Appendix I

Salmon, Steelhead and Bull Trout in Water Resources Areas 37, 38 & 39: An Interim Strategy for Stock Recovery and Project Prioritization

Prepared For:

Yakima River Basin Salmon Recovery Board Lead Entity

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PROJECT NO. 354803

February 20, 2004

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1.0 EXECUTIVE SUMMARY

The Yakima watershed is one of the largest rivers in the State of Washington, draining approximately 6,100 square miles from its headwaters in the Cascade Mountains to its confluence with the Columbia River 221 miles downstream at the City of Richland. Below the forested montaine headwaters, the river travels through chaparral in the upper-middle portion of the basin, then shrub-steppe and irrigated agricultural lands in the arid middle and lower basin. The Yakima watershed historically supported perhaps the greatest diversity in aquatic habitat types of all Columbia River tributaries draining the eastern slopes of the Cascades because of the range of elevation, climatic, and geologic conditions available, and its long length. The diversity of habitat conditions in the basin historically supported at least nine distinct stocks of salmonids, including spring, summer and fall-run chinook, coho, and sockeye salmon, and summer-run steelhead, resident rainbow, cutthroat and bull trout. Today, summer-run chinook and sockeye salmon are extirpated, other stocks such as coho salmon exist only due to hatchery reintroduction efforts, and still other native stocks such as the summer-run steelhead and bull trout are threatened with extinction. This document outlines the approach and rationale for a strategy to recover salmonid populations in the Yakima basin.

In brief, the salmon recovery strategy represented here reflects:

- Our current understanding of the habitat factors limiting salmonid production within the Yakima watershed (watershed resource inventory areas [WRIAs] 37, 38 and 39).
- The underlying causes of these conditions, to the extent they are known, and
- The projected response of the salmon stocks of interest to proposed projects based upon the needs of the reach where the project is proposed.

2.0 MISSION, GOALS, OBJECTIVES, AND RATIONALE FOR SALMONID RECOVERY IN THE YAKIMA WATERSHED

Intensive salmonid recovery efforts were initiated by the governor and legislature of Washington State following the listing of several Columbia River and Puget Sound stocks under the Endangered Species Act. Washington State House Bill 2496 directed the Washington Conservation Commission (WCC) to assemble technical advisory groups (TAGs) of local watershed experts to identify habitat factors limiting salmonid production in each of the major watersheds in the state. The limiting factors assessments conducted under SHB 2496 provide information to be used with other basin knowledge to guide habitat protection and restoration efforts needed for healthy salmonid populations. This information and guidance does not necessarily address which of the limiting factors are *most* limiting to the salmon populations within a watershed but can be used as a tool to identify on-the-ground salmon recovery projects fundable through the Salmon Recovery Funding Board (SRFB). The SRFB was created to guide the spending of state funds targeted for salmon recovery projects. Successfully funded SRFB projects will address a broader strategy for recovery that is basin-specific, reflecting not only the factors limiting habitat, but also the stock-specific status of salmonids within the basin. It is therefore the purpose of this document to outline the overall recovery strategy components for the Yakima watershed.

Individuals or agencies desiring project funding through the SRFB must submit applications through the Yakima Basin Salmon Recovery Board (YBSRB) “Lead Entity,” the City of Selah. Applications for project funding and eligibility requirements can be obtained on line at: www.wa.gov/iac/downloads/manual%2018.pdf. The YBSRB Lead Entity includes representation from the jurisdictions of Benton, Yakima and Kittitas counties, the Yakama Nation, and many city jurisdictions within the watershed. It is the role of each watershed’s Lead Entity to prioritize projects that best represent the statewide goals and guidance for salmon recovery (JNRC 2001), and the unique characteristics of the local watershed and salmonid populations within it. Projects considered by the YBSRB Lead Entity can be proposed from the entire Yakima watershed and its tributaries from the confluence with the Columbia River upstream to its headwaters. However, it is the goal of the YBSRB that applicants for SRFB funding accurately address the recognized needs in the basin and do not promote projects that fall outside the goals and objectives of the recovery strategy outlined in this document. Thus, a primary purposes of this strategy document are to provide SRFB applicants appropriate guidance to maximize the potential for effective salmon recovery through funded projects, to guide the Lead Entity’s TAG and CAG when reviewing proposed projects, and to inform the SRFB and their technical review team of our basins strategy. This chapter outlines the specific mission, goals and objectives of the recovery strategy for the Yakima watershed.

2.1 Strategy Mission Statement

To recover salmonid populations by supporting habitat protection and restoration measures and land management actions that yield tangible, sustainable and measurable benefits to salmonid populations and habitat in the Yakima watershed and throughout their historic range.

2.2 Goals Of Salmon Recovery Strategy in the Yakima Watershed

- To increase community involvement and leadership of salmon recovery efforts within the Yakima watershed.
- To contribute to the delisting of threatened mid-Columbia salmonid populations by increasing those sub-populations of the listed stocks that utilize the Yakima watershed.
- To restore habitat elements that may limit salmonid production in the Yakima watershed.
- To recover and maintain self-sustaining, harvestable populations of native and wild salmonids throughout their historic distribution range in the Yakima basin. Such an outcome would represent "recovery."

2.3 Objectives of The Yakima Watershed Salmon Recovery Strategy

- To develop and implement a credible, science-based process for identifying and ranking salmonid habitat recovery projects in the Yakima watershed.
- To submit a list of prioritized project proposals to the SRFB for each funding cycle that meets statewide, regional and local goals for salmon recovery.
- To identify and encourage project sponsors to apply for SRFB funds for credible projects through active outreach efforts.
- To provide clear guidance to potential project sponsors to solicit funding for priority salmon habitat recovery projects.
- To educate the community on the requirements and current limitations to salmonids in the Yakima River basin to ensure that project applications are biologically supportable.
- To protect functioning habitat important for salmonid production in waters of the Yakima River watershed.
- To restore salmonid habitat in the Yakima watershed in a prioritized manner that reflects the goals of this recovery strategy and the best available science.
- To eliminate data gaps important for understanding salmonid production and recovery in waters of the Yakima watershed.
- To work with watershed groups, stakeholders, and state, federal, local, and tribal governments to coordinate salmon recovery projects that maximize efficiency and cost effectiveness.

2.4 Overview of Recovery Strategy and Rationale

There is broad consensus that salmonids require:

- cool, clean, well-oxygenated water,
- in-stream flows that mimic the natural hydrology of the watershed,
- clean spawning gravels not clogged with fine sediment or burdened with toxic chemicals,
- presence of in-stream pools that will support juvenile rearing and resting areas for returning adults,
- abundance of in-stream large woody debris (LWD), particularly large key pieces, that provide cover, create pools, and provide habitat diversity,
- unobstructed migration for juveniles and adults to and from their stream of origin,
- functioning floodplains that supports complex habitat needed for salmonid production,
- broad, dense riparian stands of mature conifer and other tree species that provides cover, shade, and LWD recruitment.

The salmonid recovery strategy for the Yakima River focuses on addressing the above needs so that harvestable populations of salmonids can be enhanced and sustained. The strategy prioritizes the preservation and restoration of habitat that is known to currently or historically support significant salmonid populations (i.e., salmon strongholds), critical to the preservation and conservation of native stocks listed as threatened or endangered under the Endangered Species Act (i.e., recognized Evolutionarily Significant Units or Distinct Population Segments), will enhance cultural and recreational important fish species, and/or has the potential to yield measurable and sustainable increases in native and/or wild salmonid use after habitat improvements have been implemented. This strategy is consistent with the rationale developed by the Governors Salmon Recovery Board (JNRC 2001).

Salmonid stock recovery efforts within the Yakima watershed will emphasize both native and wild stocks. Although both native and wild stocks reproduce naturally in the wild in the Yakima watershed (WRIAs 37, 38 and 39) native stocks are unique populations that possess a distinct genome (genetic signature) that is usually specific to a watershed or sub-watershed. In contrast, wild stocks exhibit hatchery-derived genetic signatures. Such "wild" populations were either deliberately or inadvertently introduced from hatchery operations. Native stocks will exhibit relatively predictable gene frequencies for certain traits that may be lost or diluted in a wild stock of hatchery origin. To achieve all of the goals of salmon recovery for the Yakima watershed defined in sections 2.2 and 2.3 above, the strategy must focus on both native and wild stock recovery.

3.0 PROJECT EVALUATION, RANKING & RATIONALE

All projects submitted for funding consideration will be reviewed and ranked if the application is deemed to be complete and the project would provide legitimate benefits to salmonids in the Yakima watershed. If an application is not considered complete or it is not clear how the proposed project will benefit salmonids, the LE will work with and encourage the applicant to address the application deficiencies. An applicant may request technical assistance from the WDFW Watershed Steward Biologist through the LE.

All accepted applications will be presented to the LE's Technical Advisory Group (TAG) for review and evaluation. The TAG will evaluate the application using several tools and considerations including:

1. The LE's Project Scoring Rationale and Protocol (SRP).
2. Ecosystem Diagnosis and Treatment (EDT) outputs.
3. Other evaluation and supporting products (e.g. LFA, Watershed Plan, Reaches Study, etc.).
4. "Value added" project components (e.g. synergies with other preservation or restoration projects, cultural and/or social benefits, certainty of success).
5. Professional expertise and understanding of the basin and fish needs.

The TAG will document its review, identify what sources beyond the SRP and EDT outputs were considered (i.e., where used), and inform the LE when and why SRP and EDT outputs were not used or adjusted. The TAG will categorize projects based on benefits to fish. There will be four categories: high, medium, low and incomplete/do not fund at this time.

Upon completion of the TAG's review and ranking the LE's Citizen's Advisory Group (CAG) will review and evaluate the projects considering the TAG's recommendations in conjunction with cultural, social and economic ramifications. The CAG will rank projects within each category without moving projects from one category to another. The CAG will document its review of the projects and will forward its comments and recommended ranking by category to the YBSRB for approval to be submitted to the SRFB.

Priority Based Evaluation. Priorities are needed because funding and human resources are both limited, and because managers are obligated to provide declining fish stocks with the most effective habitat projects. Setting criteria to prioritize actions is needed to be efficient and effective in recovery efforts. The YBSRB will use several tools and criteria to help prioritize projects. The primary tools that will be used include a biologically-based quantitative model developed by Entrix (Appendix A), and graphical and tabular output from the Ecosystem Diagnosis and Treatment (EDT) modeling (Appendices B and C). Criteria that will be used to help prioritize and rank project include: species priority, geographic or reach priority for both restoration and protection, remedial action priority (addressing limiting factors for restoration projects), benefit longevity (life span) and other value added components of proposed projects.

3.1 Scoring Biological Functionality -- An Overview

One element inherent in the recovery strategy outlined in this document is to direct SRFB funds toward projects that best meet the goals and objectives for the recovery of Yakima basin salmonid stocks. To objectively rank projects submitted for SRFB funding through the LE, a simple, biologically-based, quantitative, scoring rationale and protocol (SRP) was developed. In brief, evaluations of projects proposed within specific reaches within the Yakima basin using this SRP involve an interpretation of how effectively projects address factors limiting habitat function, and the anticipated fish population responses after implementation. The SRP evaluates each proposed project, for *all* salmonid species that could benefit, through a series of iterative yes/no questions focused on the life history functions provided by the proposed project. The sum of the scores from these questions is multiplied by a weighting factor based on the geographic importance of the reach for protection or restoration where the project is proposed. The geographic importance of the reach is based on EDT analysis (section 3.3). Generally, higher scoring projects should yield greater fish production than lower scoring projects. The SRP is fully explained in Appendix A of this document.

3.2 Species Priority

The order of species priority for the Yakima watershed recovery strategy reflects their Endangered Species Act (ESA) status and their cultural significance for tribal subsistence and sport harvest. From highest to lowest importance, the species priority for the Yakima basin salmonid recovery strategy is: (1) steelhead, bull trout, and spring chinook, (2) fall chinook, (3) coho and (4) other native species such as resident rainbow trout. (This species priority is a primary criteria used for the scoring rationale and protocol [SRP] detailed in Appendix A). Populations of steelhead (*Oncorynchus mykiss*) and bull trout (*Salvelinus confluentus*) in the Yakima Basin are listed as "threatened" under the ESA. Spring chinook salmon (*Oncorhynchus tsawytcha*) has the highest cultural value for tribal fishers and is of high value for sport fishers. These species are therefore considered the highest priority in this recovery strategy. Fall chinook salmon spawn primarily in the lower mainstem in autumn and have a high sport fish value, but lesser cultural value to the Yakama Nation. Coho salmon (*Oncorynchus kisutch*) were extirpated in the Yakima watershed but have been reintroduced through efforts of the Yakima-Klickitat Fisheries Program (YKFP). As a result, natural spawning has been consistently documented for several years. Summer Chinook and sockeye are both listed as extinct; reintroduction efforts by the Co-managers (Washington Department of Fish and Wildlife and the Yakama Nation) have not yet begun and will not occur until limiting factors for these species are addressed (e.g., lower Yakima River water quality, passage at storage reservoirs, etc.). If conditions that support these two species are recovered the species priority may be changed over time. Detailed information on species and stock status in the Yakima basin is provided in Appendix E.

3.3 Reach Priority

The geographic prioritization of river and stream reaches in the Yakima watershed reflects the overall salmon recovery strategy geared towards maximizing the natural production of salmonids by preserving habitat that is functioning properly, and restoring that which has the highest production potential but is currently at risk or not functioning because of compromised habitat factors. Reaches are prioritized for project selection on the basis of the critical habitat contributions they provide for one or more of the priority species in the strategy. Critical habitat in this context is considered habitat needed for the completion of one or more life history stages. A major assumption in the reach prioritization is that the production potential (i.e., carrying capacity) of a reach or tributary is directly proportional to the amount of critical habitat provided in the reach or reaches being evaluated.

Reaches where projects are proposed will be prioritized using EDT analysis with adjustment made by the TAG. Reach priority in EDT is divided into two action types: protection and restoration. For projects that lay outside the geographic scope of the EDT modeling conducted for the Yakima basin, and for projects focused on bull trout, where EDT modeling is not completed, expert knowledge and evaluation through the YBSRB's TAG will be used. EDT analysis will be updated periodically to account for changes in habitat conditions and to incorporate new information.

As stated, the EDT analysis evaluates reaches for their species-specific protection (preservation) and/or restoration benefits. Protection projects will be weighted through the EDT model based on the proposed project site's existing contribution to watershed health. Restoration projects will be evaluated on the project site's restoration potential in conjunction with the reaches' limiting factors. EDT modeling results were imported into ArcMap GIS to provide spatial analysis and visual aids for our strategic plan. Spatial analysis was used to divide reaches into high, medium, low, and not ranked reaches based on protection and restoration values. Reaches that are not ranked are defined as reaches that do not produce the species being evaluated or the EDT model has incomplete data to properly rank the reach. Maps were generated to display reach value for protection by species and restoration by species (Appendix B). Geographic priority based on EDT modeling and GIS analysis is a primary criteria used for project scoring using the SRP (Appendix A).

3.3.1 Protection Priorities

Protection projects could include the purchase of land, water, access, or utilization of rights in fee title or by perpetual easement (all acquisition projects will require a willing seller). Protection of habitat that is in functional condition, or easily restored are the highest priority for protection efforts. In addition, acquisition projects will consider the level of risk of losing the habitat values associated with the land and water being acquired. Education can also be an effective tool in watershed management, by teaching values of functioning habitat, how to protect, restore and monitor those functions and how to implement and/or find assistance implementing watershed projects (i.e. Landowner Incentive Program).

3.3.2 Restoration Priorities

Some of the most significant limiting factors compromising salmonid habitat in the Yakima watershed, as identified in the EDT, LFA, WSP, and the Reaches Study include:

- Inadequate or no screening for many water diversions.
- Artificial fish barriers.
- Artificial fluctuation or dewatering of stream channels.
- Reduction in habitat heterogeneity and flood plain connectivity.
- Alteration of the natural temperature regime.
- Alteration of natural hydrologic regime.
- Impairment of water quality.
- Negative interactions between fish species (e.g. wild vs. exotic and wild vs. hatchery).

Most of the factors affecting salmonid production are present at multiple watershed locations, suggesting that throughout the Yakima River watershed similar types of actions may be taken to improve stream conditions for anadromous and resident salmonid species.

Restoration projects will be evaluated in part, based how well they address documented limiting factors identified with EDT modeling and other supporting documents (i.e. LFA, WSP, Reaches Study, etc.). Priority limiting factors for each reach have been identified using EDT modeling (Appendix C). Limiting factors will be crossed checked with other supporting documents as projects are evaluated. If inconsistencies are found between EDT and other documents or professional knowledge, the TAG will determine which is most accurate, and advise model and plan managers of their finding so corrections can be made. Some primary action priorities are discussed here due to their importance to salmon recovery and because other important sources of information should be considered for project evaluation of these types of restoration projects. They include: passage and screening, instream flow, water quality, and physical habitat restoration.

