National Park Service provided major staff support to the State Parks Commission. A study group made up of NPS staff, the Senior Resource Expert, and user-group representatives cooperated in the design of the study. The study was based primarily on a survey of knowledgeable recreation users.

This report summarizes the method used for the assessment. It identifies the value classes assigned to river reaches, the criteria on which those river reaches where evaluated, the standards for determining composite evaluations, and the process by which the decisions were made.

CATEGORY DESCRIPTION

The recreation resource value reflects the reaches' suitability for major, non-fishing, river-based recreation activities, as described in the criteria below.

VALUE CLASSES

Resource characteristics and recreation activities were rated, and reaches were assigned overall values, using the following scale:

Value Class	Definition
A	High recreation value
B	Above average recreation value
C	Average recreation value
D	Below average recreation value

These value classes generally correspond to value classes 1 to 4 of those defined for the Rivers Study in general, which were:

Value Class	Definition
1	Outstanding
2	Substantial
3	Moderate
4	Limited on a statewide basis but of local significance
U	Unknown or unclassified
N	No value

Note that there is no recreation value corresponding to value classes N, since the only river reaches assessed for their recreation value were those that an individual, user group, or commercial boating company identified as having some positive value.

CRITERIA

Two principal sets of criteria were used to evaluate river reaches for their recreation value: 1) resource characteristics and 2) recreation activities. The resource characteristics considered were:

1. Interesting hydraulics (for boating)
2. Challenge (for boating)
3. Water clarity
4. Feeling of solitude
5. Naturalness
6. Scenic quality

The recreation activities considered were:

1. Whitewater boating -- for rivers and river segments which are navigable in rafts or drift boats by intermediate to expert boaters and which contain a significant number of Class II to Class V rapids.

2. Whitewater kayaking -- for rivers and river segments which are used by accomplished boaters in canoes and kayaks. Often these are smaller streams than whitewater boating segments, with more portages and many Class III to Class V rapids.

3. Flatwater boating -- for rivers and river segments which are navigable by both motorized and nonmotorized boats, and for waters used by the general public

and for family recreation, including inner tubing. These are generally slack or slow moving but may have occasional riffles. These include Class I waters for rafting and canoeing.

4.   Camping and picnicking -- for rivers and river segments, accessed by either road or boat, which afford camping and picnicking at either developed or undeveloped sites.

5.   Hiking and backpacking -- for unroaded rivers and river segments, accessed by trail or cross-country travel, which are used by hikers and backpackers.

6.   Other activities -- for rivers and river segments affording opportunity for such activities as swimming, driving for pleasure, and trail travel by vehicles (motor bikes, three-wheelers, mountain bicycles) and horses. Recreation activities taking place in a river corridor but not dependent on or oriented to the river were not evaluated.

STANDARDS

Individual Evaluations

Appendix 1 is a sample of the worksheet used for the evaluations. Individuals, user groups, and commercial boating companies rated river reaches familiar to them on the resource characteristics and recreation activity criteria noted above. They assigned each river reach an overall value class based on a distillation of the value classifications for the separate criteria.

When rating the scenic quality criterion, the evaluators were asked to compare the reach being rated with others in the same general vegetation and climatic area; e.g., western slope Cascade rivers should not have been compared with eastern slope rivers.

The evaluators were told that a high level of use generally adds to the overall recreation value, but that in some cases high use may detract from the quality of the experience. Evaluators were also encouraged to supplement their value classifications with comments and descriptions.

Composite Evaluations

The work sheet in Appendix 2 was used to record the composite evaluations. The determination of the composite evaluations involved staff evaluations, Forest Service review, and a final ratings process.

Staff Evaluations

1.   Access and use levels: Access was not assessed as a separate factor in the rating process; significant use was assumed to indicate that access is at least adequate. A high use level was taken as evidence of high recreation value, even though the quality of the experience may be lessened for some people by this level of use. Overall staff value classifications reflected this assumption. On the other hand, a reach with high scenic quality, high boating value, or other positive attributes was not penalized for having low use levels due to poor access, lack of public awareness, remoteness, etc. The quality of experience in the latter case is apt to be much higher for those able to take advantage of it, and the overall staff value classification reflected this as

well. In summary, high use indicated high recreation value; on the other hand, low use did not lessen the value of high quality recreation resources. A further reason for not basing the value classification on access is that the access situation can change quickly.

2. Facility development: With a few exceptions where facility levels are very high (e.g., Bumping River), development levels in themselves did not determine overall value, but were considered along with other component values. Time limited facility data gathering to the number of (fishing) access sites, the number of launch ramps (federal and state ownership), and the number of camping and picnicking sites per reach. The numbers of access sites and launch ramps were discussed in the worksheet notes where appropriate, as they reflect access, but did not enter directly into the value classifications (see above discussion on access and use levels). The number of camping and picnicking units for each reach was determined from the listings in the Washington State Recreation Guide, 1985. This count was directly related to the staff rating for camping and picnicking according to the following guide:

Number of units	Value class
50 or more	A
25 to 49	B
1 to 24	C
0	D

No attempt was made to relate the number of camp and picnicking units to reach length, and the guide is somewhat arbitrary. However, it provides a rough measure of the relative level of camping and picnicking facilities provided by recreation managers, which in turn is assumed to reflect management's perception of the value of a site for camping and picnicking. Errors involved in these assumptions should not have any serious consequences since overall values are based on other component values.

Evaluators' comments on camping and picnicking facilities were considered in the staff value classifications. However, evaluators' ratings for those facilities which were unsupported by comments were not reflected in the staffs ratings. The reason for this was insufficient information to substantiate the individual evaluators' rating.[1] For camping and picnicking ratings to have been a major factor in the overall value classifications, data on private and local facilities would have been needed. There was not enough time to gather this information for this study.

3. Resource characteristics and recreation activities: (other than camping and picnicking -- see above discussion) These values were an average of individual evaluator ratings, with the following exceptions:

a. For ratings related to boating activities, more weight was generally given to ratings by boating groups than to those by non-boating groups.

b. Staff ratings generally were given for wildlife viewing only if a predictable wildlife population exists, affording a high probability for viewing (e.g. eagles in winter on the Skagit River). Staff ratings were also sometimes given based on evaluator comments, but were not given based solely on evaluator ratings, as noted above.[1]

c. Staff ratings generally were given for hiking and backpacking only for reaches with trails along most of their length. Evaluator ratings for hiking and backpacking for reaches accessed by roads generally were not reflected in staff ratings. Evaluator hiking and backpacking ratings for roaded reaches appeared often to refer to casual walking along fishing access trails, etc., as opposed to hiking as a separate activity.

4. Recommended overall staff value classifications: These generally reflected an average of evaluator's comments, with some exceptions which were explained in the worksheet notes. Component ratings which had the most influence on staff overall value classifications were those for the major activity/activities for the reach, and those for scenic quality. Other component values exerted influence on the staff overall value classification if they received special emphasis by the evaluators.

Other factors which upgraded recommended staff overall value classifications were proximity to an urban population and presence of commercial recreation operations.

Forest Service Review

Representatives of federal land management agencies (particularly the Forest Service) on the study review panel, reviewed facilities and use information on the composite worksheets for reaches on their lands, and filled information gaps.

Final Composite Value Classifications

The study review panel reviewed the classifications and suggested adjustments. If the staff agreed the changes were made. In a few cases where the staff did not agree with changes recommended by the panel, the Senior Resource Expert decided the classification. These differences of opinion occurred mainly where staff rated reaches higher than evaluators did because of heavy use. The Senior Resource Expert decided that in those cases the higher rating would become the overall value classification.

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[1]Evaluator ratings for camping and picnicking, hiking and biking and wildlife viewing which are unsupported by narrative explanation are useful data and will be retained in the data base even where they are not reflected in staff ratings. It is hoped that additional information for these components can be gathered in the future.

STUDY PROCESS

River Reaches

The reach list prepared by the Washington Water Research Center (WWRC) which was utilized for the overall Washington Rivers Assessment Study was considered inappropriate for evaluating recreational resource values. The study group determined that many recreation uses might not coincide with the WRRC reaches, and that reaches for different recreation activities might also not coincide with each other. It was decided that the people doing the evaluating for each type of recreation activity would be best qualified to define the reaches for that activity. The Friends of Whitewater (FOW) developed a list of boatable reaches. The individual evaluators were asked to use that list as a basis for deciding which reaches they would evaluate, and to use the reach start and end points as described where possible. Where the lists were incomplete or inadequate for the specific needs of the evaluators, there was provision made for those evaluators to define reaches. However, most used the FOW reaches, occasionally evaluating only a portion of some reach(es).