<u>Passage and Screening.</u> It is estimated that more than 500 water diversions in the Yakima Basin are unscreened. Unscreened diversions entrain, and can ultimately kill fish, and many water diversions dams also block access to high quality upstream tributary habitat. For example, in Cowiche Creek it is estimated that there are more than 20 unscreened diversions and pumps and at least four barriers that prevent the use of more than 20 miles of upstream habitat. Since the Yakima Basin has many inadequately screened diversions that kill fish and many barriers that prevent passage into productive habitat, screening and passage projects are considered a high priority action. To fully understand the extent of these two limiting factors, the Yakima Tributary Access and Habitat Program (YTAHP) has been developed to survey tributaries for screening and passage problems, develop solutions, and to seek funding and implement solutions.

Passage and screening evaluations will not only be based on reach priority but will receive highest consideration if project proponents provide “Screening Priority Index” (SPI) and/or passage “Priority Index”(PI) values. These specialized quantitative indices were developed by the Washington Department of Fish and Wildlife to prioritize upstream passage and screening projects for funding and implementation. The methodology documentation can be downloaded from the WDFW web site at: http://www.wa.gov/wdfw/hab/engineer/fishbarr.htm.

Instream-flow Restoration. The strategy for instream flow restoration projects in the Yakima watershed will focus initially on those tributaries where small amounts of increased instream flows will result in relatively large amounts of increased habitat. In some cases, an assessment of the appropriate flows required to maximize habitat for the species and life stages of most interest to the reach will be needed prior to initiating a project action that would immediately or sequentially increase flows. A solid foundation should exist that provides support for the proposed flows based on an established method of examining the relationship between flow and habitat quantity and quality. Instream-flow project evaluations will also consider Washington Water Acquisition Program’s guidance for improving instream flow (Publication No 03-11-005).

Water Quality Improvement. Water quality is a major limiting factor in the middle and lower mainstem Yakima River in particular. Some tributaries have also been impaired by poor water quality. Temperature, suspended sediment and agricultural chemicals in some flowing waters in the Yakima basin have exceeded either water quality criteria or known tolerance thresholds for salmonid species. Projects that address water quality issues should focus first on those areas where water quality is recognized as the limiting factor in the reach or reaches that would be affected by the project action. The Watershed Plan should be consulted for water quality improvement projects

Physical Habitat And Other Restoration Projects. Physical habitat restoration projects including riparian function restoration, instream structure restoration, floodplain restoration, and upland process restoration are very important. The current management of flows for irrigated agriculture in the watershed, where spring snowmelt is stored in headwater reservoirs for release during the growing season, results in artificially elevated streamflow in the summer and early fall months in the upper basin, and below normal flows in much of the lower basin. Amongst other effects, this unnatural flow management puts constraints on the production of early life history stages of salmonids in the upper basin, by restricting the amount of low-velocity refuge needed for rearing in the summer, and effects production in the lower basin by elevating stream temperature there. The Bureau of Reclamation is exploring ways to return the river to a more normative flow regime; however, restoration projects that address this current limitation by increasing mainstem floodplain interactions, even in the face of the current management, can still be highly useful. Similarly, instream structures can also be beneficial, particularly in mainstem and tributary reaches where factors such as scouring are recognized to limit production. Riparian habitat restoration is effective at reducing elevated temperatures (particularly in tributaries previously denuded of vegetation), quenching nutrient enrichment entering streams from uplands, and serving as a long-term source of wood and other organic enrichment to flowing waters that support the base of the food web upon which juvenile salmonids depend. The Watershed Plan and LFA should be consulted for further clarification of appropriate physical habitat restoration projects.

3.3.3 Assessment Priorities

Projects submitted to fund an assessment or study will also utilize reach priorities identified by EDT. Assessment projects will need to show that information gathered by the project will "fill a data gap," and will likely lead to a future project proposal that will protect important habitat or restore a limiting factor for the area studied. As previously suggested, a good example of this type of project would be an analysis of appropriate stream flows for maximum production in a tributary, with the idea of eventually securing additional water rights.

3.4 Feasibility, Certainty, Cost Benefits, Opportunity

Projects will be evaluated to estimate the following factors:

1. Technical Feasibility – Is the project technically feasible?

2. Certainty of Success - What is the certainty of success associated this project?

3. Appropriate Project Costs – Are the project costs appropriate for the proposed action?

4. Opportunity – Will the opportunity be lost if we don't act now?

3.5 Project Longevity.

Projects will also be evaluated to estimate benefit longevity (life span). Each project will be placed in one of three categories according to how long the project benefit will contribute to fish production as follows:

1. Low Longevity: Less than 5 years.

2. Medium Longevity: 5 to 15 years.

3. High Longevity: More than 15 years.

3.6 Value Added Components.

Project evaluations will also consider the follow project attributes:

1. Project enhances other salmonid recovery projects ongoing or proposed in the watershed to provide a "synergistic effect". Both the TAG and CAC will evaluate new projects to determine if the proposed project will complement other protection and restoration projects.

2. Project has a high (greater than 50 percent), medium (25 to 50 percent) or low (less than 25 percent funding match.

3. Project addresses a watershed need as defined by general watershed plans, limiting factors assessment, or other peer-reviewed finding in the watershed. Appendix D provides a draft example of a watershed plan summary for Cowiche Creek. More plans for other significant tributaries are under development and will become available over time through the TAG for public review to assist the public in the preparation of their SRFB application.

4. Promotes Ecosystem Function: High, Medium or Low.

5. Provides a high degree of educational opportunity by involving the local communities in the project especially school programs with the objective of teaching students about the needs and benefits of healthy fish and wildlife resources.

6. Has Community Support and Partners: High (community supports project through matching funds or labor), Medium (community supports the project through letters of support, or Low (no documented community matching or letters of support).

3.7 Strategic Plan Updates

The Yakima Basin Salmon Recovery Board plans on revising this strategic plan periodically, as new information, changing ecological conditions, and changing community interest and public policy necessitate adjustments.

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APPENDIX A:

YAKIMA PROJECT SCORING RATIONALE AND PROTOCOL (SRP)

APPENDIX A: PROTOCOL FOR PROJECT SCORING AND PRIORITIZATION

By: Jeffrey P. Fisher, Ph.D.

Overview of Project Proposal Review and Scoring Methods

Guidance provided by the Governors Salmon Recovery Board (JNRC 2001), suggests that projects selected for funding by the SRFB should lie within those sub-watersheds or reaches that are most in need of protection or restoration on the basis of: (1) their existing ability to support salmon (i.e., salmon strongholds), (2) their critical importance to the preservation and conservation of native stocks (i.e., recognized ESUs), and (3) their potential to yield measurable and sustainable increases in native salmonid use after implementation. Although both native and hatchery-origin stocks reproduce in the wild in the Yakima basin, native stocks are considered unique populations that possess a distinct gene pool that is specific to a watershed or sub-watershed, and they have relatively predictable gene frequencies for certain quantifiable traits. Hatchery stocks that reproduce in the wild often originated from a mixture of different native stocks, so the gene frequency expression in these stocks differs significantly from the native stocks.

In recognition of the importance of preserving the remaining native wild stocks and their linkages to general habitat quality in WRIAs 37, 38 and 39, and in enhancing the production of *all* naturally reproducing stocks in the watershed (i.e., regardless of origin) a two-tiered scoring rationale and protocol (SRP) will be utilized to evaluate projects proposed for funding by the SRFB. The two tiers of the SRP include:

- **Tier 1: Project Scoring Based On Biological Functionality**
- **Tier 2: Reach Prioritization Weighting of Project Score**

Tier 1 of this model numerically ranks projects proposed within sub-watersheds or reaches on the basis of the presumed benefits to specific species and life stages that would occur if the project was implemented. A series of yes/no iterative questions about the proposed project are asked to address the biological benefits of the proposed project, and the cumulative scores to the answers of each of these questions are combined. Specifically, projects proposed are evaluated on the basis of their ability to protect, restore, or assess the success of specific life history functions of specific stock(s) of salmonids in the Yakima basin.

Tier 1 of the SRP model is intended to provide an objective, unweighted comparison of the biological benefits of proposed projects. Based on the focus of the overall strategy for salmon recovery in the Yakima basin, projects with the following characteristics should score highly through the Tier 1 template:

- Native stocks benefit from the project more than introduced stocks.
- Project addresses action item(s) focused on the habitat factor and life stage *most limited* in a reach/sub-watershed.

- Project addresses the source (i.e., causation) of a limiting habitat factor will score higher than those that address symptoms only.
- Project benefits more than one salmonid species and thereby promotes biodiversity.
- Project provides, conserves, or enhances passage to more critical salmon and steelhead habitat than another proposed project in the same sub-watershed/reach.
- Project restores non-functional habitat by linking to current functioning habitats; habitat units linked in a priority that reflects those closest together first before those that are spread out.

The second tier of the SRP weights the preservation (protection) or restoration value of the reach (location) where the project is proposed into the project score as a multiplier to the Tier 1 project score. Tier 2 reach prioritization in this context is only possible if specific studies, such as those provided from Ecosystem Diagnosis and Treatment (EDT) analyses, have been conducted. In the Yakima Basin, Tier 2 reach ranking is feasible for steelhead, spring chinook, fall chinook, and coho because the Yakima Nation has completed EDT modeling for the entire basin for these species. The use of EDT data for reach prioritization of other salmonid populations in the basin is not yet possible, so other data sources such as the "Reaches Project" final report by Stanford and Snyder et. al. (2002) can be used to support reach ranking.

The two-tiered SRP model briefly described above yields numerical total project scores that can be compared against scores from other proposed projects for their overall biological benefits to the recovery of salmonid stocks within the Yakima Basin. The technical advisory group (TAG) for the Yakima basin will compile the total project score (TPS) for each proposed project in considering their potential for SRFB funding, and then present the projects that score highly through this process to the Citizens Advisory Group (CAG). The final decision to implement a project proposal that scores highly through this biologically-based scoring model may depend on other social and/or cultural benefits of the project that must also be considered by the CAG. The CAG must also consider the ability of the applicant to successfully implement the project ("project certainty") in their final decision to nominate a project for SRFB funding.

Project Categories Identified for Funding by SRFB

Specific project categories for funding were previously established by the SRFB (JNRC 2001). According to the SRFB, potentially funded projects should be categorized under the general project types of: (1) acquisition, (2) in-stream diversions (to include screening projects), (3) in-stream passage, (4) in-stream habitat, (5) riparian habitat (6) upland habitat, (7) estuarine/marine near-shore, (8) assessments and studies, and (9) combination. Table A-1 provides a summary of the project categories relevant to the Yakima Basin Salmon Recovery Board Lead Entity area (estuarine/near-shore projects not applicable to the Yakima watershed). The projects identified within each of the SRFB funding categories simply represent examples. The evaluation of projects proposed in each of these categories will be dependent on the reach priority and the numeric evaluation of the project relative to the other projects proposed within the sub-watershed

Table A-1 Salmon Recovery Funding Board Project Categories and Examples Relevant to the Yakima Watershed

Project Category	SRFB Definition	Examples
Acquisition	Rights or claims may be acquired, provided the value can be established or appraised.	• Purchase of land • Access • Utilization of rights in fee title or by perpetual easement
In-Stream Diversions	Items that affect or provide for the withdrawal and return of surface water to include the screening of fish from the actual water diversion, the water conveyance system, and the by-pass of fish back to the stream.	• Diversion dam • Fish by-pass • Fish screen: gravity and pump • Headgate • Pipes and ditches
In-Stream Passage	Affect or provide fish migration up and downstream to include road crossings, barriers, fishways, and log and rock weirs.	• Bridge • Culvert improvements • Dam removal • Debris removal • Diversion dam • Fishway • Log control (weir) • Mobilization • Rock control (weir) • Roughened channel • Traffic control • Water management
In-Stream habitat	Items that affect or enhance fish habitat below the ordinary high water mark of the water body. Items include work conducted on or next to the channel, bed, bank, and floodplain by adding or removing rocks, gravel, or woody debris.	• Bank stabilization • Carcass placement • Channel connectivity • Channel reconfiguration • Complex log jams • Deflectors/barbs/vanes • Dike removal/setback • Livestock fencing/crossing • Log or rock control (weirs) • Off-channel habitat • Plant removal/control • Riparian plant installation • Roughened channel • Spawning gravel placement • Wetland restoration • Woody debris placement

Project Category	SRFB Definition	Examples
Riparian Habitat	Freshwater, marine near-shore, and estuarine items that affect or will improve the riparian habitat outside of the ordinary high water mark or in wetlands.	• Livestock fencing • Livestock stream crossing • Livestock water supply • Plant removal/control • Riparian plant installation • Wetland restoration
Upland Habitat	Items or land use activities that affect water quality and quantity important to fish, but occur above the riparian or estuarine area.	• Alternate water source • Erosion control (road and slope) • Impervious surface removal • Livestock fencing • Low/no till agriculture techniques • Pipes and ditches • Plant removal/control • Riparian plant installation • Road abandonment/ decommissioning • Sediment collection ponds
Assessments and Studies	The results of proposed assessments must directly and clearly lead to identification, siting, or design of habitat protection or restoration projects. Assessments intended for research purposes, monitoring, or to further general knowledge and understanding of watershed conditions and function, although important, are not eligible for SRFB funding.	• Feasibility studies • Channel migration studies • Reach-level, near-shore, and estuarine assessments • Barrier inventories • Unscreened water diversion inventories • Landslide hazard area inventories
Combination Projects	Projects that include both planning and assessments.	• acquisition and restoration • enhancement elements or acquisition and non-capital

A.3 Sub-watershed and Reach Priorities in the Yakima Watershed

Reach delineation is effective at identifying the natural characteristics of the river basin such that projects aimed at restoring salmon habitat can be distributed to areas with the highest potential for sustaining or improving conditions for salmon, steelhead or bull trout. Two significant studies have been completed to better define habitat conditions of the Yakima watershed at the reach scale. These efforts represent the most rigorous analyses of habitat conducted to date within the Yakima watershed. The first effort developed broad scale reach delineations of the mainstem based upon hydrological and geomorphic characteristics (Stanford and Snyder [*S&S*] 2000). The second effort, undertaken by the Yakama Nation, identifies habitat potentials based upon the EDT modeling process. The EDT process identifies the preservation or restoration potential of a reach at high resolution. EDT diagnostics have been completed for spring and fall chinook and coho salmon and steelhead throughout the basin and its major tributaries.

The Yakima River's mainstem reach characteristics originally defined by S&S (2000) are summarized below simply to inform project applicants of the broad scale mainstem conditions within the watershed.

S&S Reach 1—Yakima River Delta (RM 0.0 to RM 2.1): This reach incorporates the confluence of the Yakima River with the Columbia River. The natural delta of the Yakima River is highly altered because of pooling upstream of McNary Dam. The lower 2.1 miles of the historic Yakima River are inundated, reducing the extent of historic distributaries and off-channel rearing areas.

S&S Reach 2—Mouth to Prosser Diversion Dam (RM 0.0 to RM 47.1): A single meandering channel with few braids or mid-channel islands characterizes this reach. The channel has downcut over time, isolating the channel from the adjacent floodplain. The reach from the mouth to Kiona (RM 29) was identified as the main fall chinook spawning area, although the report indicated that it was difficult to assess spawning utilization due to turbidity during spawning. However, WDFW has developed new techniques of estimating fall chinook spawning escapement in the lower Yakima, and has successfully done so since 1998. Other anadromous salmonids use this reach only for overwintering and migration because of high summer water temperatures.

S&S Reach 3—Prosser Diversion Dam to Granger (RM 47.1 to RM 82.8): The upper 17 miles of this reach includes side channels, backwater areas, and diverse habitat types; the downstream 18 miles are characterized by a low-gradient meandering single channel with little habitat diversity. Satus and Toppenish creeks are the two major tributaries in this reach, with additional significant inflow from groundwater and irrigation return drains.

S&S Reach 4—Granger to Union Gap (RM 82.8 to RM 106): Snyder and Stanford (2000) consider this one of the most structurally complex and diverse sections of the Yakima River. For most of the reach, I-82 constrains the floodplain on the north/east side (left bank) of the river, whereas the south/west side (right bank) is in a semi-natural state with numerous side-channels, braids, and backwater areas.

S&S Reach 5—Union Gap to Selah Gap (RM 106 to 116.4): This reach borders the City of Yakima and is characterized by numerous side-channels, islands, and backwater areas. However, dikes confine the full extent of the natural floodplain through much of this reach.

S&S Reach 6—Selah Gap to Wilson Creek (RM 116.4 to 147.0): The river is confined in a canyon through the upper portion of this reach, with no side-channel complexes, few islands, and only a few backwater areas. As the river leaves the lower end of the canyon, it flows across a deep alluvial floodplain that has been heavily mined for gravel. The river is confined through this portion of the reach by dikes and bank protection, with little in-channel complexity.

S&S Reach 7—Wilson Creek to Thorp (RM 147.0 to RM 163.0): This reach flows through the Ellensburg valley. The channel is constrained on one side by I-90, and there is some flood control diking at several locations. At the lower end, there are braided channel complexes with some side-channels.

S&S Reach 8—Thorp to Teanaway River (RM 163 to 176.1): The river is confined in much of this reach as it flows through the Ellensburg Canyon. The upper mile of the reach, below the Teanaway, offers exceptional rearing habitat.

S&S Reach 9—Teanaway River to Cle Elum River (RM 176.1 to 185.6): This reach is primarily a large main channel, with the exception of some side channels at the lower end. The channel is mainly confined by I-90 and railroad berms and there are no significant tributaries entering the mainstem between the Teanaway and Cle Elum rivers.

S&S Reach 10—Cle Elum River to Easton Dam (RM 185.6 to 202.5): Tributaries in this reach include Spex Arth Creek, Peterson Creek, Little Creek (RM 194.6), Big Creek (RM 195.8), Tucker Creek (RM 1999.9), and Silver Creek (RM 201.9). The reach is considered to be a high quality area for spawning and rearing, characterized by numerous side channels, complex structures in the channel, and good riparian vegetation. There is some housing development within the floodplain in this reach.

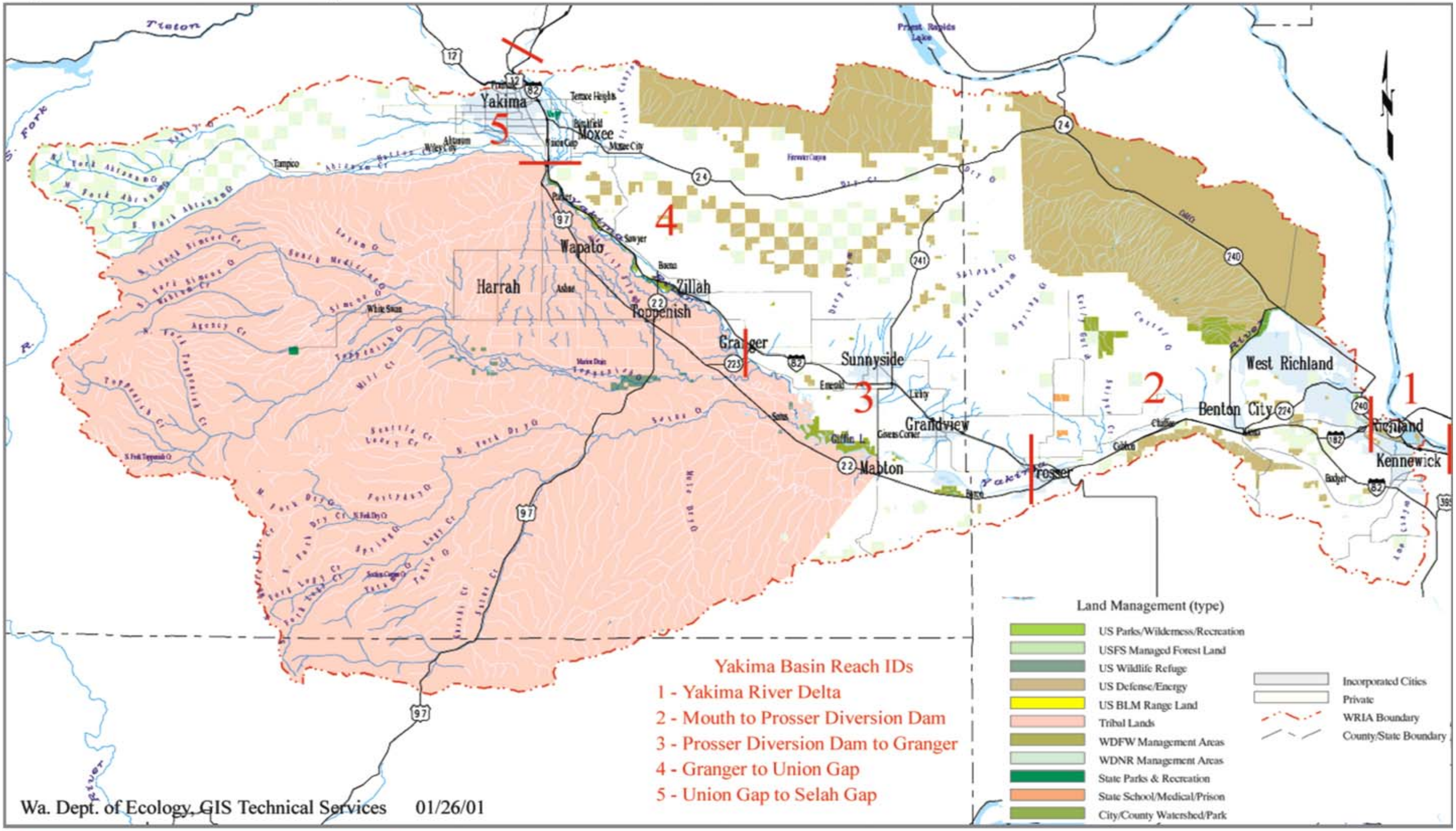
S&S Reach 11—Easton to Keechelus Dam (RM 202.5 to 214.5): Major tributaries in this reach include Kachess River (RM 202.5), Cabin Creek (RM 203.5), Hudson Creek, Cedar Creek, Stampede Creek, Telephone Creek, Mosquito Creek, Swamp Lake Creek, and Price Creek. This reach is characterized by numerous side channels, logjams, and braided channels, and is considered to be high quality spawning and rearing habitat with little influence from development. The channel has an excellent riparian corridor, with a lot of complex in-channel structure.

Snyder and Stanford (2000) prioritized the above reaches for protection in the following order (not all reaches were prioritized):

1. Upper Yakima: reaches 9, 10 and 11
2. Kittitas Valley: reach 7 and lower reach 8
3. Yakima City (Union Gap): reach 5
4. Upper and lower Naches River: reaches not considered above
5. Wapato: reach 4
6. Selah: reach 6
7. Yakima mouth: reach 1
8. Athanum Creek: sub-basin not considered in mainstem reach breaks listed above.

The reach breaks identified by Snyder and Stanford are depicted in Figures A-1, A-2, and A-3, which depict the watershed resource inventory areas 37, 38 and 39.

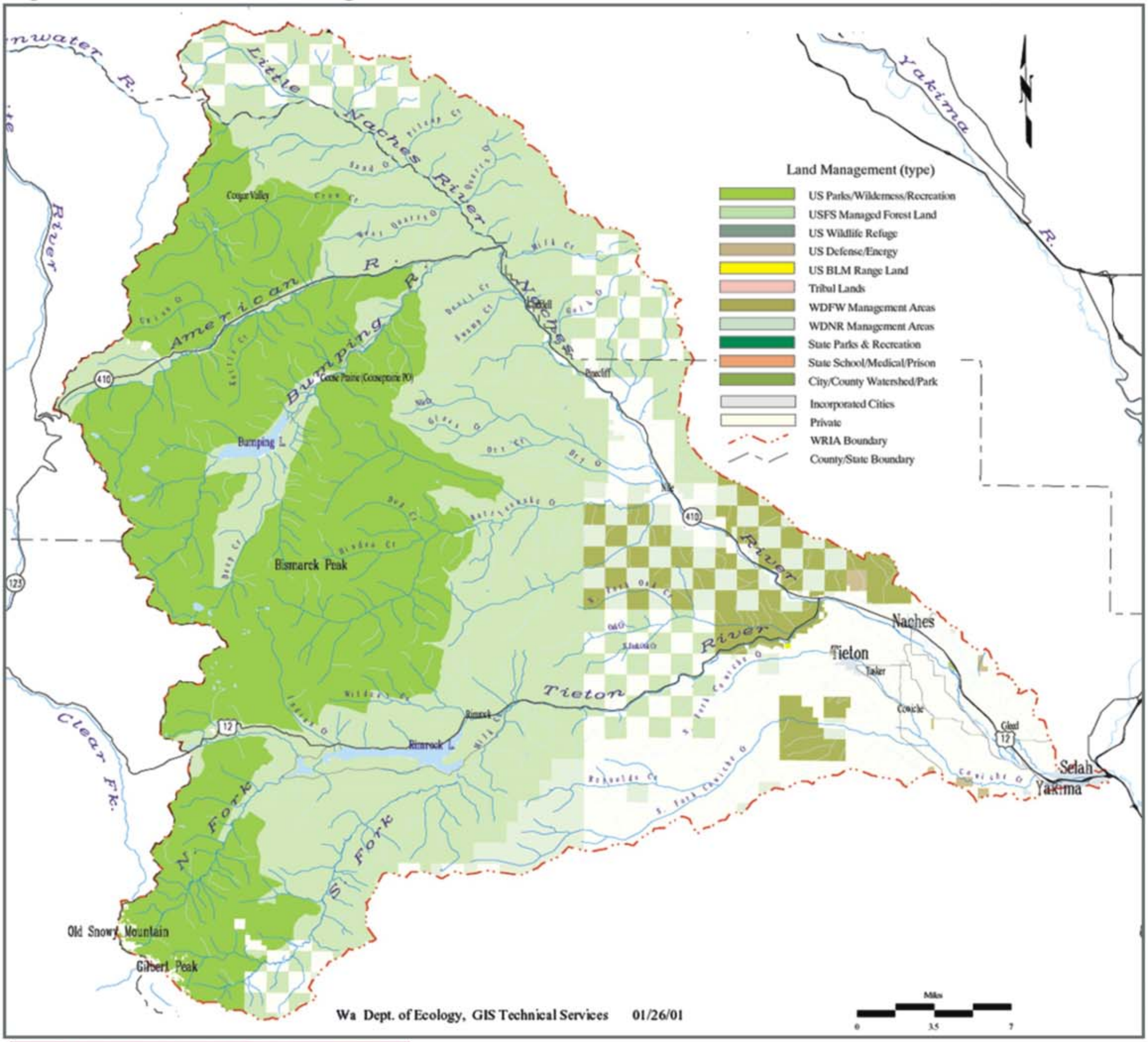
Figure 3-1. WRIA 37 Basin Map



ENTRIX

Prepared for the Naches/Upper Yakima Lead Entity Salmon Recovery Strategy

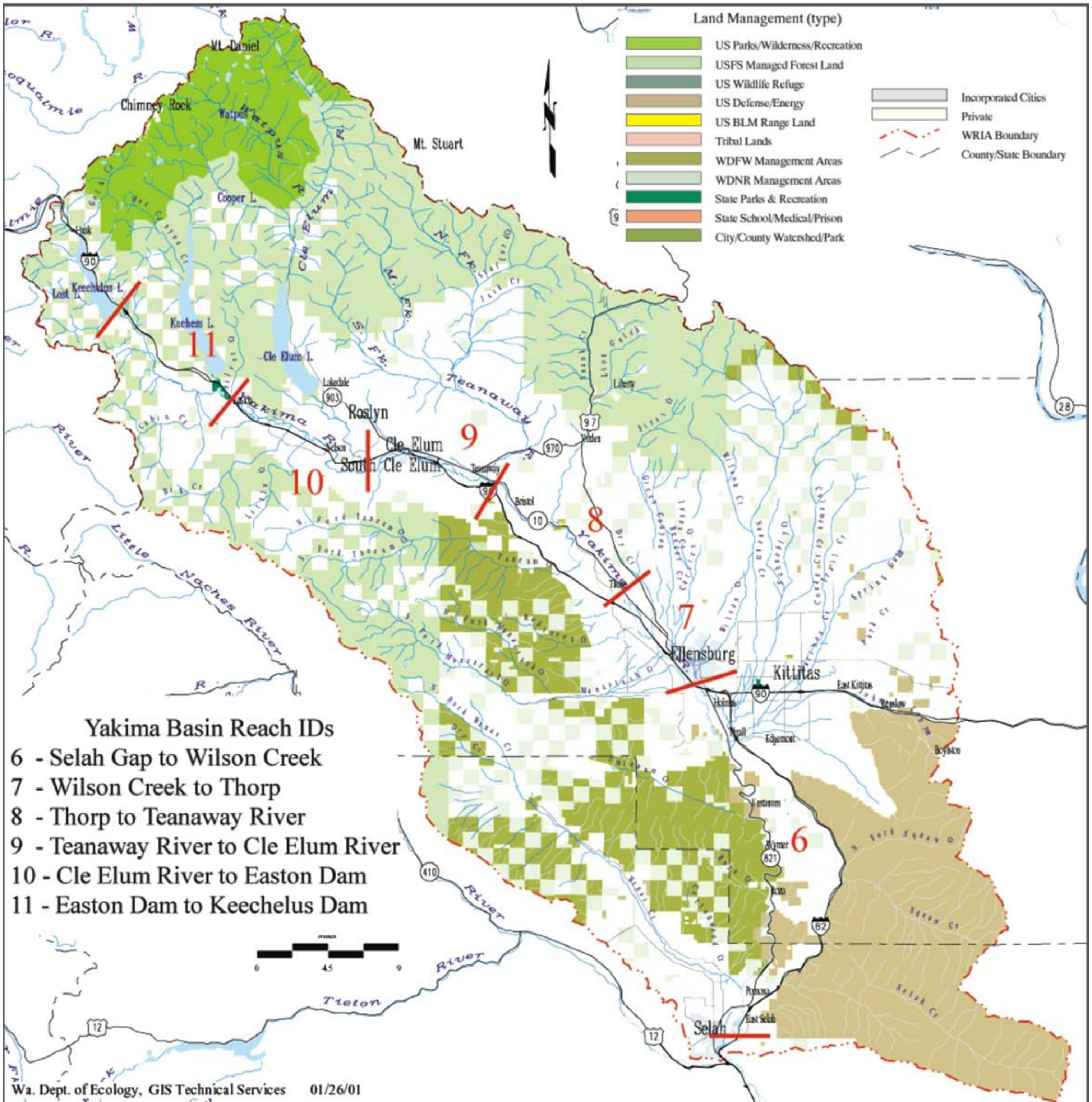
Figure 3-2. WRIA 38 Basin Map



ENTRIX

Prepared for the Naches/Upper Yakima Lead Entity Salmon Recovery Strategy

Figure 3-3. WRIA 39 Basin Map



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Prepared for the Naches/Upper Yakima Lead Entity Salmon Recovery Strategy

Reach descriptions from the EDT analysis are of significantly higher resolution (i.e., significantly shorter stream length) and also include the main tributaries to the Yakima River. For this reason, qualitative descriptions of these reaches would be too lengthy to provide for this document. Table A-2 summarizes how the EDT and Snyder and Stanford reach priorities will be categorized and applied in the SRP for projects proposed in the Yakima basin for SRFB funding. These categories--high, medium or low priority in the recovery strategy--are reflected as different multipliers (weighting factors) to the cumulative project score obtained from the Tier 1 SRP, as further defined in section A.4. Qualitative descriptions of the type of characteristics these categories of reaches are likely to exhibit are provided below. These descriptions should be considered for general guidance only, as interpretations of reach quality are inherently subjective. The EDT output of reach priority will take precedence for reach categorization into the SRP for project scoring (see A-2).

General Characteristics of Category 1—High Priority Reaches

These subwatersheds/reaches represent systems that most closely resemble natural, high quality functional aquatic ecosystems. In general, they support large, often continuous blocks of high-quality habitat and sub-watersheds (tributaries) supporting multiple populations. Connectivity among these sub-watersheds/reaches and through the mainstem river corridor is good, and they significantly support life history functions for at least two of the highest priority species in the Yakima watershed (i.e., steelhead, bull trout, spring Chinook). Exotic species may be present but are not dominant. Protecting the functioning ecosystems in these sub-watersheds is a very high priority. Habitat complexity and flow regimes in these watersheds are sufficient and diverse to support multiple salmonid species. Given the existing functionality in Category 1 sub-watersheds/reaches, the most appropriate projects are usually those that protect properly functioning habitats through a combination of easement and/or landowner agreements, conservancy programs, or property purchase.

General Characteristics of Category 2—Medium Priority Reaches

These sub-watersheds/reaches support important salmonid resources, and are often classified as strongholds for one or more populations throughout. Category 2 sub-watersheds/reaches generally have an increased level of fragmentation relative to Category 1 sub-watersheds from habitat disturbance and/or loss. These subwatershed/reaches support a substantial area where the populations of the high priority species in the Yakima may have been lost or are at risk for a variety of reasons. At least one federally listed fish species should be found within the sub-watershed/reach of such category 2 reaches. Connectivity among sub-watersheds within Category 2 watersheds may still exist or could be restored so that it is possible to maintain or rehabilitate life history patterns and dispersal. Restoring ecosystem functions and connectivity within these sub-watersheds are high priorities. Such restoration projects in these watersheds should address causal mechanisms, such as land-forming processes, such that restoration projects are long-lived and relatively maintenance free.