The Mountaineers also prepared inventory of river reaches with hiking or recreational driving potential. They also submitted evaluation worksheets for 41 of those reaches. Many of these corresponded to FOW reaches. Those reaches that did not correspond were either new reaches which were added to the data base, or reaches that overlapped more than one FOW reach. In the latter case, the relevant rated criteria were applied on the final data base to each overlapped FOW reach, to avoid defining intersecting reaches on that data base.

Individual Evaluations

A mailing list of potential evaluators was put together from several sources, among them the Friends of Whitewater, the Washington Environmental Council and Washington Trails Association. An outdated Nationwide Rivers Inventory (Park Service) mailing list was also used. The list continued to grow to a total of 208 user/environmental groups and individuals.

A mailing, including an invitation to participate in the study, a franked return response form, and a one-page article describing the study, was sent to all identified user groups. A second packet was then mailed to eighty groups and individuals who had agreed to participate in the study. The packet consisted of:

1. A letter describing the overall process.

2. A draft list of 234 boating reaches. Participants were asked to use these reaches in their evaluations. Instructions were also given for defining additional reaches if the need arose.

3. A few sample recreation value worksheets (see Appendix I) with instructions printed on the reverse side. These were to acquaint people with the kind of information needed: a phone follow-up was done to find out how many worksheets each group needed. Additional worksheets were sent out later along with an updated reach list.

4. Map of Washington State Water Resource Inventory Areas (WRIA's). This map was developed by the Washington Water Research Center for hydroelectric planning, and WRIA areas were adopted for the study by the Washington State Energy Office.

Reaches identified during the study for boating, hiking/backpacking, and general recreation were grouped by WRIA number. Participants were asked to indicate the WRIA number on each worksheet.

5.   An addendum was added to the worksheets for packets going to commercial operations, to gather additional information on seasons and numbers of clients.

The worksheet, although all on one page, was fairly complex and detailed. Recognizing this, the staff contacted each group by telephone to answer questions and get a feel for their intended level of response.

Composite Evaluations

A composite worksheet for each of 186 recreation reaches was sent to panel members along with a memorandum outlining the suggested composite evaluation process and inviting comments. The composite worksheets represented about 450 completed recreation worksheets for boating reaches, 41 composite worksheets for reaches evaluated by The Mountaineers for hiking/backpacking and general recreation, and nine composite worksheets for reaches evaluated by other participants.

Panel members were asked to notify the staff of reaches where they disagreed with staff ratings. Cases of disagreement between the staff and the panel were resolved as described in the Standards section of this report.

The ratings for all reaches except those in National Parks and Wilderness areas (which are already protected from hydropower development) were then entered into a computer, and tabulations were provided to the Senior Resource Expert and the State Coordinator. Maps at the 1:100,000 scale were prepared showing defined reaches with color-coded reach ratings. A summary 1:500,000 map was also prepared.

The recreation river reach evaluations were then correlated with the Washington Water Resource Center river reaches at the Washington State Energy Office.

PROJECT EVALUATION

This recreation assessment is necessarily subjective. This subjectivity is reflected not only in the ratings, but also in the number, location, types of reaches considered. Many of the evaluators were primarily interested in boating, and they evaluated the reaches they are most familiar with. There were more evaluators for some reaches than for others. However, the consensus of user groups and public agency representatives on almost all of the reach evaluations was strong enough to assure considerable overall reliability.

Future refinement of the study could include evaluation of the 464 hiking and backpacking reaches identified late in the study by the Mountaineers. Camping and picnicking data on sites other than those included in this study (local and private campgrounds and picnic sites) is available and could be added. Also, information pertaining to recreation found in other parts of the Rivers Study, e.g., hunting and fishing, could also be reviewed and incorporated as appropriate.

The study provides a further basis not only for environmentally sensitive planning for hydropower development, but also for river conservation per se. This recreation assessment can be considered in local and state-level planning, policymaking, regulating, and development related to rivers.

USE CONSIDERATIONS

The recreation assessment does not preclude the need to proceed with consultations as provided for in federal or state law.

## PARTICIPANTS

Study Evaluation Panel

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Gary Olverson, Colville National Forest
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Jim Doyle, Mount Baker-Snoqualmie National Forest
Mel Bennit, Okanagon National Forest
Warren Hartman, Olympic National Forest
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Carl Anderson, Wenatchee National Forest

Survey Participants

Washington Kayak Club
Friends of Whitewater
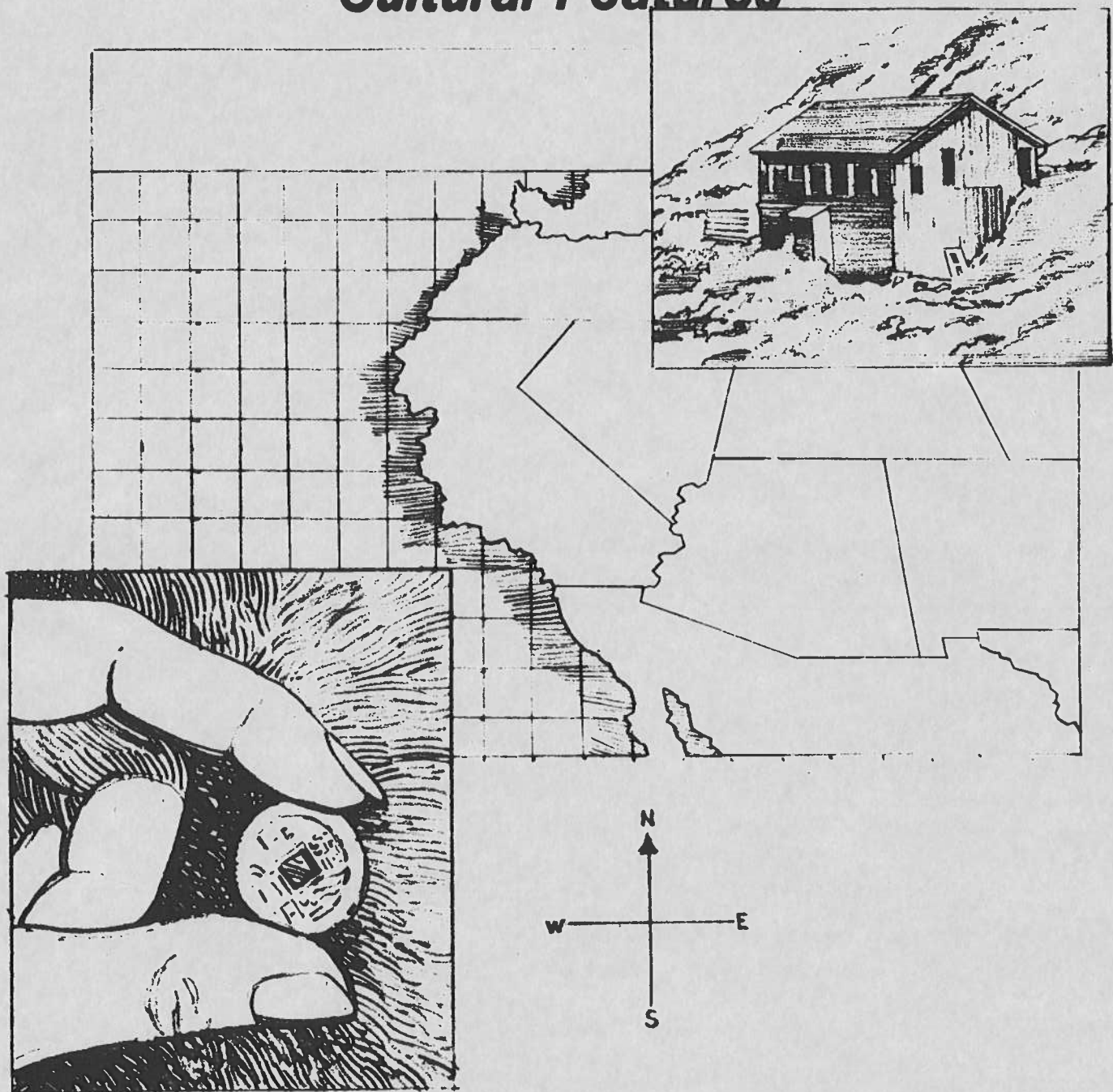
Cultural Features

PACIFIC NORTHWEST RIVERS STUDY

ARCHAEOLOGICAL AND HISTORIC RESOURCES IN WASHINGTON

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INTRODUCTION

The Pacific Northwest Rivers Study evaluated and ranked resident fish, wildlife, natural feature, recreational, and archeological/historic resources, as well as institutional constraints on hydropower development, in and adjacent to the region's rivers. The Department of Community Development, Division of Archeology and Historic Preservation (formerly the Office of Archaeology and Historic Preservation) was the lead agency for the evaluation of the archaeological and historic resources. This evaluation covered free-flowing river reaches in the state of Washington identified as having mean annual flows greater than 30 cubic feet per second (cfs) and the potential for hydropower development.