Table A-2 Yakima Basin Reach and Sub-watershed Priorities

Tier 2 Reach Category	Snyder & Stanford Mainstem Reach or Sub-watershed
Category 1: High Priority in Recovery Strategy	High priority reaches include those reaches identified in the top third of the EDT analyses for high preservation or restoration potential for the ESA-listed stocks (steelhead, bull trout) and spring Chinook. Protection and restoration projects in mainstem reaches 10, 11; upper and lower (above Naches-Cowiche Div. Dam) Naches River and upper Naches tributaries (above Tieton R.); Satus Cr.; West, Middle and North Fork Teanaway R. would also be considered in this category.
Category 2: Medium Priority in Recovery Strategy	Medium priority reaches include those reaches identified in the top third of EDT rankings for preservation/restoration potential of the non-listed salmon stocks of lesser priority to the Yakima recovery strategy (i.e., coho, fall chinook), or those reaches in the middle third of the rankings for the ESA-listed species and spring Chinook. Protection and restoration projects in the Snyder and Stanford (2000) mainstem reaches 4, 5, 6, 7, 8, 9; Toppenish Cr., Ahtanum Creek; Cowiche Cr., Manastash Cr., Taneum Cr., Swauk Cr., mainstem Teanaway R., lower Cle Elum R., Big Cr., Cabin Cr. would also be considered in this category.
Category 3: Low Priority in Recovery Strategy	Low priority reaches include those reaches identified in the middle third of EDT rankings for preservation/restoration potential of the non-listed salmon stocks of lesser priority to the Yakima recovery strategy, or the lower third of EDT rankings for the ESA-listed stocks or spring Chinook salmon. Large-scale protection/restoration projects in the Snyder and Stanford (2000) mainstem reaches 1, 2 & 3; Amon Cr., Corral Cr., Snipes Cr., Spring Cr., Marion Drain, Tieton R. below Tieton Dam, Wenas Cr., Wilson/Naneum Cr. system, Reecer Cr., Dry/Cabin creek would also fit in this category.

General Characteristics of Category 3—Low Priority Reaches

These sub-watersheds and/or reaches may still contain significant habitat that supports salmonids. In general, however, these sub-watersheds have experienced substantial degradation and are highly fragmented by extensive habitat loss, most notably through loss of connectivity with the mainstem corridor. The opportunities for restoring full expression of life histories for multiple populations found within the reach are limited, but possible to some extent. An assessment of the production potential and habitat conditions is often warranted to best identify where restoration could best serve overall production in these sub-watersheds. Therefore, projects in the SRFB "assessment" category are often the most appropriate for this group of sub-watersheds, although restoration projects focused on fixing well understood long-term source problems could also score high. As with Category 2 sub-watersheds/reaches, restoration projects in

Category 3 sub-watersheds should address causal mechanisms for habitat degradation, so that any habitat restoration projects implemented are long-lived.

A.4 Project Scoring Rationale and Protocol Methodology (SRP)

Project proposal interpretation will be conducted using a two-tiered quantitative scoring method (the SRP) that reflects the benefits of each project on specific life history functions of the species that would most benefit from the project. Briefly, projects are scored by answering a series of questions that address the biological functions provided for the species of importance to the recovery of salmon in the Yakima watershed, yielding a sum of scores (SS). The SS is then weighted based on: (1) the geographic importance of the sub-basin/reach to salmon recovery where the project would occur (a multiplier of the score), and (2) the certainty of success/habitat quality modifier (a divisor of the score).

How was the SRP model developed?

The protocol proposed for scoring specific projects represents a modification of the Indicator Value Assessment (IVA) method initially developed for addressing wetland functions (Hruby et al. 1995) and a "salmon overlay" modification of that same model (City of Everett & Pentec, 2001). It deviates substantially from these models in the type of questions asked, and the manner by which the data are ultimately used—to characterize the value of potential salmon restoration projects. The model also differs in the application of weighting factors to yield the Total Project Score (TPS). These weighting factors modify and normalize the sum of scores (SS) acquired from answering the questions in Table A-3 relative to: (1) the geographic prioritization of the sub-watershed for overall salmon recovery where the project is proposed and (2) the certainty in outcome. The geographic prioritization of the sub-watersheds/reaches within the Yakima basin reflects the overall salmon recovery strategy geared towards maximizing the native stock enrichment of steelhead, bull trout and chinook salmon. The enhancement or re-establishment of naturally produced but hatchery-derived chinook and coho salmon is of lesser importance but still valid within the context of salmon recovery for the Yakima basin. This species prioritization is reflected in the scoring template (Table A-3).

How does it work, exactly?

The Tier 1 project scoring method characterizes biological functionality created by potential projects through the answering of a series of yes/no questions that are focused on specific life history pathways of salmonids. The maximum score for each question posed for a species is "5," if the species is of the highest priority due its endangered or threatened status (steelhead/bull trout) or sociocultural and economic value (spring Chinook). The cumulative score for all species that could benefit is tallied for each question. Table A-3 provides the scoring template for the SRP model. Note that points are only awarded for each "yes" answer in the template.

As seen in Table A-3, many questions have a, b and c parts to them. Questions with subcategory designations of *a*, *b* or *c* (e.g., 1a, 1b, or 1c) are meant to indicate that the question is applicable to *a* and/or *b*, and/or *c*. These are usually worded to reflect the general type of project categories recognized by the SRFB—namely, (a) protection-based, (b) restoration-based, or (c) assessment-based. In nearly all cases, only one of the a, b or c questions will apply, given the general project categories recognized by the SRFB, but some project proposals may fit into both a protection and restoration category, and it would therefore be appropriate to answer all the applicable questions.

The following premises should be considered:

- The maximum score for each question will vary by species, to reflect the overall species' role in salmonid recovery in the Yakima watershed and/or their status under the ESA. The maximum scores for each species are thus as follows: steelhead = 5, bull trout = 5, spring chinook = 5, fall chinook = , coho = 3, other native species (e.g., rainbow trout, sockeye salmon, mountain whitefish) = 2.
- Steelhead and bull trout are given maximum scores of 5 because of their ESA listings in the mid-Columbia, and hence, Yakima basin. Although the spring chinook are not an ESA listed species in the Yakima basin, they are perhaps the most important species to the watershed in terms of their role in the overall salmon recovery based on historic escapement and relative value to tribal and non-tribal Yakima River fisheries; thus, they are also given a maximum score of 5. Fall chinook salmon are valued slightly lower than spring chinook in the Yakima R. fisheries and the stock is largely supported by hatchery augmentation using in-basin and out-of-basin stocks, hence, the maximum score to each question for this stock is 4. Coho salmon are given a maximum score of 3 because native coho were extirpated from the system many years ago. Ongoing efforts to reintroduce coho in the Yakima watershed are relying on hatchery introductions of out-of-basin stock origins. Projects that benefit native resident rainbow trout and mountain whitefish are also recognized in the scoring template because the TAG recognizes that a holistic salmonid recovery plan should not exclude other native fishes whose stocks are interrelated to the higher valued stocks.
- "Yes" answers are given to each question if the project is closely associated with the biological function for each species, as indicated in the question.
- In recognition of the SRFB recovery objectives that emphasize protecting functioning habitat that already exists as the highest priority (JNRC 2001), "yes" answers to questions that focus on protection/preservation-based projects receive maximum scores possible for each species in question. Similarly, as reflected in the scoring template questions (Table A-2), restoration-based projects receive slightly lower maximum scores, and assessment-based projects receive the lowest maximum scores in the template.
- Restoration-based projects generally receive slightly lower scores than the maximum possible because the restoration of habitat to a functional status has greater uncertainty (and often cost) than preservation/protection-based projects. Some

exceptions to this rule are seen in the scoring template, and are explained in the text below where applicable.

- In general, "yes" answers to questions that focus on assessment-based projects receive the lowest scores for each species because habitat assessment projects in the Yakima basin are generally considered less essential to salmon recovery at this stage in the recovery process. However, the TAG recognizes that some important restoration projects require assessments before they can proceed further. Thus applicants should not be dissuaded from applying for SRFB funds for assessment projects provided a strong argument can be made to connect the assessment to a future restoration project.

- Tier 2 weighting factors are applied to the Tier 1 sum of scores (SS) acquired from answering the questions in Table A-2. The first weighting factor, WF-1, reflects the protection or restoration potential category of the reach where the project is proposed (Table A-3) and is applied as a multiplier to the SS. Note that protection-based projects use the protection-based category for the reach where the project is proposed; restoration-based projects use the restoration potential categories (see Table A-2). The second weighting factor, WF-2, represents a modifier (divisor) to the score to reflect the certainty of success of the project. Equation [1] reflects the full equation required to achieve the Total Project Score:

[1] Total Project Score (TPS) = (SS)(WF1)(WF2)

where:

- SS = sum of scores for each Tier 1 question presented in the project scoring template (Table A-3)

- WF 1 = Tier 2 sub-watershed/reach weighting factor. For projects in Category 1 sub-watersheds/reaches, multiply the unitless sum of scores (SS) by 1.4, in Category 2 sub-watersheds/reaches, multiply SS by 1.2, in Category 3 sub-watersheds/reaches multiply SS by 1.0.

- WF 2 = certainty of success/habitat quality modifier. This modifier is applied to the equation to reflect several elements of uncertainty that may be associated with a proposed project. These elements of uncertainty include:

  a) Unique elements of the habitat that may not otherwise be reflected in SS (e.g., project located in key spawning habitat, educational aspects).

  b) The certainty of the long-term viability of the project. This characteristic reflects how the project addresses causal mechanisms of habitat impairment as opposed to symptoms of habitat impairments.

WF 2 modifiers should be applied to the score of (SS)(WF1)(WF2) as one of three possible quotients: (a) WF 2 = 1.0—if the project has a high certainty of success in the long term. That is, that the project will remain viable for the long term, (b) WF 2 = 0.66—if the habitat where the project would occur offers habitat of use to the priority species for recovery but the habitat type is not particularly limited in the sub-watershed, or if there is less confidence in the long term viability of the project (75-90% certainty), or (c) WF 2 = 0.33—if the project would benefit habitat that is neither used by priority salmonids or is unlimited in the sub-watershed, or if the confidence in the long term viability of the project is better than random (50%), but less than 75%.

The wide spread in the WF-2 modifiers should ensure adequate spread in project scores to differentiate amongst the different projects scored. First-time applicants with no previous record of field project management and successful completion are strongly encouraged to partner with a co-applicant with a good, proven record to improve project certainty, and increase TAG confidence in project success.

Table A-3. Draft* Project Tier 1 Scoring Template.

	HABITAT PATHWAY	Spring Chinook	Coho	STHD	Bull Trout	Fall Chinook	Other Fish (rainbow, whitefish Sockeye)	Total Score Possible[2]
	HYDROLOGY (surface water, groundwater)							
1a	project protects/preserves perennial stream or spring flows [F,R,M,S][1]	5	3	5	5	4	2	24
1b	project restores perennial stream or spring flows (e.g., via water right trade) [F,R,M,S][1]	5	3	5	5	4	2	24
1c	project assesses functions of freshwater spring or stream flows (e.g., IFIM) [F,R,M,S][1]	3	1	3	3	2	0	10
2a	project protects against future groundwater withdrawals [F, R, M][1]	3	1	3	3	2	0	12
2b	project restores groundwater source by permanently eliminating water right [F, R, M][1]	5	3	5	5	4	2	24
	WATER QUALITY (e.g., temperature, dissolved oxygen, suspended. sediments, nutrients, toxics)							
3a	project protects against potential shoreline erosion through riparian planting, other natural bioengineering or land acquisition/easement [F, S, H, R][1]	5	3	5	5	4	2	24
3b	project restores or stabilizes erosion-prone shoreline habitat [F, S,R,H][1]	4	2	4	4	3	1	18
4a	project protects against water temperature increase (e.g, land purchase) [H, M, F, R, S][1]	4	2	4	4	3	1	18
4b	project would restore habitat to yield lower temperatures over time [H, M, F, R, S][1]	5	3	5	5	4	2	24
4c	project assesses temperature conditions to determine production potential [H, M, F, R, S]	3	1	3	3	2	0	12
5a	project would protect against future loss in d.o. percent saturation [H, M, F, R, S][1]	4	2	4	4	3	1	18
5b	project would restore d.o. saturation to naturally achievable levels [H, M, F, R, S][1]	5	3	5	5	4	2	24
5c	project would assess d.o. saturation levels to determine prod. Potentials [H, M, F, R, S][1]	3	1	3	3	2	0	12
6a	project protects against future introduction of contaminant source [F,S,R,H][1]	4	2	4	4	3	1	18

HABITAT PATHWAY		Spring Chinook	Coho	STHD	Bull Trout	Fall Chinook	Other Fish (rainbow, whitefish Sockeye)	Total Score Possible[2]
6b	project restores water quality by reducing or eliminating contaminant source [F, S,R,H] [1]	5	3	5	5	4	2	24
6c	project assesses contaminant source fate and transport [F, S,R,H] [1]	3	1	3	3	2	0	12
IN-CHANNEL HABITAT (e.g., lwd, spawning gravel, pool/riffle ratios)								
7a	project protects or promotes lwd recruitment/retention [F, R, S] [1]	5	3	5	5	4	2	24
7b	project restores lwd densities in area where natural retention should exist [F, R, S] [1]	4	2	4	4	3	1	18
7c	project assesses lwd loading on basis of geomorphic constraints of stream [F, R, S] [1]	3	1	3	3	2	0	12
8a	project protects against spawning gravel scouring and/or embedding [S, F, H] [1]	5	3	5	5	4	2	24
8b	project restores spawning gravels to area where natural retention should exist [S, F, H] [1]	4	2	4	4	3	1	18
8c	project assesses spawning gravels [S, F, H] [1]	3	1	3	3	2	0	12
HABITAT ACCESS								
9	project protects habitat access under all flows [M, S, F, R, H] [1]	5	3	5	5	4	2	24
10a	project restores juvenile access under high flows [M, S, F, R, H] [1]	3	1	3	3	2	0	12
10b	project restores juvenile access under mean flows [M, S, F, R, H] [1]	4	2	4	4	3	1	18
10c	project restores juvenile access under low flows [M, S, F, R, H] [1]	5	3	5	5	4	2	24
11a	project restores adult access under high flows [M, S, F, R, H] [1]	3	1	3	3	2	0	12
11b	project restores adult access under mean flows [M, S, F, R, H] [1]	4	2	4	4	3	1	18
11c	project restores adult access under low flows [M, S, F, R, H] [1]	5	3	5	5	4	2	24

Question	HABITAT PATHWAY	Spring Chinook	Coho	Steelhead	Bull Trout	Fall Chinook	Other Fish (rainbow, whitefish Sockeye)	Total Score Possible[2]
12	project assesses habitat access/factors affecting upstream distribution [M, S, F, R, H] [1]	3	1	3	3	2	0	11
FLOODPLAIN CONNECTIVITY/RIPARIAN CONDITION								
13a	project protects floodplain connectivity (e.g., acquisition) [S, F, M, R, H] [1]	5	3	5	5	4	2	24
13b	project restores floodplain connectivity (e.g., dike breaching) [S, F, M, R, H] [1]	5	2	5	5	4	1	22
13c	project assesses floodplain connectivity [S, F, M, R, H] [1]	3	1	3	3	2	0	12
14a	project protects riparian corridor [S, F, M, R, H] [1]	5	3	5	5	4	2	24
14b	project restores riparian corridor function [S, F, M, R, H] [1]	5	2	4	4	3	1	18
14c	project assesses riparian corridor function [S, F, M, R, H] [1]	3	1	3	3	2	0	12

[1]Functions (listed in order of probable importance for project type): F--feeding, R - rearing; S - spawning, M- Migration, H – health

[2]Total Project Score (TPS) = SS(WF1)(WF2). where SS = sum of individual Tier 1 scores for each question. WF 1 = Tier 2 Weighting Factor; WF2 = Tier 2 Certainty of Success Weighting Factor

WF 1: TIER 2 sub-watershed/reach categories: multiply total score by 1.4 for projects in Category 1 sub-watersheds/reaches,

1.2 for Category 2 sub-watersheds/reaches, 1.0 for Category 3 sub-watersheds/reaches.

WF 2 = 1.0 if high certainty of success (90-100%, where certainty is a long term increase in salmonid production); WF 2 = 0.66 if reasonably certain (75-90%) of success; WF 2 = 0.33 if moderately certain of success (50 to 75%).

A.5 Rationale for Tier 1 Questions Related to Yakima Basin Recovery

1.1.2 <u>Habitat Pathway: Hydrology</u>

1.1.2 Question 1a: Does the project protect/preserve perennial stream or spring flows?

Assumptions: This question addresses the essential functions of feeding, refuge, spawning, migration and osmoregulation provided for salmonids by projects that could preserve existing flows in stream channels within the Yakima watershed. These functions can be affected by spring flows regardless of whether those flows are found in habitat directly used by salmonids, or upstream of salmonid habitat. Flows could be secured/preserved by such actions as land acquisition or easements along riparian corridors where ephemeral tributaries or springs ultimately flow into (or already provide) existing salmonid habitat. Projects that donate a shallow groundwater right, or prevent additional water rights from becoming established, could also yield an answer of "yes" to this question, in recognition of the groundwater/surface water connection to small streams and springs. Projects that secure water flows upstream of anadromous barriers are still viable because they recognize the hydrologic continuity of stream networks.