This report summarizes the method which was used to complete this assessment. It identifies the value classes to which river reaches were assigned, the criteria which were used to determine the value of river reaches, the standards used to apply these criteria, and the process by which decisions were made.

CATEGORY DESCRIPTION

For the purposes of this study, archeological and historic resources are districts, sites, buildings, structures, and objects that may be evaluated in terms of the criteria for the National Register of Historic Places (36 CFR 60 AND 36 CFR 63).

VALUE CLASSES

The cultural value classes are defined as follows:

Value Class	Definition
1	Outstanding known or potential cultural resource value
2	High known or potential cultural resource value
3	Moderate known or potential cultural resource value

Value Class	Definition
4	Limited known or potential cultural resource value
U	Unknown potential or unclassified cultural resource value
N	No cultural resource value

CRITERIA

River reaches which included portions of National Parks, Indian Reservations, Wilderness Areas, and Wild and Scenic Rivers were excluded from classification. The remaining river reaches were assigned cultural resource values by a process which emphasized known resources and their significance as determined through the National Register process or a comparable process at the local level. Two criteria were used to determine the overall cultural resource value of the river reaches. These were: 1) site significance, and 2) extent of survey coverage.

STANDARDS

Criterion 1: Site Significance

Sites were distinguished on the basis of documented levels of significance determined through the review processes established by federal, state, or local governments. The types reflect, in terms of the National Historic Preservation Program, a ranking of properties along a continuum of significance from the nation as a whole to the state and finally the local community. Distinct legal and regulatory processes are required for each that afford them consideration during the environmental review process. The value of a river reach directly reflects the established significance of the known properties it contains:

A. National Historic Landmark

National Historic Landmark designation recognizes nationally significant properties essential to the understanding and appreciation of the nation's history, development, ideals, and character. Landmarks include districts, sites, buildings, structures, and objects which have been pivotal in the development of American history, architecture, archaeology, or culture. National Historic Landmarks are designated by the Secretary of the Interior. The National Park Service reports annually to Congress on the condition of National Historic Landmarks.

B.   National Register Properties

National Register properties consist of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture. The National Register is an authoritative guide to be used by federal, state, and local governments; private groups; and citizens to identify the nation's cultural resources and to indicate what properties are worthy of protecting from destruction or impairment.

Designation as a National Register property is obtained either by the nomination process involving the state review board and the State Historic Preservation Officer with review by the Secretary of the Interior (36 CFR 60) or by the determination of eligibility process involving consultation between the permitting, licensing, or funding federal agency; the State Historic Preservation Officer; and in the case of disagreement, the Secretary of the Interior.

C.   State Register Property

A State Register Property represents a property important in understanding Washington State history, architecture, or archaeology. These properties are listed by the State Historic Preservation Officer based upon significance review recommendations of the State Advisory Council on Historic Preservation.

D.   City/County Landmark

City/County Landmarks are created and protected by local ordinances and reflect properties important in understanding local history, architecture, or archaeology based upon significance review recommendations of the local landmark review board.

E.   Native American Burial

State law RCW 27.34 specifically protects Native American burial on public and private lands. Notification and consultation with the concerned Indian tribe or tribes and a permit from the State Historic Preservation Officer are required before a burial can be legally disturbed.

F.   Multiple Inventory Properties

A river reach that contains three or more inventory properties is placed in this category. Random samples were drawn from DAHP files to determine the ratio of inventory properties necessary to yield one site eligible for National Register listing given a general probability model. The result was three to one.

G.   Inventory Property

Inventory properties represent buildings, structures, sites, objects, and districts which have been recorded to professional historic preservation standards but have not yet been subject to a formal review process as required by the National Register, State Register, or City/County Landmark programs. The required levels of documentation are detailed in the Secretary of the Interior's "Standards and Guidelines for Archaeological and Historic Preservation," (Federal Register, V. 48 N. 190:44716).

H. No Site Data

River reaches that contain no recorded properties are put in this category. Survey coverage interacts with this category in a specific manner. As survey coverage increases, confidence that the reach contains no sites grows and lowers the value of the reach.

Criterion 2: Survey Coverage

The criterion of survey coverage reflects the actual on-site inspection of a river reach by cultural resource specialists. The documentation of that inspection must meet the standards of the Secretary of the Interior. Any cultural resource survey report without an accompanying map detailing the area examined was not included in the calculated percentages. For certain types of surveys, a set percentage value was assigned. For example, a bridge replacement cultural resource survey was assigned a one percent value. Four broad percentage categories were developed to which the reach's combined coverage could be accurately assigned: a) 76 to 100 percent, b) 51 to 75 percent, c) 21 to 50 percent, and d) under 21 percent.

Overall Classification

For most river reaches, an overall value was assigned automatically based on site significance. For example, if a National Historic Landmark was present, the assigned value was 1 (outstanding). Similarly, if a National Register, State Register, or City/County Landmark site is present, the reach was rated 2 (high), since these properties reflect determined significance and require specific review processes. If a Native American burial was recorded, the reach was designated 2 (high) because of the legislated permitting and consultation procedures. If three or more inventory proprietors were present, the reach was also rated 2. Finally, when multiple property values were recorded for a reach, the highest value predominated (e.g., a reach that contained a National Register property and an Inventory property was rated 2). The classification matrix is presented in Table 1.

Table 1. Classification matrix for cultural resource values.

Survey Coverage	Site Significance							
	NHL	NRP	SRP	CCL	NAB	IP3	IP	NSD
76-100%	1	2	2	2	2	2	3	4
51-75%	1	2	2	2	2	2	3	4
21-50%	1	2	2	2	2	2	3	3
0-21%	1	2	2	2	2	2	U	U

Abbreviations:
NHL: National Historic Landmark
NRP: National Register Property
SRP: State Register Property
CCL: City/County Landmark
NAB: Native American Burial
IP3:   Multiple Inventory Properties (three or more properties)
IP: Inventory Property (less than three properties)
NSD: No site data

The river reaches which were excluded from classification were also assigned value class U.

STUDY PROCESS

Participation by Other Agencies and Private Interest Groups

During the course of this study, multiple strategies were employed to solicit comments and technical information from other agencies and public and private interest groups. These included the formation of a volunteer technical advisory group, the circulation of draft and revised draft methods and procedures documents, visits to agencies maintaining separate files, and an agency and public review of the assessed river reaches.

Advisory Group

To provide for comments during the development of the assessment methods, DAHP established a volunteer technical advisory group. Formation of the group was mandated by BPA guidelines which stated that the state, tribes, and federal agencies would be represented in the evaluative process commensurate with their legal authorities and management responsibilities. The group included professional cultural resource staff of federal agencies, tribes, local governments, and DAHP. Staff from public utilities, an engineering firm involved in cultural resource management, and representatives from academic and amateur archaeology were also invited to participate. Agencies, groups, and individuals consulted are listed at the end of this document.

Document Circulation

Both draft documents were circulated with a request for written comments. Comments detailing specific technical suggestions were incorporated into the revised procedures where possible.

Agency Visits

In order to incorporate information maintained by local government preservation offices, the staff visited each preservation office and reviewed their landmark register and inventory files. They also visited three of the National Forests to provide assistance.

The staff also participated in a joint meeting with representatives of the other state historic preservation offices and the National Park Service to compare procedures and to discuss and resolve common issues.

Agency Review

To provide for agency review, worksheets for river reaches on National Forest lands were copied and sent to the respective Forest Service offices for their examination, incorporation of missing information, and assignment of cultural resource values based upon developed procedures.