Protocol: Answer "yes" if the project would protect or preserve the hydrology of a freshwater stream or spring. If the project is a groundwater acquisition, the water right secured must be from a shallow aquifer hydraulically connected to a recognized stream or spring in the Yakima watershed. Scoring can be done from maps or aerial photographs, but may require field survey to verify that the water flow is significant (i.e., measurable).

1.1.3 Question 1b: Does the project restore perennial stream or spring flows?

Assumptions: This question addresses the same functions as question 1a, and is similar in its rationale. Because flow restoration is causal to the reestablishment of other functional elements of a salmonid stream (e.g., floodplain connectivity, in-channel habitat, etc.), flow restoration projects have maximum species scores of '5,' similar to flow preservation/protection based projects. Flow restoration could occur by returning historically diverted flows back into a historic channel, or removing specific screen diversions (i.e., as appropriate).

Protocol: See question #1a protocol. Answer "yes" if the restoration of flow would be measurable after the project was complete and resulted in a quantifiable increase in fish use of habitat.

1.1.4 Question 1c:Does the project assess functions of freshwater spring or stream flow/velocity profile(s)?

Assumptions: This question addresses the same functions as those of questions 1a and 1b, although in practice, will primarily focus on the migration, spawning and feeding functions. In some systems, there may be potential to maximize the functionality of flows for specific life history stages and species based upon modeling such as Instream Flow Incremental Methodology (IFIM) or other tools. The assessment of stream flow could be a worthwhile endeavor as a salmon recovery project if there is information available to suggest that a system is currently artificially limited in its production potential by flow, and there is some manner by which flow limitations could be rectified. Under such a scenario, the assessment of the proper flows to support the species and life stages limited by the existing flow regime would be scientifically defensible and appropriate. Such an assessment could serve as a precursor to a subsequent project aimed at flow supplementation (e.g., by developing a storage reservoir or wetland, restoring previously diverted flows and/or securing a water right).

Protocol: Answer "yes" if the project would develop a database on flows in a basin(s) of interest to the Yakima watershed salmon recovery. Protocols for the actual flow measuring should be developed in conjunction with a project application and consultation with the Lead Entity.

1.1.5 Question 2a: Does the project protect against future groundwater withdrawals?

Assumptions: Groundwater withdrawals affect surface water discharge, although the exact location of the effects of groundwater withdrawals on surficial flows are not easily recognized. For example, in the Yakima watershed, flow regulation has altered groundwater hydrology, resulting in a reduced spring snowmelt recharge. Irrigation withdrawals in the summer result in reduced base flows below the Rosa diversion dam downstream of the Columbia confluence. Groundwaters supporting summer base flows are artificially elevated in temperature due to the flip-flop flow regime, which results in groundwater recharge of the upper basin (above Rosa) during the summer months—when recharge waters are warmer. Groundwater withdrawals could further reduce baseflows, exacerbating the associated thermal impacts already limiting production in the lower basin.

Protocol: Answer "yes" if the project prevents future groundwater withdrawals. Because of the uncertainty in direct effects on surface flows, therefore the maximum score possible is lower than 2b for each species potentially benefited.

1.1.6 Question 2b: Does the project restore groundwater source by permanently eliminating water right?

Rationale & Assumptions: The functions of groundwater are explained in 2a (above). The maximum score for question 2b exceeds that of 2a because the direct benefit to surface flows from such an action has less uncertainty associated with it.

Protocol: See 2a.

1.1.7 Question 3a: Does the project protect against potential shoreline erosion through riparian planting, other natural bioengineering (i.e., without armoring), or land acquisition/easement?

Rationale & Assumptions: Fluvial shorelines in the Yakima watershed represent the interface with the terrestrial environment. The terrestrial interface is the principal source of organic enrichment to streams required for sustaining the detritus-based food web upon which salmonids ultimately (albeit indirectly) depend. Maintaining shoreline integrity without artificial armoring is critical for the sustenance of the food web and the integrity of floodplain function. Naturally unstable shorelines, however, can serve as a chronic source of fine sediments to streams that may ultimately affect spawning and rearing habitat conditions. Protecting erosion-prone shoreline habitats can be facilitated by a variety of means through acquisition, easement, or specialized bioengineering. This question recognizes the values of such projects, but emphasizes the need to avoid bank armoring methods used historically to reduce shoreline erosion (i.e., rip-rap, log booms, etc.).

Protocol: The boundaries between project areas should be examined during field surveys to determine the nature of shorelines. Often, distinct breaks in shoreline type define the boundaries of adjacent project areas. If these breaks are the result of shoreline armoring, bulkheading, or deep water, then the two adjacent project areas would be judged as lacking shallow-water connectivity. Projects that protect shoreline habitats without armoring will receive an answer of "yes." Such projects can be accomplished through engineering that dissipates energy away from the shoreline without compromising shoreline habitats elsewhere. Projects that compromise habitat elsewhere in the name of protecting shoreline habitat should not be scored. An example of a project that would receive a "yes" to this question would be an acquisition or easement of low gradient shoreline with a recognized off-channel/side channel network.

1.1.8 Question 3b: Does the project restore or stabilize erosion-prone shoreline habitat without artificial armoring?

Rationale & Assumptions: Riprapping or bulkheading of shorelines also interferes with normal shoreline sediment erosion and deposition processes (e.g., Canning and Shipman 1995). Thus, bulkheads or riprap at any slope that limits natural shoreline processes are scored under this question.

Protocol: This question can be answered either through site photographs of sufficient detail or through a site visit. Answer "yes" to Question 3a if the project area high-water shoreline has 10 to 50 percent riprap or vertical bulkheads. Answer "yes" to Question 3b if more than 50 percent of the shoreline is hardened. It is assumed that some assessment will be done in association with any restoration project focused on shoreline erosion, hence, there is no question addressing assessment-based projects on shoreline erosion.

Protocol: Projects that restore shoreline habitats and integrity will receive an answer of "yes." Shoreline stabilization means should not rely on immovable armoring unless part of a greater design that results in a net increase/improvement in shoreline/riparian habitat.

1.1.9 Question 4a: Would the project protect against water temperature increases?

Assumptions: When absolute temperature thresholds for salmonid survival are exceeded, the habitat is no longer usable by salmonids. However, species tolerance levels differ within the Salmonidae, and among geographic locations. Growth ceases before survival thresholds are reached (Fisher 2000). Temperature preferences are generally 1 to 3ºC below which maximum growth can be achieved (Timmons et al. 1991, as cited in Fisher 2000). The growth threshold for temperature is considered to be approximately 18 +/- 2 ^{o}C (64^{o}F) as a 24-hr average. Species with prolonged freshwater life cycles (e.g., coho, steelhead) are at greater risk to loss of habitat from temperature intolerance than species that spend a limited portion of their life cycle in freshwater.

Protocol: Temperature within a project area should be determined from previous monitoring efforts to the extent practicable. Alternatively, or additionally, this data can be collected during field visits with portable field probes. Efforts should be made to characterize the temperature over the seasonal range, and such measurements should be taken in conjunction with dissolved oxygen. Measurement of acceptable temperature in a project area in the late spring or summer would suggest that this water quality factor would be unlikely to limit salmonid use in the fall through early spring, when temperatures are lower and DOs higher.

1.1.10 Question 4b: Does the project restore habitat or flows to yield lower water temperatures over time?

Assumption: See 4a. Restoration of habitat to yield lower water temperatures receives a higher score because of the recognized limitations currently caused by high water temperatures in the Yakima river (i.e. WRIA 37).

Protocol: Answer "yes" if the restoration project yields measurable reductions in the mean seasonal temperature in the project area, as compared to historical data.

1.1.11 Question 4c: Would the project assess temperature conditions to determine production potential?

Assumption: See 4a; assessment of temperature is scored lowest, as temperature limitations to salmonid production in the watershed are already largely understood.

Protocol: Answer "yes" if the project involves a temperature monitoring component coupled with an assessment of how the temperature conditions will affect growth, survival and interspecific interactions.

1.1.12 Question 5a: Would the project protect against loss in dissolved oxygen saturation?

Assumptions: This indicator addresses the health and growth efficiency of salmonids when dissolved oxygen concentrations are at their maximum for the altitude, salinity and water temperature where the project would occur. Habitat provides no function for salmonid rearing or refuge during periods when DO concentrations are depressed below thresholds of tolerance for the priority species. The threshold for DO below which growth may be compromised is established as 6 mg/l. However, dissolved oxygen concentrations are a multi-function parameter affected by temperature, altitude and salinity—increases in all decrease the maximum dissolved concentrations at saturation (percent saturation). Because these factors will vary naturally over conditions in the Yakima watershed, absolute concentrations are less reflective of habitat quality than is an index of percent saturation. For this reason, both the absolute dissolved oxygen concentration as well as the percent saturation should be considered when evaluating how a project could affect this important water quality parameter. Maximum habitat function is provided when the majority of habitat provides dissolved oxygen concentrations at saturation, and above the absolute thresholds at all times. However, if the majority of an area does not meet temperature and/or DO criteria for salmonids (e.g., mid-day in midsummer) it can still provide suitable habitat at other times, when dissolved oxygen is not limiting. Projects that reduce thermal loadings (e.g., via shading) and/or biological oxygen demand will have a positive effect on oxygen concentrations. In-channel projects that increase mixing via aeration will also have a positive influence on this habitat parameter.

Protocol: Dissolved oxygen in a project area should be determined from previous monitoring efforts to the extent practicable. Alternatively, or additionally, this data can be collected during field visits with portable field probes. Efforts should be made to characterize the DO over the seasonal and/or tidal range, and such measurements should be taken with temperature. Measurement of acceptable temperature and DO in a project area in the late spring or summer suggests that these water quality factors would be unlikely to limit salmonid use in the fall through early spring, when temperatures are lower and DOs are higher. Answer "yes" if the project would protect against a future decrease in dissolved oxygen.

1.1.13 Question 5b. Would the project restore dissolved oxygen saturation to naturally achievable levels?

Assumption: See 5a. The restoration of dissolved oxygen is ranked higher than protection in this case, as current limitations in dissolved oxygen at multiple locations in the Yakima watershed currently preclude the use of potentially suitable habitat by salmonids.

Protocol: Answer "yes" if a measurable increase in dissolved oxygen in the project area can be shown after project implementation.

1.1.14 Question 5c: Would the project assess dissolved oxygen to determine production potential?

Assumption: In many locations within the Yakima watershed it will be necessary to gauge the suitability of water quality for supporting salmonids prior to the implementation of a specific habitat or passage restoration project. Dissolved oxygen often represents the most limiting water quality factor in marginal aquatic habitats and an assessment of the variability (seasonal and diurnal) is essential under such conditions.

Protocol: Answer "yes" if monitoring will be conducted to assess variability in dissolved oxygen concentration and its effect on carrying capacity.

1.1.15 Question 6a: Does the project protect against future introduction of contaminant source?

Assumption: This question primarily addresses the feeding and health functions, as identified in Table A-1. Toxicants within the water column or streambed sediments could cause direct mortality, preclude the use of habitat, or cause sublethal toxicity to salmonids during periods of exposure within a project area. Such contaminants could also alter the food web upon which salmonids require for rearing. For example, outmigrant juvenile salmonids passing through a PCB- and PAH-contaminated portion of the Duwamish River Estuary were found to exhibit reduced disease resistance relative to unexposed control group fish (Arkoosh et al. 1998). In this study, the impact from such exposures to the overall salmonid population within a WRIA is assumed to be proportional to the relative percentage of the population exposed to those conditions when such thresholds are exceeded. Thus, if water column or sediment thresholds are exceeded during periods of high abundance, then the impact could be significant; if thresholds are exceeded during low abundance periods, the impact from the stressor would be less significant, but still noteworthy. It is assumed that exceedence of existing water quality toxicant standards within a project area (e.g., a TMDL listing) would equate to a potentially stressful condition for salmonids. The direct impact from contaminated sediment exposures to the overall salmonid population within a WRIA is proportional to the total area affected. Lethal concentrations of contaminants are defined by the state sediment quality standards (SQS) or cleanup screening levels (CSLs). However, the SQS and CSLs criteria are biologically-based on benthic infaunal taxa, and not directly linked to salmonids in the trophic zone. More appropriate threshold references may need to be addressed. A project that would prevent land use changes that might otherwise result in the introduction of a contaminant into the Yakima watershed (e.g., an acquisition) would protect against such future introductions.

Protocol: Evaluation of water column and/or sediment contaminants within a project area can be conducted by review of relevant and applicable data from the site or from a nearby location that could be construed to exhibit similar conditions based upon site history. If there were no historical record of industrial activity on or near the site, it would be unlikely that toxicant exceedences in the water column would exist. Should field reconnaissance suggest that water or sediment quality is locally impaired within the project area, then field sampling should be conducted and samples submitted to a qualified laboratory to define the extent and significance of impairment. Field observations of odd color, odor, sheen, or unusual biological indicators (e.g., dead fish, dead algae, etc.) would be indicators to the assessor that water samples should be collected and submitted for analysis from the project area. If water samples are collected, site conditions will dictate whether simple grab samples, depth-integrated, or depth-profile sampling is warranted. Standard water sampling protocols should be followed in accordance with standard methods (APHA et al. 1995). Sediment sampling protocols should be followed in accordance with local jurisdiction requirements. Thus, sampling may involve grab samples for surficial sediments or sediment coring. Site-specific protocols will be developed for each evaluation in conjunction with regulatory authorities.

1.1.16 <u>Question 6b: Does the project restore water quality by reducing or eliminating contaminant source?</u>

Assumptions: See 6a; the restoration of water quality impaired by contaminants to enable the use of habitat previously precluded to salmonids is highly desirable in multiple locations within the Yakima watershed. For this reason, the resolution of a recognized contaminant problem is scored slightly higher than a project that might simply protect an area from future introductions of a contaminant, as the latter should be largely prevented by existing state and federal regulations.

Protocol: Answer “yes” if a measurable improvement in sediment and/or water quality can be verified after project implementation.

1.1.17 <u>Question 6c: Does the project assess contaminant source fate and transport?</u>

Assumptions: The identification of source sediment and water quality contamination with toxicants may be advisable prior to the implementation of a specific habitat or passage restoration project.

Protocol: Answer “yes” if water quality or sediment quality investigations of a potential project area are usually identifiable for toxicants that could affect fish health or production.

1.1.18 Question 7a: Does the project protect or promote LWD recruitment/retention?

Assumptions: Large woody debris (LWD) loading is particularly important to provide channel complexity and form pools used for rearing and refuge. It is especially important for those species that exhibit long freshwater life history phases in their life cycle. The recruitment potential of LWD varies naturally across the habitat types found in the Yakima watershed, and it has also been disrupted by flow regulation and revetments in many portions of the watershed. Projects that protect areas with functional recruitment potential are therefore particularly important.

Protocol: Areas that currently recruit LWD into the active stream channel of the Yakima watershed can be protected by acquisition projects. Project areas where LWD recruitment/retention is maintained or promoted through acquisition or other means would receive a “yes” to this question.

1.1.19 Question 7b: Does the project restore lwd densities in area where natural retention should exist?

Assumptions: Numerous reaches and subwatersheds are deficient in LWD. The importation of LWD into such areas addresses a symptom of habitat impairment, rather than the cause, but is often advisable as a transitory means to add complexity to habitat and increase rearing areas.

Protocol: Answer “yes” if the project results in a suitable increase in LWD density in the reach after project implementation.

1.1.20 Question 7c: Does the project assess LWD loading on basis of geomorphic constraints of stream?

Assumptions: The retention of wood in the channel is a function of channel width, wood size, and wood type, whereby wide channels retain proportionately less wood per unit channel length than narrower channels. For purposes of this model, LWD is defined to include the following:

- logs with length >8 m and diameter >0.6 m
- logs/trees with rootwad and/or branches, length >8 m, and diameter >0.3 m
- stumps with diameter >1 m

Ralph et al. (1991) identified “good” loading levels for Washington streams with channel widths less than 20 m in unmanaged forests at a range of 0.46 to 3.95 pieces per channel width. Values specific to the Yakima basin (as available) should be used to refine the above wood loading assessment indicators to represent a suitable recruitment of LWD in the project area.

Protocol: Wood loadings within a project area must be assessed by field surveys of the project area. A number of pieces by size class along the edge of the bankfull width line should be counted along with those visible at lower water levels. In a broader floodplain area, the number of pieces of LWD visible between is counted and divided by the area of the project area between the same boundaries.

1.1.21 Question 8a: Does the project protect against spawning gravel scouring and/or embedding?

Assumption: In some reaches of the Yakima watershed, gravel embeddedness limits the quality of otherwise suitable habitat for spawning due to excessive recruitment and/or deposition of fines. In other areas, manipulations to the shoreline or stream corridor have affected the recruitment rates of salmonid spawning-sized gravels. Flow manipulations and/or flood scours may, in some reaches or subwatersheds, also be contributing to gravel scouring. Certain property acquisitions or flow regulation projects may have the benefit of providing stability to known spawning bed locations by preventing their alteration.

Protocol: Answer "yes" if the project would occur in an area identified as a known spawning ground for any of the species of interest to the recovery strategy, and the project would help to preserve/protect the spawning areas.

1.1.22 Question 8b: Does the project restore spawning gravels to area where natural retention should exist?

Assumption: See 8a for potential impacts to spawning gravels. The restoration of spawning beds could provide direct increases to salmon production; however, the long term benefits of such projects is predicated upon addressing the source for the loss of spawning gravels initially.

Protocol: Answer "yes" if the project establishes spawning beds in a geomorphically suitable location where previously they did not exist.

1.1.23 Question 8c: Does the project assess spawning gravels?

Assumptions: The assessment of the suitability of an area for providing spawning habitat should be conducted with the consideration of other habitat restoration projects potentially implemented. However, past studies of the Yakima watershed have largely documented where spawning occurs or is impaired by an inadequate quantity or quality of gravel.

Protocol: Answer "yes" if the project involves some component of substrate assessment. Embeddedness can be determined qualitatively by visual inspection, or quantitatively by freeze-core methods.

1.1.24 Question 9: Does the project protect habitat access under all flows?

Assumptions: Artificial (man-made) barriers to immigration and emigration limit habitat use by salmonids for spawning and rearing, and thereby may reduce the overall carrying capacity of the aquatic environment for salmonid production. Habitat access restrictions may ultimately represent the most important element to reducing the ability of a system to support salmonids. Protecting habitat access to suitable habitat represents the first step towards ensuring that further habitat loss from displacement does not occur.

Protocol: Answer "yes" if the project proposed will not limit access and will protect existing access under all flows where access is currently facilitated.

1.1.25 Question 10a: Does the project restore juvenile access under high flows?

Assumption: See question #9 for role of habitat access. Restoration of access to juveniles under high flows may be a benefit, provided it does not result in stranding when flows drop. It is scored lower than 10b or 10c, as the ideal scenario provides for access under the lowest of flows.

Protocol: Answer "yes" if access is restored under ordinary high flows.

1.1.26 Question 10b: Does the project restore juvenile access under mean flows?

Assumptions: See question #10a. This question has maximum scores slightly lower than those identified under 10c (low flows).

Protocol: Answer "yes" if access is restored under average flows, and is not restricted by higher flows.

1.1.27 Question 10c: Does the project restore juvenile access under low flows?

Assumptions: See question #10a. Many areas of potential habitat are precluded from use when flows are minimal. This question receives the highest possible scoring due to the desirability of providing minimum flows that ensure habitat access to juveniles.

Protocol: Answer "yes" if access is restored under low flows, and is not restricted by higher flows.

1.1.28 Question 11a: Does the project restore adult access under high flows?

Assumptions: Access to habitat by adult salmon is most often restricted by depth, height and velocity barriers, as with juvenile salmonids. With the exception of depth, height and velocity barriers are less restrictive to adults than juveniles owing to their larger size. Providing access to habitat represents the first step in ensuring the potential for adult spawning and subsequent juvenile rearing.

Protocol: An assessment of whether and how passage restoration could be restored should consider available protocols for analyzing barriers to upstream migration (Powers 1997). Answer "yes" the design implemented restores upstream passage for adult salmonids under high flow.

1.1.29 Question 11b: Does the project restore adult access under mean flows?

Assumptions: See 11a; passage restoration under mean flow is scored slightly higher than under high flows because available habitat is more accessible.

Protocol: See 11a; answer "yes" if the design restores passage under mean flows.

1.1.30 Question 11c: Does the project restore adult access under low flows?

Assumption: See 11a. Access under low flows is the most desirable goal and is therefore scored highest.

Protocol: See 11a; answer "yes" if habitat access is provided under typical low flows in the system.

1.1.31 Question 12: Does the project assess habitat access/factors affecting upstream distribution?

Assumption To answer this question, the assessor must examine the project area for the presence/absence of culverts, dikes and/or fish screens. If these are present within the project area, they pose a potential restriction to immigration/emigration of salmonids (recognizing that in some places that fish screens are warranted). Culverts should be evaluated for length, slope, diameter, jump height, pool depth, water depth in the culvert, and velocity, using the criteria established by the WDFW for adult and juvenile fish passage (Powers 1997).

Protocol: Answer "yes" if the project can determine either alternatives to immigration/emigration barriers of salmonids, or the design allow for easier passage.

1.1.32 Question 13a: Does the project protect floodplain connectivity (e.g., acquisition)?

Assumption Past development and agricultural practices have confined the historic floodplain in the Yakima River, resulting in a substantial loss of productive rearing habitat. Efforts to re-establish floodplain connectivity often yield measurable increases in fish use, and provide refuge and rearing conditions for juvenile salmonids during high flows. This question addresses the existing *recognized* function of floodplain areas (vs. historic), and seeks to give credit for protecting such important habitat.

Protocol: Answer "yes" if the project, via acquisition or other means, protects existing connectivity of aquatic habitat with the floodplain.

1.1.33 Question 13b: Does the project restore floodplain connectivity (e.g., dike breaching)?

Assumptions Channel armoring and roadways along many portions of the Yakima watershed currently restrict the connectivity of stream channels with their floodplains. Restoring floodplain connectivity can yield measurable benefits to water quality and fish production.

Protocol: Answer "yes" if the project restores hydrologic and biologic connections to historic floodplain habitat.

1.1.34 Question 13c: Does the project assess floodplain connectivity?

Assumptions See 13a; an assessment of floodplain connectiveness to a project area may be required prior to restoration.

Protocol: Answer "yes" if the proposed project assesses floodplain connectivity.

1.1.35 Question 14a: Does the project protect riparian corridor?

Assumptions: Late seral stands of riparian forest are necessary to recruit LWD into the active stream channel and floodplain accessible to anadromous fish. Immature riparian forests do not provide LWD that will be retained for a long enough period of time in the channel to be considered important fish habitat elements. Riparian vegetation also provides shade and organic contributions to support the detrital base upon which salmonids ultimately depend. Riparian vegetation that includes a mix of native species will provide a greater food resource to juvenile salmonids than will a riparian border of non-native species.

Flow regulation in the Yakima watershed, particularly within WRIA 37, have resulted in the simplification of the riparian corridor. As a result, mixed-age riparian forests are not present because newly sprouted seedlings are abnormally scoured or desiccated by the flip-flop flow regulation. The long-term impact of these effects suggest that the late seral stands currently existing, once gone from natural attrition, will not be replaced at the normal rate. Such a condition, if realized, could exacerbate the high temperature conditions already identified as a limiting factor in the lower basin.

Protocol: Answer “yes” if the project protects riparian functions.

1.1.36 Question 14b: Does the project restore riparian corridor function?

Assumptions: The restoration of the riparian corridor is, in many cases, essential for providing a long term source of LWD to the channel, as well as providing shade over the channel and detritus to support the food web.

Protocol: Answer “yes” if the project restores riparian function.

1.1.37 Question 14c: Does the project assess riparian corridor function?

Assumptions: Width and composition of the riparian forest is usually assessed from a site survey of the project area, as aerial photography may not provide the accuracy to delineate the riparian composition at the widths defined by the model. The state of maturity of a riparian stand can be evaluated from recent, high-quality, aerial photographs, or from field surveys. Relatively smaller sizes of LWD can be retained in lower-energy, off-channel estuarine habitats and thus provide the same functions as larger LWD in more active channels. Mature trees considered for this purpose are those with diameter at breast height (dbh) of more than 0.3 m. Diameter at breast height should be considered from field measurements of at least six trees within the project area.

Protocol: Answer “yes” if the project involves a quantitative assessment of riparian corridor function.

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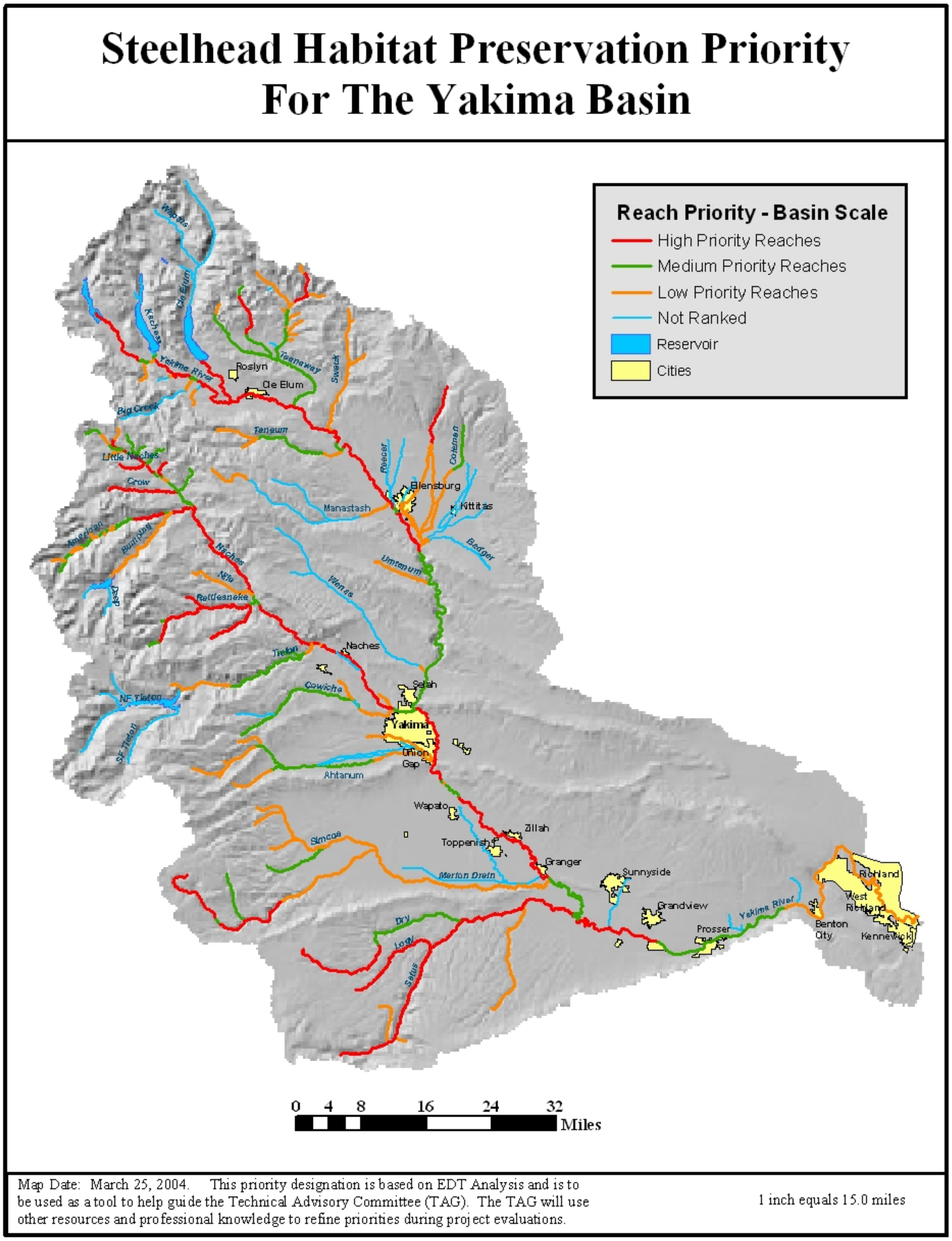
APPENDIX B:

REACH PRIORITY BY SPECIES

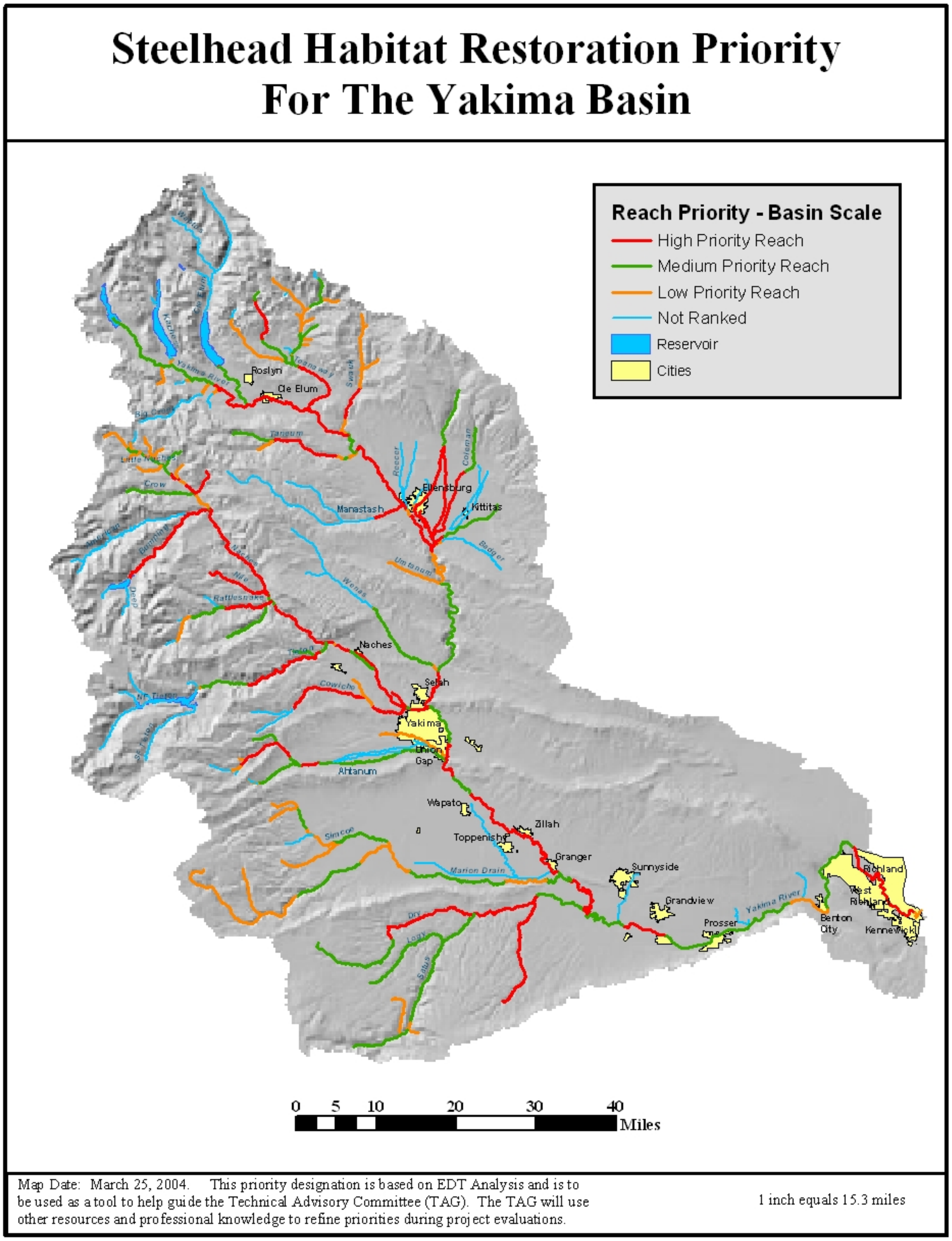
APPENDIX B: REACH PRIORITY BY SPECIES

Priority designations are based on Ecosystem Diagnostic and Treatment (EDT) analysis and our Technical Advisory Group's (TAG) professional knowledge based on scientific data and working experience. However, since EDT modeling for bull trout will not be completed until the Fall of 2004 we used the TAG's professional knowledge to complete the bull trout designations. These maps were generated for the following purpose: to provide guidance to help prioritize projects, to inform project proponents of priority areas for our Lead Entity, and to present our priorities to the Salmon Recovery Board. The maps were developed for the Lead Entity to help rank projects and should not be used for other purposes.