Public Review

To provide for public review of the completed study, a two day public meeting was held where the classified 1,414 river reaches and the supporting river reach worksheets were available for inspection. The data summary sheets available for public inspection containing information on Native American burials were masked to protect the sited. These reaches were given a comparable site significance letter designation (B, C, D, or F).

Calculation of Preliminary Density Values

River reaches were treated as being of equal length. Under the classification system, two reaches, one .5 miles long and the other 20 miles long, each including 3 inventory

properties, would both have been assigned a value of 2 (high cultural resource value). Assuming 100 percent survey coverage, the reaches contain 0.15 sites per mile and 6.0 sites per mile, respectively. If the .5 mile reach had only two sites, it would be assigned value class 3 (moderate cultural resource value), despite having a site density almost 27 times that of the longer reach.

To address this problem in particular, as well as other limitations to the value classification system (discussed under project evaluation), and to supplement the classification, DAHP included preliminary density values (PDV's) in its database. Known resources were divided by reach length to yield the number of National Register or potential National Register properties per reach mile. The higher the density, the greater the probability of hydropower project impacts on cultural resources actually present, assuming even distribution of resources within the reach. It should be emphasized that this is a minimal figure, and does not reflect site significance. The presence of historic and archaeological districts containing multiple properties was also noted.

Data Compilation

River reach worksheets were employed to record and inventory information for each of the 1,414 river reaches. Survey information recorded included bibliographic references for professional surveys undertaken in the river reach, a percentage estimate of the portion of the river reach examined by each survey, and a sum total of survey coverage.

Site data recorded on the worksheets included site number, name, a brief description of the property, the status of each site (National Historic Landmark, National Register, State Register, City/County Landmark, Inventory Property), and the most recent date the site was examined. The presence of recorded Native American burials and whether a particular reach was excluded from classification were also noted.

All these river reach worksheets are on file at the Office of Archaeology and Historic Preservation.

Summary data sheets were then prepared for the river reaches, reflecting the highest applicable value class for each river reach. It was the information from these sheets which was entered on to the computer database. There is a sample summary data sheet in Appendix I. Each line on the data sheets describes one reach as follows:

In the Value column are the overall value classes for each reach.

In the Survey column are the survey coverages for the classified reaches, codified as follows:

Code	Survey Coverage
a	76 to 100 percent
b	51 to 75 percent
c	21 to 50 percent
d	less than 21 percent

In the Site column the site significance of each classified reach is given, codified as follows:

Code	Site Significance
A	National Historic Landmark
B	National Register Property
C	State Register Property
D	City/County Landmark
E	Native American Burial
F	Multiple Inventory Properties
G	Inventory Property
H	No Site Data

Summary Results

Classes

As expected, almost 60 percent of the river reaches had insufficient information to classify and 24 percent of the reaches were excluded from classification. Thus 84 percent of the reaches were in value class U. Next in frequency was value class 2 (high) with 16 percent. The other classes combined (1, 3 and 4) together were assigned to less than 1 percent of the river reaches. No reach was assigned value class N (no resource value).

Survey

Ninety-five percent of the reaches had less than 21 percent survey coverage. Seventy-two percent of them had no recorded coverage. The estimated mean for survey coverage for all 1,414 reaches is less than 4 percent.

Site

Sixty-nine percent of the reaches have no site data. Over 16 percent of the river reaches contain either National Register, State Register, City/County Landmark, Native American Burial, or Multiple Inventory Properties.

Planning Density Values

Extremely preliminary analysis of the PDV's indicates that any value over 1.0 should be considered a high density based on current knowledge. Approximately 5 percent of the reaches have density values over this figure. PDV's range from under 0.1 to 10 sites per mile.

PROJECT EVALUATION

Assumptions and Limitations of the Value Classification

In addition to treating the river reaches as being of equal length, which was addressed by the preliminary density calculations previously discussed, this value classification system has certain other intrinsic limitations, including the following:

1. Survey coverage was assumed to be of equal quality. In reality, the quality can vary widely. For this study the quality of surveyors, quality of reporting, and accommodation to various ground covers and terrains were assumed to be comparable.

2.	Survey coverage was assumed to be directly related to site discovery. However, in heavily forested areas, or aggraded floodplains, surface survey may not reveal the presence of archaeological sites. Recorded sites in these areas have been more often the result of fortuitous discovery than of systematic site survey.

3.	River reaches were treated as being environmentally uniform. Variations which might have lead to anomalous site densities is a reach's surveyed portions were ignored.

Quality of the Data

Most information used in the study is recent, dating from the last 10 to 15 years, and relatively free of the inconsistencies that plague earlier works. All sites and surveys are documented to standards set by the Office of Archaeology and Historic Preservation and the Secretary of the Interior. The database represents properties documented to explicit standards, and they have "significance" established through a public review process at either the federal, state, or local level. Information not documented to these standards could not be included. Some study users may find that sites, with which they are familiar, were not included. DAHP encourages cultural resource personnel at all governmental levels to document these sites to required professional standards so they can be evaluated and incorporated into future river studies.

Scale

The scale of this study is unprecedented. Not since early investigations into the area's prehistory and history has there been an attempt to deal with the cultural resources of the entire state, and those efforts did not result in an extensive quantitative database. Consequently, subsequent use of this database by researchers offers an excellent opportunity to make comparisons between different regions of the state or to test hypotheses.

Emphasis on River Systems

Pacific Northwest rivers were the traditional focus of prehistoric and historic transportation and settlement. Accumulation and interpretation of cultural resource data in the state's river basins is therefore extremely useful. However, the 1,000 foot (from the river) study universe may be problematic in certain circumstances. In situations where major changes have occurred in drainage systems (e.g., river meanders) much cultural information is excluded from this database. Future studies could perhaps address this additional data, essential to planners when hydropower project impacts extend beyond the 1,000 foot limits.

National, State or Local Register Focus

Using National, State, or Local Register eligibility as a major criterion in the river reach evaluation process marks the first time that state and local register properties have been systematically incorporated into the federal planning process at a level equal to National Register properties within the state. While these registers are biased towards historic structures, the use of the three to one ratio of inventory properties to National Register sites in assigning value classes and the preliminary density values increase representation of archaeology properties.

Cooperation and Communication

The fact that archaeology and historic resource concerns are being incorporated into the planning process in a comprehensive fashion is a resounding success of this study. Another

positive outgrowth of this study is the degree of inter-agency and individual communication and information sharing it has promoted. Historic preservation and cultural resource information has been exchanged, and the strength and weaknesses of existing information has been identified in a preliminary fashion.

RECOMMENDATIONS

Provide a Means of Updating the River Reach Information

The cultural resource databases of the historic preservation agencies and forest service are dynamic. New surveys and properties are constantly being added and significance evaluation is a scheduled component of historic preservation agency programs. Provisions should be made to incorporate new data into the system on an ongoing basis.

Explore the Desirability of Developing Systems for Evaluating Unsurveyed River Reaches

A majority of the river reaches had insufficient information to classify. Addressing the archaeological and historic significance of unsurveyed river reaches represents a major challenge in the cultural resource management field today. To address this challenge, numerous agencies are exploring the possibility of predictive models for targeting on-site inspections. It would be beneficial to examine their approach and models and evaluate their applicability to this project.

Integrate this Planning Effort with Other Agencies' Planning Efforts

DAHP is currently implementing a state-wide comprehensive historic preservation planning effort entitled "The Resource Protection Planning Process." This comprehensive planning approach was developed, like the current study, by the National Park Service, and it would be beneficial to explore how they can complement one another.