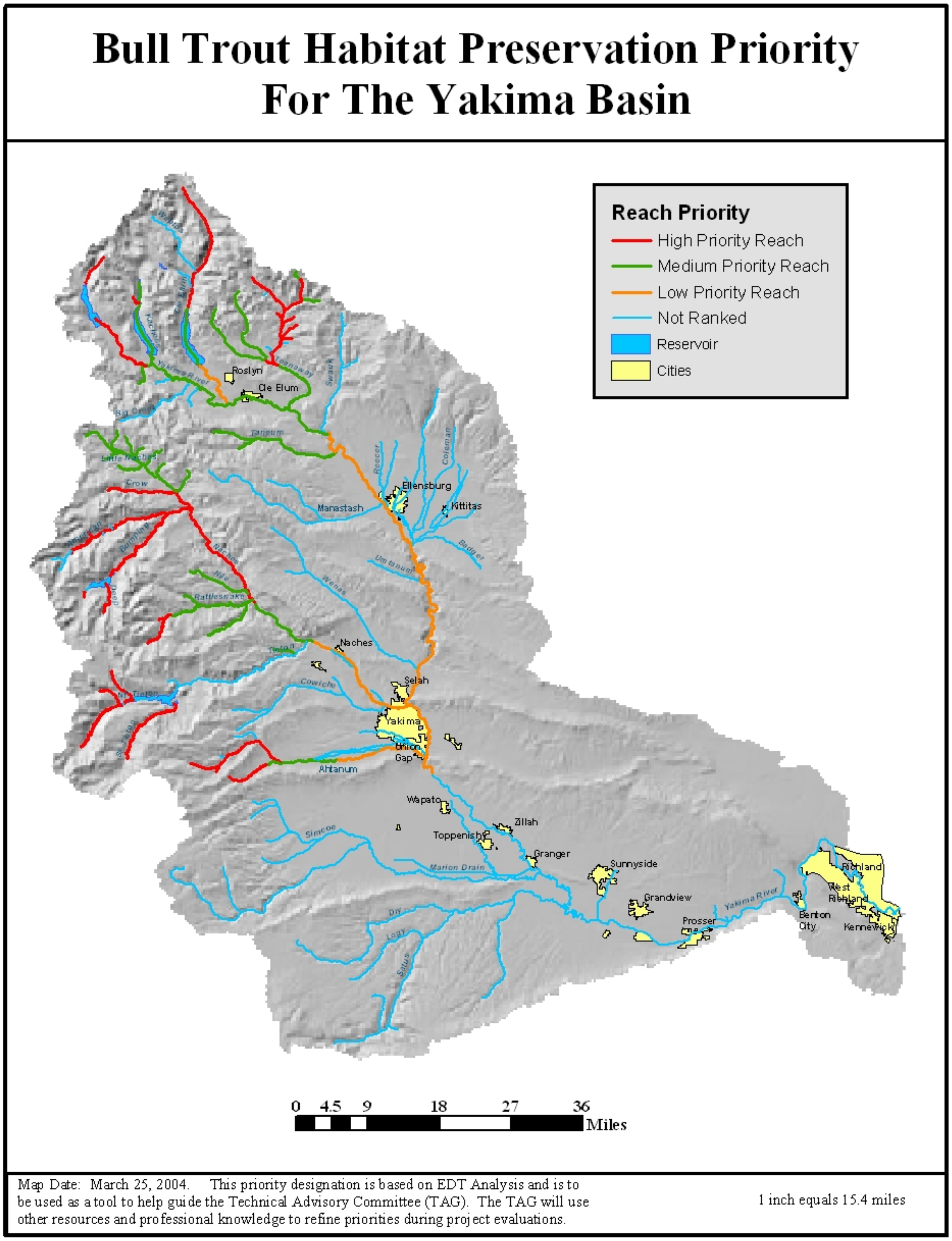
Map 1. Steelhead habitat preservation priority guidance.



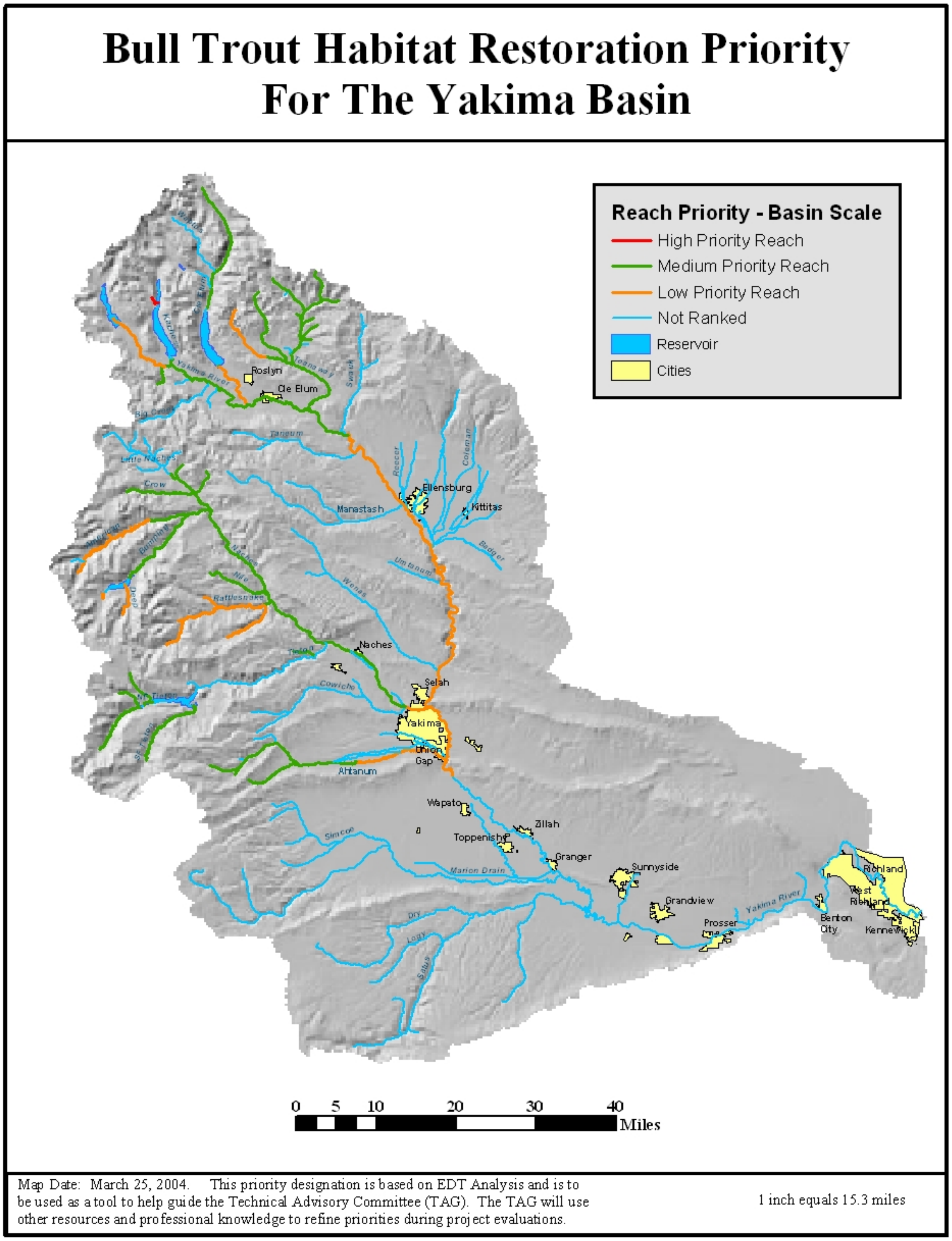
Map 2. Steelhead habitat restoration priority guidance.



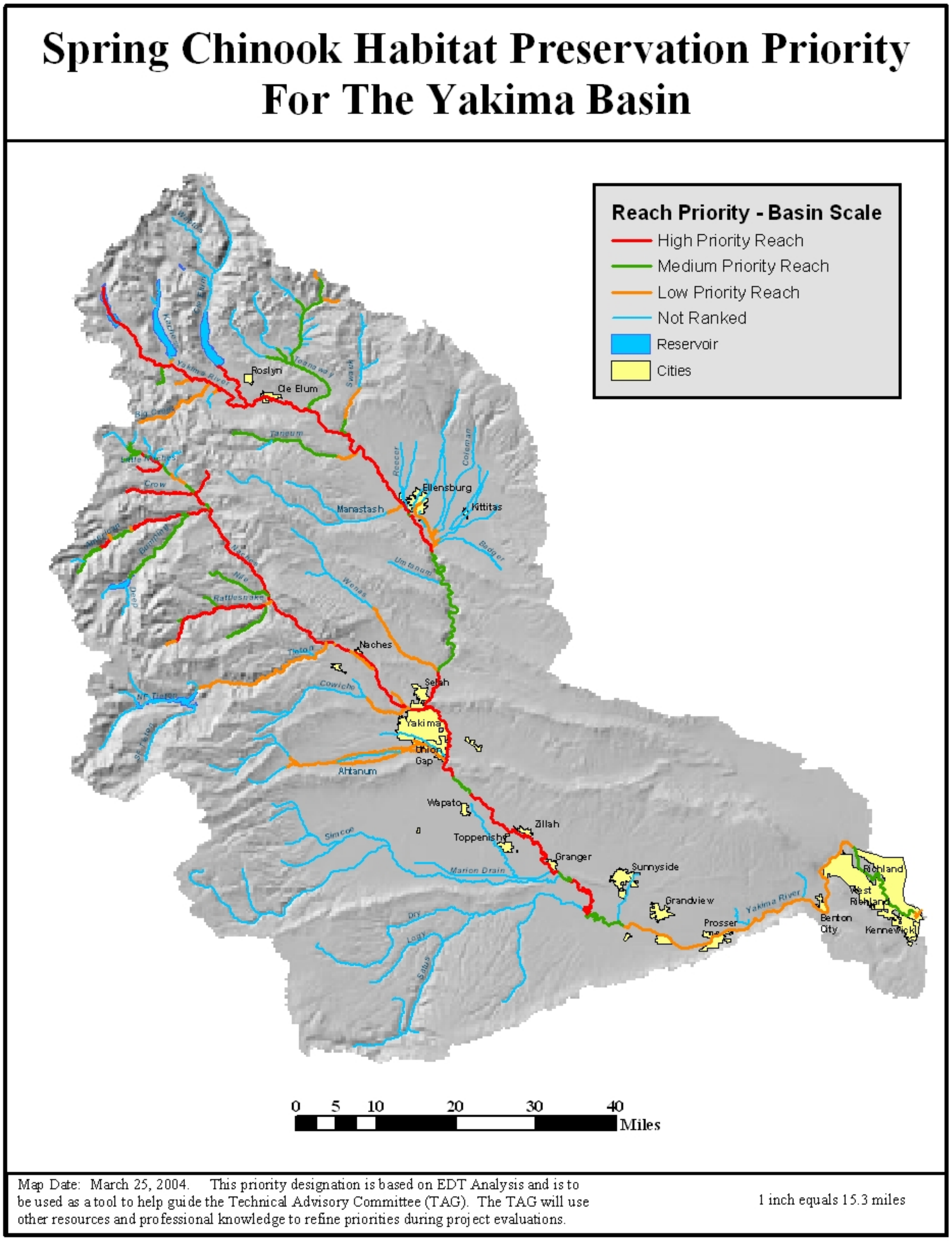
Map 3. Bull trout habitat preservation priority guidance.



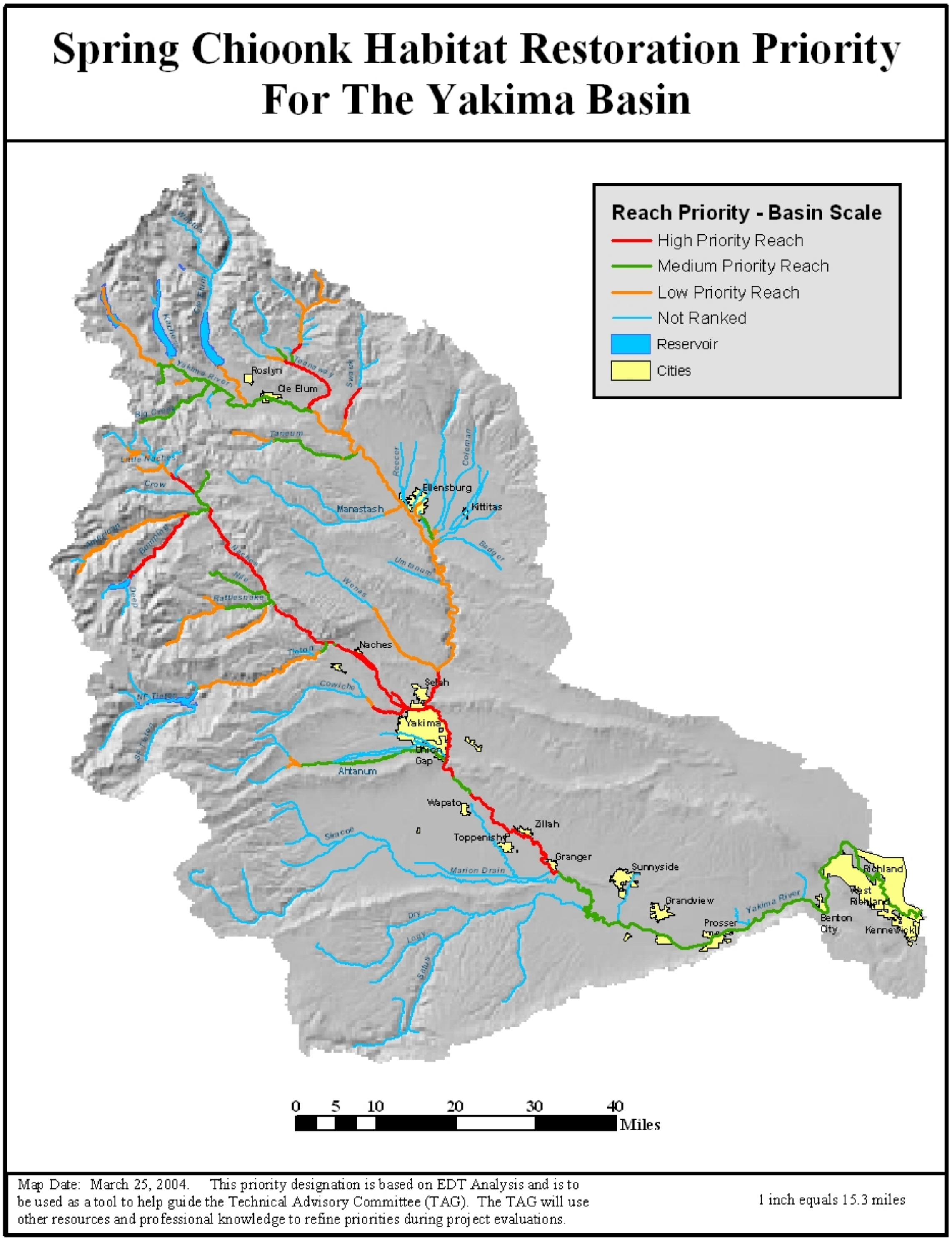
Map 4. Bull trout habitat restoration priority guidance.



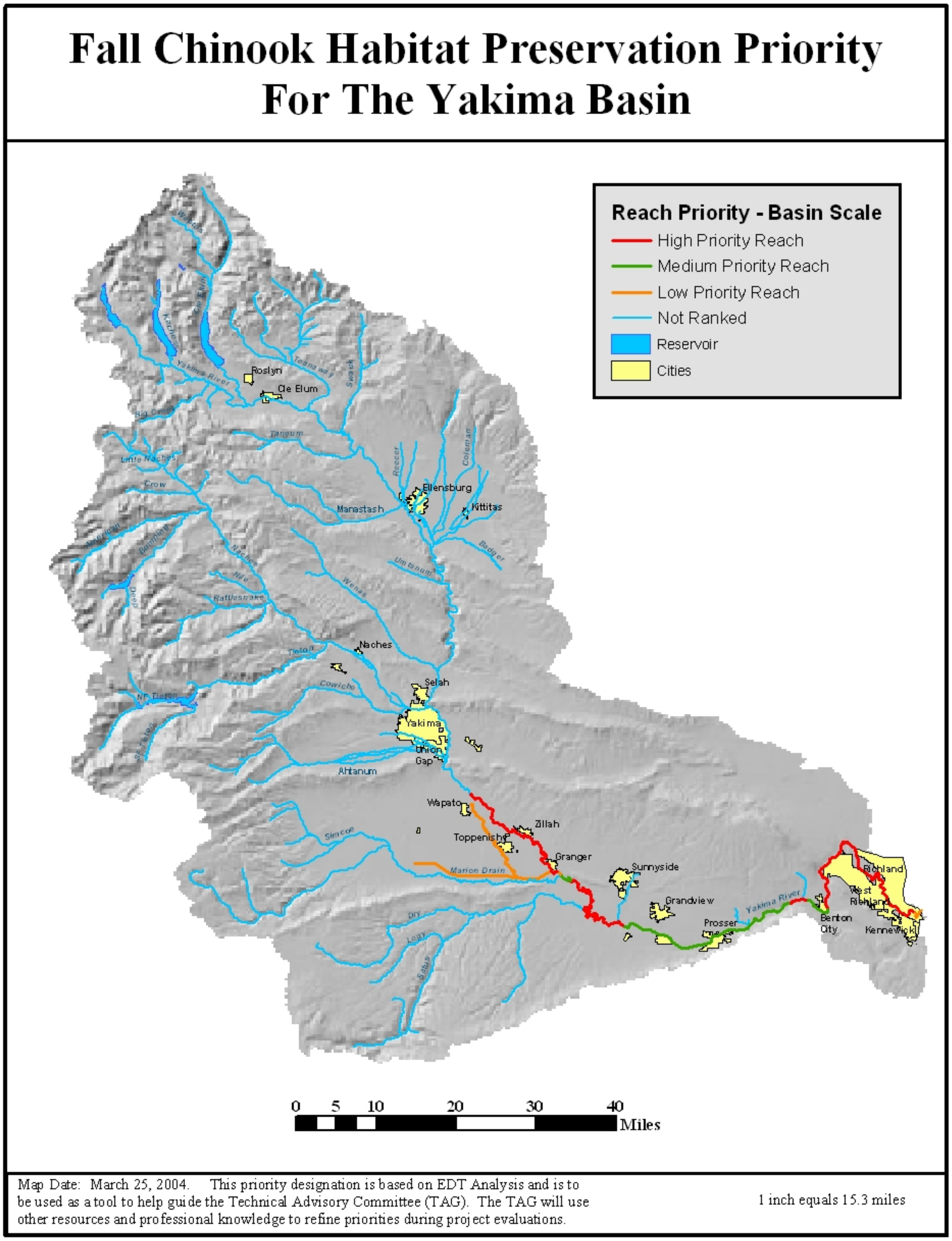
Map 5. Spring chinook habitat preservation priority guidance.