DATABASES INCLUDED IN STUDY

Office of Archaeology and Historic Preservation
     National Register of Historic Places
     State Register of Historic Places
     Determination of Eligibility for the National Register Files
     Washington Archaeological Research Center Shared Database
     State Historic Inventory Files
     National Forest's Historic and Archaeological Inventory Records
     Cultural Resource Reports

Forest Service Inventory Records
     Colville National Forest
     Gifford-Pinchot National Forest
     Mt. Baker-Snoqualmie National Forest
     Okanogan National Forest
     Olympic National Forest
     Umatilla National Forest
     Wenatchee National Forest

County Landmark Registers and County Inventory Files
     Clark County Preservation Office
     King County Preservation Office

Pierce County Preservation Office
Snohomish County Preservation Office

City/County Landmark Register and City/County Inventory Register
Spokane City/County Preservation Office

City Landmark Registers and City Inventory Files
Seattle Historic Preservation Office
Tacoma Historic Preservation Office

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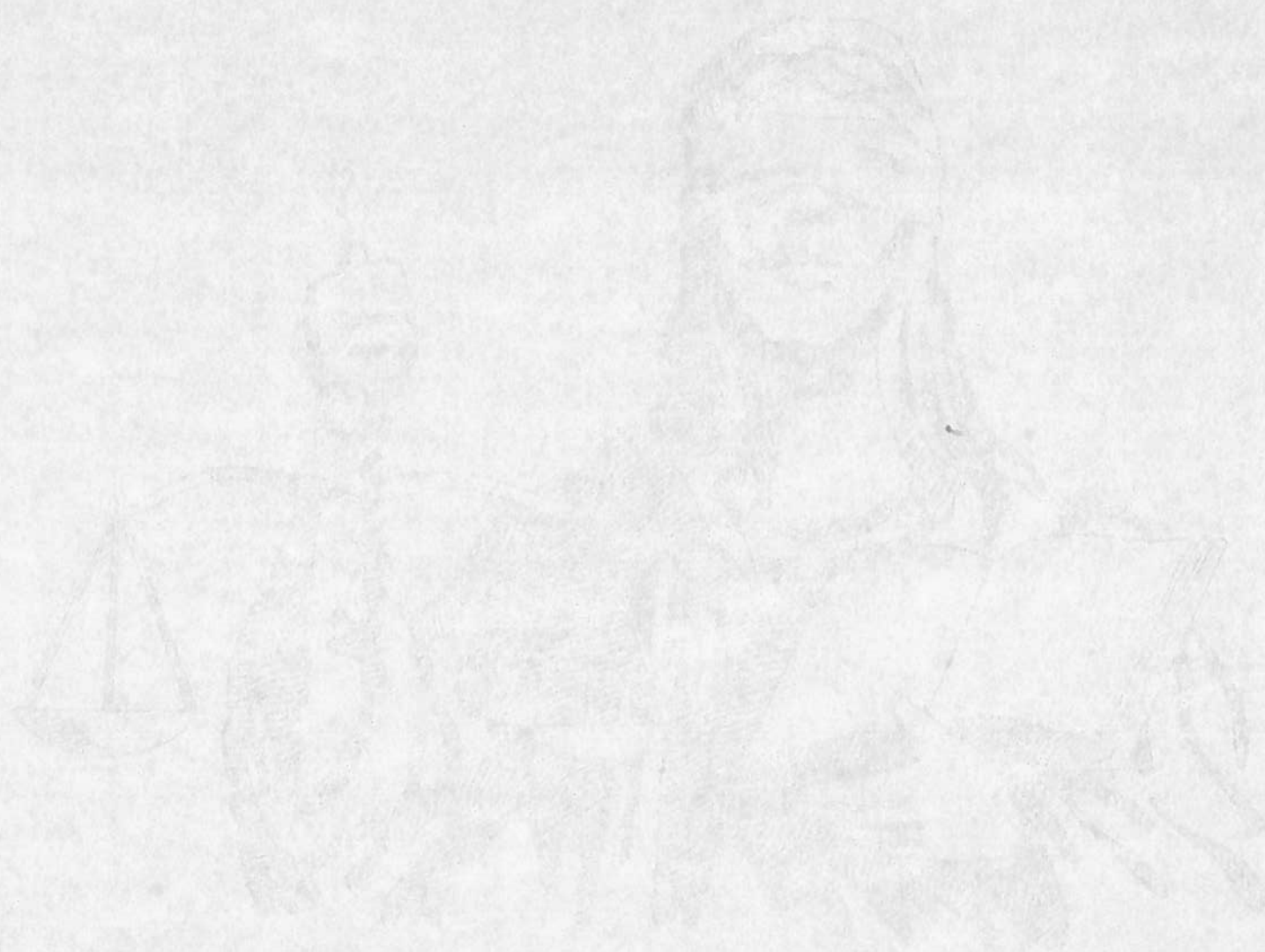
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Institutional Constraints

PACIFIC NORTHWEST RIVERS STUDY

INSTITUTIONAL CONSTRAINTS IN WASHINGTON

LEAD AGENCY

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INTRODUCTION

The Pacific Northwest Rivers Study evaluated and ranked resident fish, wildlife, natural feature, recreational, and cultural resources, as well as institutional constraints on hydropower development, in and adjacent to the region's rivers. The Washington State Energy Office was the lead agency for the evaluation of the institutional constraints on hydropower development. The study covered free-flowing river reaches in the state of Washington identified as having mean annual flows greater than 30 cubic feet per second (cfs) and the potential for hydropower development.

CATEGORY DESCRIPTION

Institutional Constraints are laws, policies, plans, ordinances administered by federal, state, or local governments, or by Indian tribes which prohibit, significantly limit, or otherwise impose conditions on hydropower development in a given location.

CONSTRAINT CLASSES

Constraint classes were developed to correspond to the value classes utilized in assessing the resources categories evaluated by the Rivers Study. These constraint classes are as follows:

Constraint Class	Division
1	Federal, state or local regulations prohibit hydropower development
2	Potential federal prohibition of hydropower development
3	Federal, state or local regulations limit or restrict hydropower development
4	Federal, state or local regulations permit hydropower development with case-specific conditions

Constraint Class	Division
U	Unclassified or unknown institutional constraints on hydropower development
N	No institutional constraints present

CRITERIA

Constraint Class 1

A river reach was included in Constraint Class 1 if it was in or contained any of the following designated management areas, or was subject to legal exclusions to hydropower development.

Designated Management Areas

1. Federal
    a. National Parks
    b. National Monuments
    c. Wilderness Areas
    d. Wild and Scenic Rivers
    e. Estuarine Sanctuaries
    f. Research Natural Areas
    g. Areas of Critical Environmental Concern

2. State
    a. Wildlife Refuges
    b. Natural Heritage Areas

3. Local
    a. Shoreline Management Act
       --designated Natural shorelines

4. Tribes (as applicable)

Constraint Class 2

Areas explicitly identified for potential inclusion as a Constraint Class 1 designated management area (e.g., wild and scenic study or potential study rivers) were included in Constraint Class 2.

Constraint Class 3

A river reach was included in Constraint Class 3 if was affected by one of the following special management areas:

A. National
    1. Wildlife Refuges
    2. Roadless Areas
    3. Sites in the National Register of Historic Places
    4. National Natural Landmarks
    5. Campgrounds
    6. Trails
    7. Special Management Areas in National Forest Management Plans
    8. National Recreation Areas

B. State
    1. Waysides
    2. Wildlife Habitat Management Areas
    3. State Forests
    4. State Parks

C. Local
    1. County Parks
    2. City Parks
    3. Shoreline Management Act
        --designated Conservancy, Rural, or Urban shorelines

Constraint Class 4

River reaches on which hydropower development is a generally permitted use were designated as Constraint Class 4. Hydropower development on these reaches would be subject to case specific conditions based on the merits of a given proposal. The only reaches assigned this constraint class where in the National Forests, though land with local zoning restrictions but not falling under the Shoreline Management Act may be included in the future.

Constraint Class U

Reaches on which any institutional constraints were unknown or unclassified were designated as Constraint Class U. In addition to reaches missing shoreline management or National Forest classifications, reaches in most Indian Reservations were assigned to this constraint class.

Constraint Class N

No reach or reach segment was considered to have no institutional constraint to hydroelectric development, thus this constraint class was never assigned.

Overall Constraint Classes

Up to three constraint classes assigned for segments of each river reach were retained in the final data base. The overall constraint class for a given segment of a river reach was the highest classification applicable to it.

STANDARDS

The standards for applying most of the constraint class criteria are obvious, i.e, a river reach either is or is not in a National Park. Those which are less obvious are discussed in this section according to their sources.

Shoreline Management Act

The Washington Shoreline Management Act (SMA) of 1971 applies to non-federal shore lands throughout the state, including any streams where the mean annual flow is greater than 20 cubic feet per second. Thus, virtually all streams in Washington included in the Rivers Study that are not on federal lands were affected by the SMA. The exceptions to this are most likely due to differences in the methods used to calculate mean annual flows. In addition, information on a small number of the shore lands which should have SMA designations was missing.

The guidelines developed by the Washington Department of Ecology for local governments to use in developing their shoreline master programs classified all applicable shorelines into four distinct environments: natural, conservancy, rural, and urban. The classifications are based on the existing development patterns, biophysical capabilities and limitations of the shorelines, and the goals and aspirations of the local citizenry.

The intent of the natural environment designation is to preserve and restore those natural resource systems existing relatively free from human influence. Therefore, activities which may degrade the actual or potential value of this environment are strictly regulated.

The intent of a conservancy environment designation is to protect, conserve, and manage existing natural resources and valuable historic and cultural areas in order to ensure a continuous flow of recreational benefits to the public and to achieve sustained resource utilization.

The rural environment was intended to protect agricultural land from urban expansion, restrict intensive development along undeveloped shorelines, provide a buffer between urban areas, and maintain open spaces and opportunities for recreational uses compatible with agricultural activities.

The objective of the urban environment designation was to ensure optimum utilization of shorelines within urban areas by providing for intensive public use and by managing development so that it enhances and maintains shorelines for a multiplicity of urban uses.

The natural environment designation would therefore preclude hydropower development, so reaches with natural shorelines were placed in Constraint Class 1.

Any hydropower project proposed for a conservancy, rural, or urban environment would require a shoreline substantial development, conditional use, or variance permit which would be reviewed on a case-by-case basis for conformance with the local shoreline master program, the SMA, and other applicable state regulations. The river reaches with any of these three shoreline environments were classified under Constraint Class 3.

National Forest Service

The resource management plans for the seven national forests in Washington were assessed by the the foresters in charge for their compatibility with hydropower development. They assigned the constraint classes which they deemed consistent with

those plans to the river reaches in their forests. Some of the factors used in this determination were the presence of campgrounds, visual management areas, roadless areas, potential Wild & Scenic Rivers, and recreation areas.

Wild and Scenic Rivers

Classifying Wild and Scenic Rivers was complicated by both varying sources of recommendations and steps in the designation process. Most of the Skagit River and several of its tributaries (Cascade, South Fork Cascade, Suiattle, Sauk, and North Fork Sauk) constitute the only designated Wild and Scenic Rivers under the federal Wild and Scenic Rivers Act of 1968 in Washington State. The reaches in this group were assigned to Constraint Class 1.

The only Wild and Scenic Study River enacted by Congress under section 5(a) of that Act is a portion of the Snake River, which is not part of the Rivers Assessment.

There are 27 rivers or segments of rivers in Washington which were identified as potential federal Wild and Scenic Rivers under the 1980 National Rivers Inventory. In addition, the National Forest Service personnel in the individual forests have identified other rivers and river segments within their boundaries for study or potential study as Wild and Scenic Rivers. Finally, the Skykomish River and several of its tributaries are Washington State Scenic Rivers.

In some cases, rivers which were considered potential Wild and Scenic Rivers according to the 1980 inventory, were labeled as study rivers within the forest boundaries by the forest service. Conversely, there are rivers in the national forests which are potential Wild and Scenic Rivers according to the 1980 inventory, but which the forest service did not identify as such on their data sheets.

Constraint Class 2 was originally intended to be assigned only to study rivers. However WSEO decided that a more cautious approach of assigning all potential and study rivers, as indicated either by the National Forest Service data sheets (for reaches within National Forest boundaries) or the 1980 inventory, to Constraint Class 2 was more appropriate, given the variation in the ways that the status of the rivers was identified.

STUDY PROCESS

Data Collection

The Department of Ecology mapped the Shoreline Management Act designations on United States Geological Survey (USGS) 1:100,000 scale maps. These were sent to WSEO where they were compared to maps of the WRIA-based river reaches. The (often multiple) shoreline management environmental categories and constraint classes for each reach were then entered onto the institutional constraint data sheets.

National Forest Service personnel filled in their information on a duplicate set of data sheets to those completed by the WSEO. These data sheets were then checked against USGS 1:100,000 scale maps at WSEO and some alterations were made to conform the information to national forest and wilderness boundaries . (The recently amended wilderness boundaries had been added to one set of USGS maps by Bob Bicknell of the Washington Department of Game.)

Other agencies also contributed information about locations of management areas which did not appear on the USGS maps. The National Heritage Program of the Washington

Department of Natural Resources compiled a list of Research Natural Areas, Special Interest Areas, National Landmarks, and Natural Area Preserves, and noted the river reaches upon which they are located. The federal Fish and Wildlife Service compiled a list of mitigation lands located along streams and rivers in Washington, located by their township, section, and range coordinates.

Using the USGS 1:100,000 scale maps, WSEO correlated the locations of some additional designated resource areas (e.g., National Parks) and special management areas with the river reaches.

<u>Final Compilation</u>

WSEO entered the information from the two sets of data sheets (WSEO and NFS) into the computer data base. There is a sample data sheet in Appendix I. Each line on the data sheets describes one reach as follows:

In the SMA column are the shoreline management environmental designations, codified as:

Code	Environment
N	natural
C	conservancy
R	rural
U	urban

In the state Special Management column are some designated resource areas and special management areas, codified as:

Code	Definition
HMA	Habitat Management Area
RNA	Research Natural Area
ML	Mitigation Land

In the federal other column are the following special river and land classifications:

Code	Definition
WS	Wild and Scenic River, Wild and Scenic Study River, or Potential Wild and Scenic River
WN	Wilderness Area
IR	Indian Reservation
MR	Military Reservation

In the Forest Service column are the national forests, codified as:

Code	National Forest
BS	Mount Baker-Snoqualmie
OL	Olympic
GP	Gifford Pinchot
WE	Wenatchee
OK	Okanogan
CO	Colville
UM	Umatilla

In the Park Service column are the national parks, codified as:

Code	National Park
MR	Mount Rainier
NC	North Cascades
OY	Olympic

In the Class column are as many as three constraint classes, in numerical order from 1 to 4, then U.

The most common entries on the Comments column are the break points on the river reaches between different constraint classes. Mileages, where shown, are approximate. Features and named areas of note (e.g., the special management areas) are also given in this column.

Printouts of the database were sent to the forest service for review and comment.

PROJECT EVALUATION

The list of special management areas and the corresponding constraint classes for each does not indicate the relative lengths or proportions of those areas on the reaches. For example, the designation of N (Shoreline Management natural environment) on a particular reach could refer to anything from all of the reach to less than a quarter of a mile of one shore.

USE CONSIDERATIONS

PARTICIPANTS

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Washington Department of Ecology
United States Fish and Wildlife Service
Washington Department of Game

APPENDIX IA

RESIDENT GAMEFISH SPECIES OF WASHINGTON

(Source: WDG's 1984 "Washington Game Fish Seasons and
Catch Limits" pamphlet).

Common Name	Latin Name
Largemouth bass	Micropterus salmoides
Smallmouth bass	Micropterus dolomieui
Brown bullhead	Ictalurus nebulosus
Black bullhead	Ictalurus melas
Yellow bullhead	Ictalurus natalis
Channel catfish	Ictalurus punctatus
Blue catfish	Ictalurus furcatus
Freshwater ling (burbot)	Lota lota
Black crappie	Pomoxis nigromaculatus
White crappie	Pomoxis annularis
Arctic grayling	Thymalus arcticus
Yellow perch	Perca flavescens
Northern pike	Esox lucius
Bluegill sunfish	Lepomis macrochirus
Green sunfish	Lepomis cyanellus
Rock bass	Ambloplites rupestris
Pumpkinseed	Lepomis gibbosus
Warmouth	Chaenobryttus gulosus
Bull trout	Salvelinus confluentus
Cutthroat trout	Salmo clarki
Golden trout	Salmo aguabonita
German brown trout	Salmo trutta
Dolly Varden trout	Salvelinus malma
Eastern brook trout	Salvelinus fontinalis
Kokanee	Oncorhynchus nerka
Lake or Mackinaw trout	Salvelinus namaycush
Atlantic salmon	Salmo salar
Rainbow trout	Salmo gairdneri
Walleye	Stizostedion vitreum
Lake whitefish	Coregonus clupeaformis
Mountain whitefish	Prosopium williamsoni

1. For a given stream reach, each of the seven parameters listed below was rated as low, intermediate or high (if available, using data collected from August through mid-September, otherwise using best estimates of stream condition for the same time period). Unknown parameters were not rated.

2. Numerical scores were assigned to each rated parameter as follows:

    low = 1, intermediate = 2, high = 3.

3. The sum of the numerical scores was divided by the number of rated parameters to obtain an average habitat quality score for the system.

4. Stream reaches with mean scores of 1.0 - 1.49, 1.50 - 2.49 and 2.5 - 3.0 were assigned habitat indices of low, intermediate, and high, respectively.

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Parameter 1: Stream Flow[1]

a. Low: Late summer stream flows inadequate (CPF less than 15 percent of ADF), and/or extreme fluctuation between flood and base flows.

b. Intermediate: Late summer stream flows limited to moderate (CPF 16-36 percent of ADF), and/or fluctuations between flood and base flows pronounced but moderate in effect.

c. High: Late summer stream flows adequate (CPF more than 36 percent of ADF), and/or little or no fluctuation between flood and base flows.

Parameter 2: Maximum Summer Stream Temperature

a. Low: Less than 8 degrees C (46 degrees F) or more than 24 degrees C (76 degrees F).

b. Intermediate: 8 to 11 degrees C (46 to 52 degrees F) or 20 to 24 degrees C (69 to 76 degrees F).

c. High: 11 to 20 degrees C (52 to 69 degrees F).

Parameter 3: Water Quality[2]

a. Low: Pollutant loadings severely limit trout productivity.

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[1] TCPF = critical period flow (average daily flow during August and the first half of September); ADF = average daily flow (for the water year).

[2] Pollutants include nitrates, phosphates, suspended and dissolved solids, high or low pH values, organics, metals, etc.

b.   Intermediate: Pollutants introduced periodically and/or in low enough concentrations that trout productivity is rarely severely affected.

c.   High: Little or no pollutants present.

Parameter 4: Productivity[3]

a.   Low: Trout food organisms rare (less than 100 organisms per square foot), and/or stoneflies absent; Elmid beetles rare; mayflies and caddisflies sometimes present; worms, midges, and snails prominent, and/or little or no submerged aquatic vegetation present.

b.   Intermediate: Trout food organisms common (100 to 350 per square foot), and/or stoneflies rare; Elmid beetles vary in occurance; mayflies and caddisflies prominent, and/or occasional patches of submerged aquatic vegetation present.

c.   High: Trout food organisms numerous (more than 350 per square foot) and/or stoneflies and Elmid beetles common; mayflies and caddisflies prominent, and/or well-developed and abundant submerged aquatic vegetation present.

Parameter 5: Percent Cover[4]

a.   Low: Less than 25 percent cover

b.   Intermediate: between 25 and 40 percent cover.

c.   High: Over 40 percent cover.

Parameter 6: Substrate[5]

a.   Low: Fines, boulders, or bedrock predominate, and/or interstitial spaces in gravel of rubble well plugged with fines.

b.   Intermediate: Gravel and rubble prominent, but fines, boulders, or bedrock predominate, and/or interstitial spaced limited to moderate plugging with fines.

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[3]   Number of organisms per square foot determined by Surber samples from riffles -- excluding aquatic Annelids from counts; submerged aquatic vegetation includes algae and moss growing on rocks.

[4]   Cover includes water depth (pools), surface turbulence, loose sub-strate, large rocks and other submerged obstructions, undercut banks, aquatic and overhanging terrestrial vegetation, dead snags and other debris lodged in the channel, and anything else that allows trout to avoid the impact of the elements or enemies.

[5]   Boulders are 12 inches or greater in diameter, rubble is 3 to 12 inches in diameter, gravel is 0.2 to 3 inches in diameter, and fines are less than 0.2 inches in diameter (sand, silt and clay particles).

c.   High: Gravel and rubble predominate, and/or fines present in small to moderate amounts, but little or no plugging of interstitial spaces.

Parameter 7: Bank Condition

a.   Low: Bank vegetation poor -- little or no shading or overhang, and/or 50 percent of bank eroded.

b.   Intermediate: Bank vegetation fair -- some shading and overhang, and/or 20 - 50 percent of bank eroded.

c.   High: Considerable plant growth provides good shading and overhang, and/or 20 percent of bank eroded.

WILDLIFE HABITATS

Key Habitat Type

1. Excellent/extensive deer winter range
2. Excellent/extensive elk winter range
3. Mountain goat winter range
4. Big horn sheep winter range
5. Big horn sheep range
6. Big game migration corridor
7. Fawning area
8. Calving area
9. Spotted owl management area (established or potential)
10. Old growth
11. Wintering bald eagle habitat/anadromous fish run
12. Raptor nesting
13. Peregrine falcon wintering
14. Potential peregrine falcon nesting habitat
15. Excellent riparian habitat
16. Mountain goad habitat
17. Cougar habitat
18. Turkey habitat
19. Grizzly habitat
20. Moose habitat
21. Snowy owl wintering
22. Caribou habitat
23. Excellent furbearer habitat
24. Critical waterfowl wintering
25. Waterfowl nesting/brooding
26. Goose nesting/brooding
27. Swan wintering
28. Estuary/delta/intertidal
29. Great blue heron rookery/habitat
30. Critical upland bird habitat (wintering, nesting)
31. Larch Mountain salamander habitat
32. Western pond turtle habitat
33. Mitigation property
34. Habitat Management Area (HMA)
51. Moderate quality/amount deer winter range
52. Moderate quality/amount elk winter range
53. Big game summer range
54. Resident deer/elk habitat
55. Bald eagle migration corridor
56. Good riparian habitat
57. Alder/oak/hardwood bottoms
58. Beaver ponds
59. Oxbows
60. Upland bird habitat
61. Moderate quality waterfowl wintering area
62. Second growth
71. Limited winter range

Key Habitat Type (continued)

72. Residential area
73. Orchards/fencing
74. Agricultural use
75. Logging
76. Limited riparian habitat
81. Extensively logged
82. Mining with associated tailings
83. Dikes, dredged
84. Channelized
85. Riprapped
86. Heavy agricultural use
87. Heavy residential use
88. Industrial use
99. Not entered correctly

APPENDIX 2B

WILDLIFE SPECIES

"OUTSTANDING VALUE" SPECIES
(Species of Special Concern)

CODE	NON-GAME	CODE	GAME
AQCH	Golden eagle	AISP	Wood duck
ARHE	Great blue heron	ALAL	Moose
BALO	Upland sandpiper	ALGR	Chukar
BRCL	Aleutian Canada good	ANAC	Pintail
BURE	Ferruginous hawk	ANAM	American widgeon
CALU	Gray wolf	ANAME	Pronghorn antelope
CHAL	Snowy plover	ANCAE	lesser snow goose
CICO	Columbia River tiger beetle	ANCR	Green-winged teal
CLMA	Western pond turtle	ANCY	Cinnamon teal
COAM	Yellow-billed cuckoo	ANDI	Blue-winged teal
ERALS	Streaked horned lark	ANPW	European widgeon
FACO	Merlin	ANPL	Mallard
FAME	prairie falcon	ANST	Gadwall
FAPE	Peregrine falcon	AYAM	Redhead
FARU	Gyrfalcon	AYVA	Canvasback
GAIM	Common loon	BOUM	Ruffed grouse
GRCA	Sandhill crane	BRBEH	Atlantic brant
HAGR	Chinquapin hairstreak	BRBEN	Black brant
HALE	Bald eagle	BRCF	Vancouver Canada goose
LANU	Giant Columbia River limpet	BRCMI	Cackling Canada goose
LICO	Giant Columbia spire snail	BRCMO	Great Basin Canada goose
ODVL	Columbian white-tailed deer	BRCO	Western dusky Canada goose
PAHA	Osprey	BRCT	Taverner's Canada goose
PEER	White pelican	CACA	Beaver
PEOC	Brown pelican	CACAN	Spruce grouse
PLLA	Larch mountain salamander	CAGAN	Common snipe
PLTO	Townsend's big-eared bat	CASQ	Scaled quail
POMA	Mardon skipper	CEEN	Rocky Mountain elk
RATA	Woodland caribou	CEER	Roosevelt elk
SCGR	Western gray squirrel	CEUR	Sage grouse
SPZE	Oregon silverspot butterfly	COFA	Bank-tailed pigeon
STNE	Great gray own	COVI	Bobwhite quail
STOC	Spotted own	DEBI	Fulvous whistling duck
STVA	Barred own	FECO	Cougar
SYID	Pygmy rabbit	FURB	Furbearers
THTA	Northern pocket gopher	GUGU	Wolverine
TMCO	Western pocket gopher (T. m. couchi)	HIHI	Harlequin duck
		LOCA	Valley quail
TMGL	Western pocket gopher (T. m. glacialis)	LUCA	River otter
		LYCA	Lynx
TMLO	Western pocket gopher (T. m. louiei)	LYRU	Bobcat
		MAAM	Marten
TMTU	Western pocket gopher (T. m. tumuli)	MAPE	Fisher
		MEGA	Turkey
URAR	Grizzly bear	ODHC	Blacktail deer

"OUTSTANDING VALUE" SPECIES
(Continued)

CODE	NON-GAME	CODE	GAME
ODHH	Mule deer	PEPE	Hungarian partridge
ODVO	White-tailed deer	PEPH	Sharp-tailed grouse
OLBU	Trumpeter swan	PHCO	Ring-necked pheasant
OLCO	Whistling swan	VUFC	Cascade red fox
ORAM	Mountain goat	WATE	Waterfowl
ORPI	Mountain quail	ZEMA	Mourning dove
OVCA	Mountain sheep		

"SUBSTANTIAL VALUE" SPECIES

CODE	NON-GAME	CODE	GAME
AYCO	Ring-necked duck	TATA	Badger
BUAL	Bufflehead	URAM	Black bear
BUCL	Common goldeneye	VUFF	Lowland red fox
BUIS	Barrow's goldeneye		
CLHY	Oldsquaw		NON-GAME
DEOB	Blue Grouse		
FUAM	Coot	ACGE	Northern goshawk
MECU	Hooded merganser	ATCU	Burrowing own
MEMO	Common merganser	BUST	Green-backed heron
MESE	Red breasted merganser	BUSW	Swainson's hawk
MUER	Shorttailed weasel	CAAL	Great egret
MUFR	Longtailed weasel	DRPI	Pileated woodpecker
MUVI	Mink	ELCA	White-tailed kite
ONZI	Muskrat	NYNY	Black-crowned night heron
OXTA	Ruddy duck	NYSC	Snowy owl
SYFL	Eastern cottontail	OTFL	Flammulated owl
SYNU	Nuttal's cottontail	TYAL	Common barn owl

TABLE I
SPECIAL PLANT LIST FOR WASHINGTON
RIVERS STUDY

Antennaria corymbose
Arabis crucisetosa
Arenaria franklinii
  var. thompsoii
Arenaria paludicola
Artemisia campestris
  ssp. borealis
  var. wormskioldii
Aster jessicae
Aster junciformis
Astragalus columbianus
Astragalus cusickii
  var. cusickii
Astragalus diaphanus
Astragalus kentrophyta
  var. douglasii
Astragalus microcystis
Astragalus riparius
Bolandra oregana
Botrychium boreale
Botrychium lanceolatus
Calamagrostis
  crassiglumis
Calochortus
  longebarbatus
  var. longebarbatus
Calochortus nitidus
Carex aenea
Delphinium viridescens
Dryopteris cristata
Eleocharis atropurpurea
Eleocharis rostellata
Epipactis gigantea
Erigeron basalticus
Erigeron howellii
Erigeron oreganus
Erigeron peregrinus
  ssp. peregrinus
  var. thompsonii
Eriophorum viridicarinatum
Eryngium petiolatum
Erythronium revolutum
Filipendula occidentalis
Fritillaria camschatcensis
Galium kamtschaticum
Gaultheria hispidula
Gentiana douglasiana

Carex comosa
Carex densa
Carex flava
Carex hystricina
Carex interrupta
Carex machrochaeta
Carex pauciflora
Carex paupercula
Carex pluriflora
Carex prionophylla
Carex saxatilis
  var. major
Carex stylosa
Carex synchnocephala
Chrysolepis chrysolphylla
Chrysosplenium tetrandrum
Cicuta bulbifera
Cimicifuga elata
Coptis asplenifolia
Corydalis aguae-gelidae
Cyperus rivularis
Cyprideium calceolus
  var. parviflorum
Cyprideium fasciculatum
Limosella acaulis
Lindernia anagallidea
Liparis loeselli
Listera borealis
Lobelia dortmanna
Lobelia kalmii
Lomatium laevigatum
Lomatium rollinsii
Lomatium suksdorfii
Lycopodium inundatum
Machaerocarpus californicus
Mimulus jungermannioides
Microseris borealis
Mimulus pulsiferae
Mimulus suksdorfii
Mimulus washintonensis
Muhlenbergia glomerata
Nymphaea tetragona
Oenothera flava
Ophioglossum vulgatum
Parnassia palustris
  var. neogaea
Penstemon barrettiae

Gentiana glauca
Geum rivale
Hackelia cinerea
Hackelia venusta
Heuchera grossularifolia
  var. tenuifolia
Howellia aquatilis
Iliamna longisepala
Phacelia lenta
Plantago macrocarpa
Platanthera chorisiana
Platanthera obtusata
Platanthera sparsiflora
Pleuricospora fimbriolata
Poa gracillima
  var. multnomae
Poa nervosa
  var. nervosa
Polemonium pectinatum
Potentilla breweri
Ranunculus longirostris
Ribes cereum
  var. colubrinum
Ribes cognatum
Ribes irriguum
Ribes wolfii
Rorippa columbiae
Rubus niggerrimus
Salix candida
Salix maccalliana

Penstemon deustus
  var. variabilis
Petrophytum cinerascens
Salix tweddyi
Samolus parviflorus
Sanguisorba menziesii
Sanicula marilandica
Saxifraga cernua
Saxifraga debilis
Saxifraga integrifolia
  var. apetala
Sidalcea hirtipes
Sidalcea oregana
  var. calva
Sisyrinchium sarmentosum
Sisyrinchium septentrionale
Spiranthes romanzoffiana
  var. porrifolia
Sullivantia oregana
Tauschia tenuissima
Teucrium canadense
  ssp. viscidum
Thalictrum dasycarpum
Trifolium thompsonii
Trillium albidum
Utricularia intermedia
Woodwardia fimbriata

TABLE II

PLANT ASSOCIATIONS OF CONCERN
FOR NORTHWEST RIVERS STUDY - WASHINGTON

Black cottonwood - Oregon ash community
Black cottonwood - red alder community
Red alder forest
Black cottonwood - willow community
Black cottonwood - Sitka willow community
Black cottonwood/western water hemlock community
Black hawthorn/cow parsnip community
Quaking aspen forest
White alder forest
Shrub-dominated bogs and wetlands
Rush, sedge, and her-dominated bogs, fens, and wetlands

Note: Also included in the survey will be upland communities that fall within the
1,000 ft. distance to the river reach.

APPENDIX 3B

GEOLOGICAL RANKING PROCESS
(RANKING IN PARENTHESES FOLLOWING FEATURE)

I. **Falls:**

General: common, low scientific/educational value

A. Unnamed Falls - unknown value (5)

- several hundred in Washington alone
- quality unknown

B. Named Falls - moderate value (3)

- named falls tend to be of higher quality than unnamed falls (usually higher scenic value, geological significance varies)

C. Well known "Scenic Falls" - substantial value (2)?

- from Falls of the Pacific Northwest or similar reference (geological significance varies)

II. **Gorges:**

General: relatively common (more than 50 obtained from references), variable scientific/educational value.

A. Unnamed Gorges - unknown value (5)

- identification from topographic maps may be inaccurate
- site characteristics are unknown

B. Named Gorges - moderate value (3)

- possible educational/scientific value by exposing mineral beds or demonstrating glacial or erosional processes
- high scenic value

C. NNL or PNNL* - outstanding or substantial value (1 or 2)

- demonstrated national significance

*NNL - National Natural Landmark
PNNL - Proposed National Natural Landmark

III. **Mineral Springs:**

Substantial value (2)

- uncommon
- moderate scientific/educational value

IV. Caves:

Substantial value (2)

- uncommon
- moderate scientific/educational value

V. Hot Springs:

Substantial value (2)

- uncommon
- high scientific/educational value

VI. Fossil Localities:

General: relatively common (more than 30 obtained from references); high scientific/educational value.

A. Most Beds - moderate value (3)

B. Recommended Sites - substantial value (2), possible outstanding value (1)

C. NNL or PNNL Sites - outstanding or substantial value (1 or 2)

- demonstrated national significance

VII. Mineral Exposures and Rock Formations:

General: uncommon (10 - 15 obtained from references), high educational/scientific value.

A. Most Sites - substantial or moderate value (2 or 3)

B. Recommended Sites - outstanding or substantial value (1 or 2)

C. NNL or PNNL - outstanding or substantial value (1 or 2)

- demonstrated national significance

VIII. Other Geological Features

(15 in the state) ranked individually