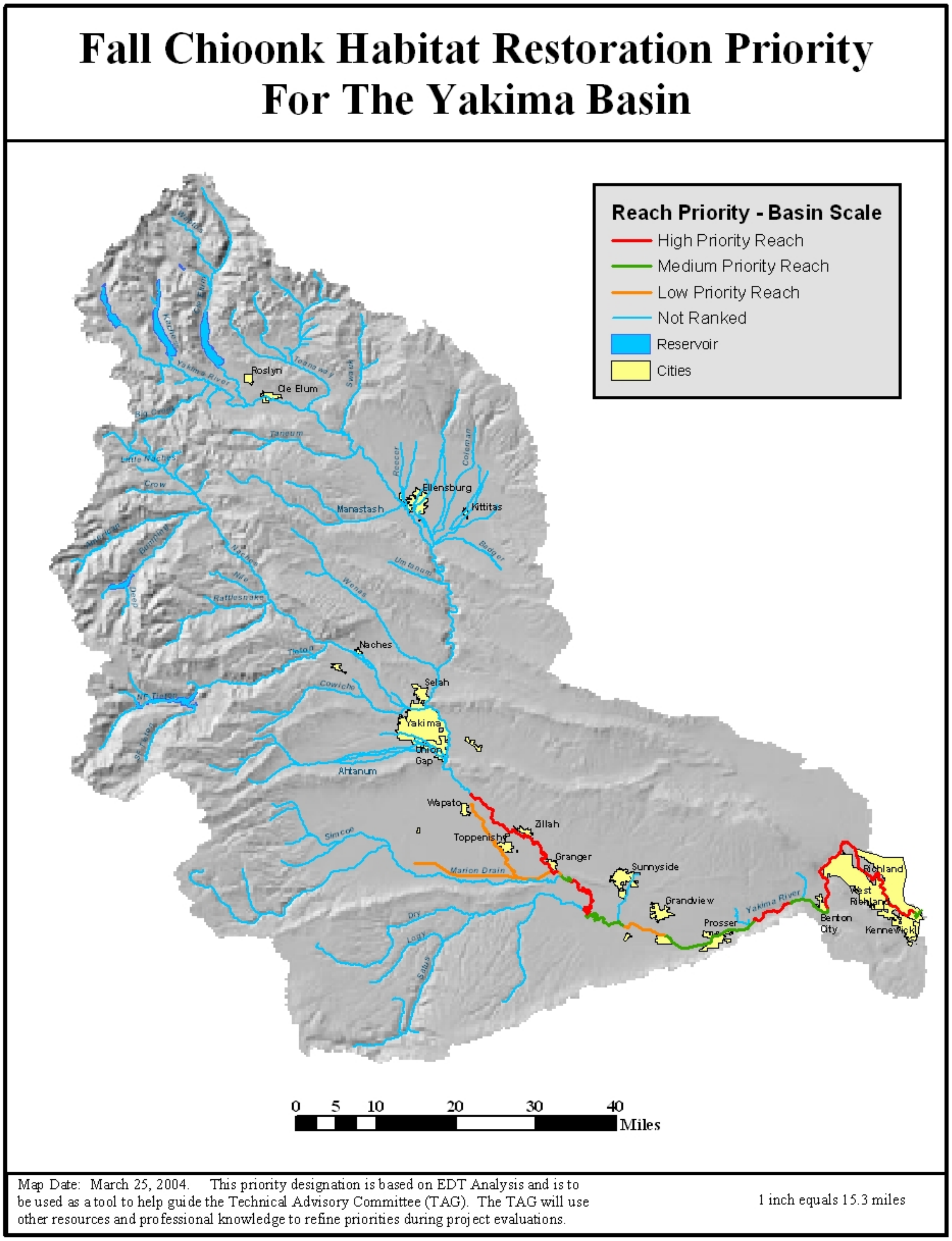
Map 6. Spring chinook habitat restoration priority guidance.



Map 7. Fall chinook habitat preservation priority guidance.

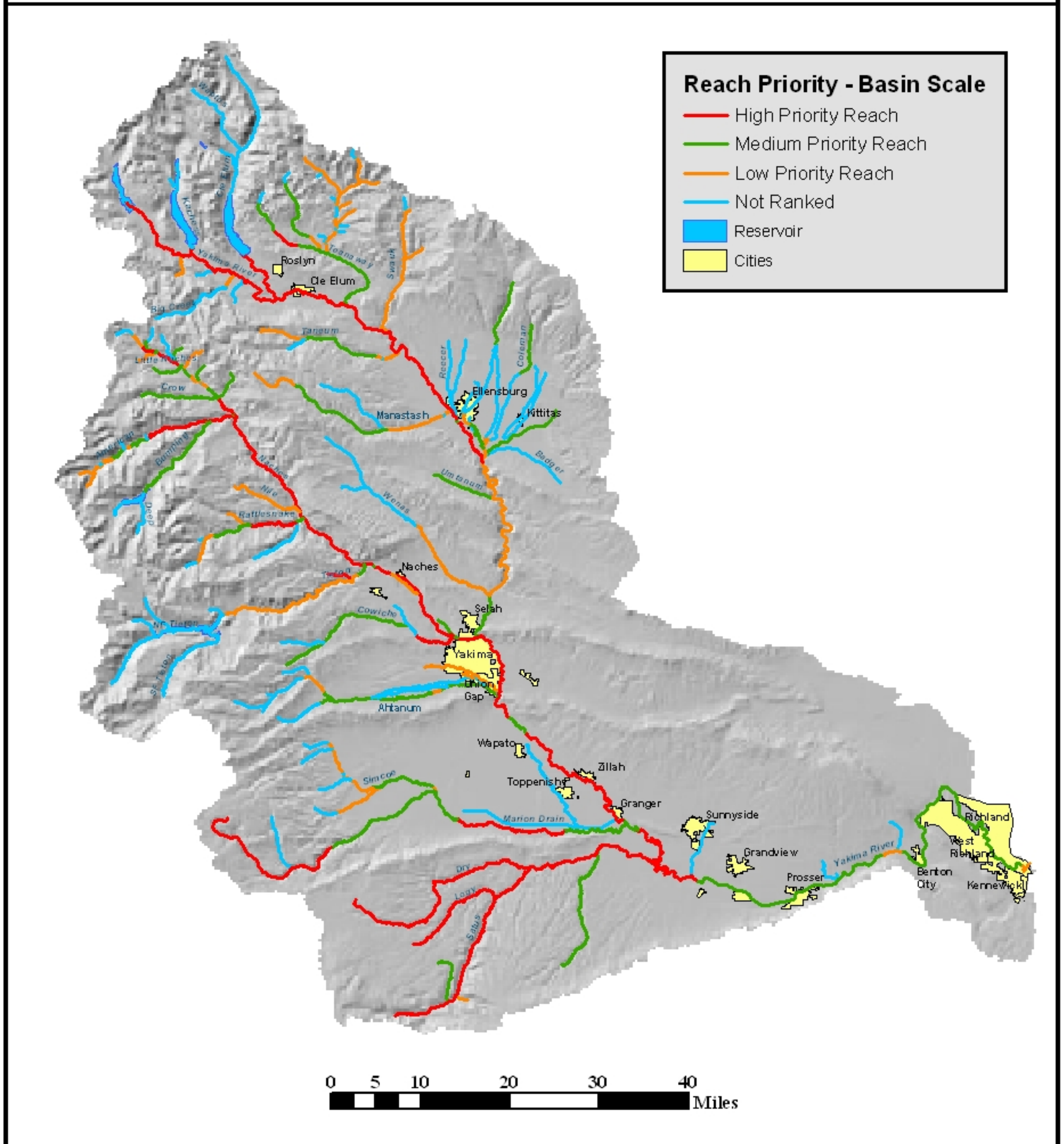


Map 8. Fall chinook habitat restoration priority guidance.



Map 9. Coho habitat preservation priority guidance.

Coho Habitat Preservation Priority
For The Yakima Basin

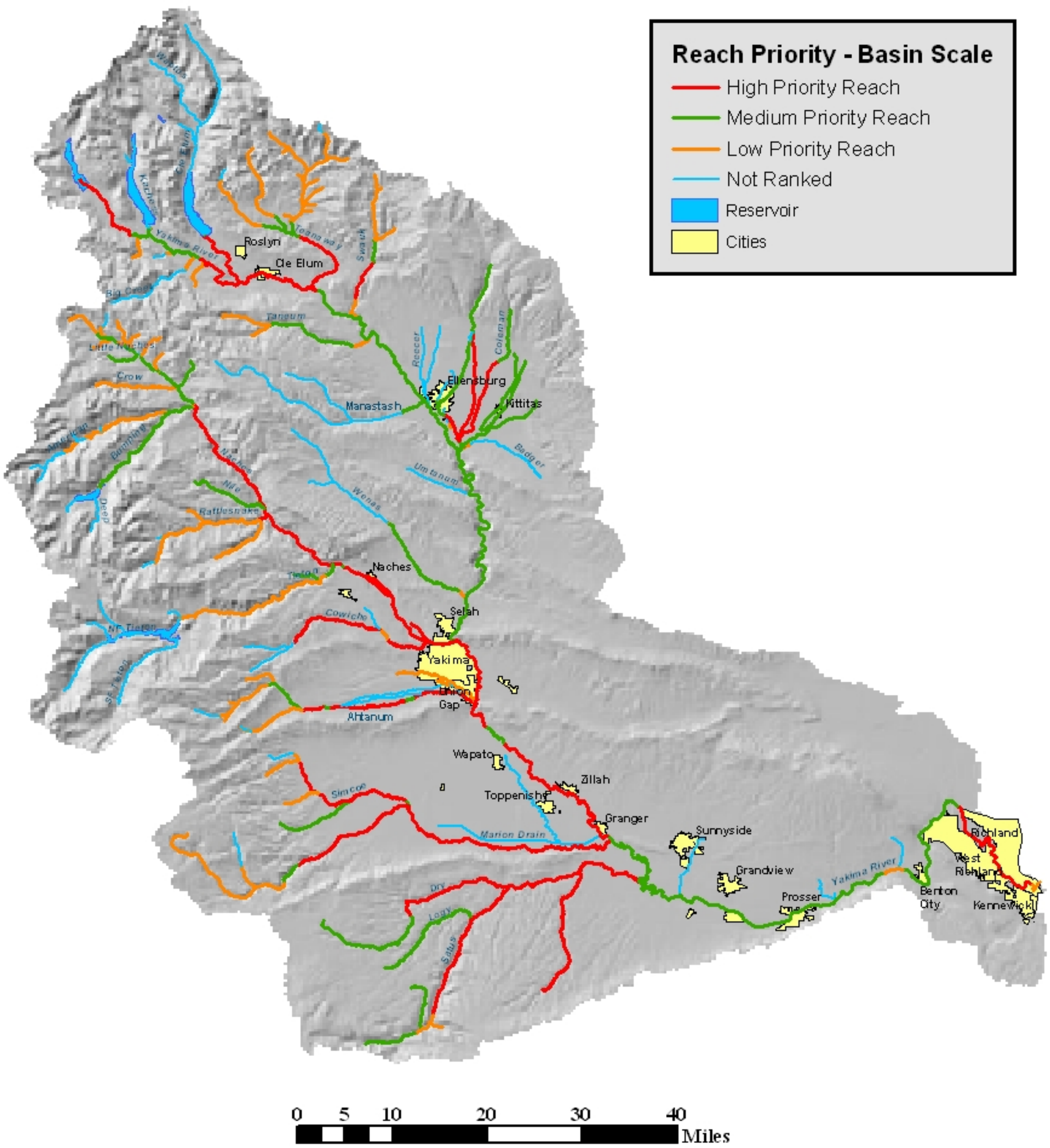


Map Date: March 25, 2004. This priority designation is based on EDT Analysis and is to be used as a tool to help guide the Technical Advisory Committee (TAG). The TAG will use other resources and professional knowledge to refine priorities during project evaluations.

1 inch equals 15.3 miles

Map 10. Coho habitat restoration priority guidance.

Coho Habitat Restoration Priority For The Yakima Basin



Map Date: March 25, 2004. This priority designation is based on EDT Analysis and is to be used as a tool to help guide the Technical Advisory Committee (TAG). The TAG will use other resources and professional knowledge to refine priorities during project evaluations.

1 inch equals 15.3 miles

APPENDIX C:

ACTION PRIORITY BY REACH OR STREAM

APPENDIX C: ACTION PRIORITY BY REACH OR STREAM

Action priorities are based on EDT analysis and are to be used as a tool to help guide Project Proponents, the Technical Advisory Group (TAG), the Citizen Committee, and the Board. This is a static list of priorities that will be updated as conditions change and when new information determines a change in priorities is needed. The action priorities listed for each tributary is not necessarily in priority order but does provide the actions that are the most important to recover suitable habitat within the tributary. The TAG will use other resources and professional knowledge to refine priorities during project evaluations as described in the main body of this strategic plan.

		Limiting Factors				
Watershed	**Stream Name**	**1**	**2**	**3**	**4**	**5**
Ahtanum	**Ahtanum Creek**	Max Temperature	Low Flow	Screening & Passage	Riparian / LWD	Confinement
	Bachelor Creek	Screening & Passage	Max Temperature	Low Flow Summer	Riparian / LWD	Hyporheic Discontinuity
	Foundation Creek	Fine Sediment	Riparian / LWD	Confinement	Bed Scour Depth	
	MF Ahtanum	Fine Sediment	Riparian / LWD	Bed Scour Depth	Confinement	
	Nasty Creek	Fine Sediment	Natural Confinement	Riparian / LWD		
	NF Ahtanum	Fine Sediment	Riparian / LWD	Confinement	Bed Scour Depth	
	SF Ahtanum	Fine Sediment	Max Temperature	Riparian / LWD	Screening & Passage	
	Spring Branch Cr	LWD Deficiency	Confinement	Fine Sediment	Max Temperature	Riparian Degradation
American	**American R**	Carcass Deficiency	Riparian / LWD	Non-Native Fish Spp	Bed Scour Depth	
	Miner Cr.	Carcass Deficiency	LWD Deficiency			
	Morse Cr.	Fine Sediment	Carcass Deficiency	LWD Deficiency	Embedded	
	Bumping R	Fine Sediment	Max Temperature	Non-Native Fish Spp	LWD Deficiency	Low Flow Winter
	Deep Cr	Fine Sediment	Carcass Deficiency	Embedded		

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	Kettle Creek	Carcass Deficiency	Fine Sediment	LWD Deficiency	Non-Native Fish Spp	
	Rainer Fork	Carcass Deficiency	Non-Native Fish Spp			
	Union Cr.	Carcass Deficiency				
Cle Elum	**Cle Elum River**	Riparian / LWD	Carcass Deficiency	Riparian Degradation	Non-Native Fish Spp	Flow
	Waptus River	Carcass Deficiency	Riparian / LWD	Non-Native Fish Spp		
	Cooper River	Riparian / LWD	Carcass Deficiency	Confinement		
Cowiche	**Cowiche Cr**	Screening & Passage	Flow	Fine Sediment	Riparian / LWD	Max Temperature
	Cowiche Cr SF	Screening & Passage	Flow	Max Temperature	Riparian / LWD	Fine Sediment
	NF Cowiche Cr	Fine Sediment	Riparian / LWD	Max Temperature	Screening & Passage	Flow
	Reynold's Cr.	Max Temperature	Confinement	Fine Sediment	Riparian / LWD	
Currier	**Currier Creek**	Fine Sediment	Max Temperature	Confinement	Riparian / LWD	Flow
	Reecer Creek	Max Temperature	Fine Sediment	Riparian / LWD	Confinement	Flow
Greenwater	**Pyramid Creek**	Fine Sediment	Max Temperature	Riparian Degradation	Low Flow	
Kachess	**Kachess River**	Riparian / LWD	Carcass Deficiency	Fine Sediment	Low Flow	
Little Naches	**Bear Cr**	Max Temperature	Fine Sediment	LWD Deficiency	Low Flow	Confinement
	Blowout Cr.	Fine Sediment	Bed Scour Depth	Riparian / LWD	Max Temperature	
	Crow Cr.	Fine Sediment	Max Temperature	Low Flow	Carcass Deficiency	
	Little Naches	Fine Sediment	Riparian / LWD	Max Temperature	Carcass Deficiency	Confinement
	NF Little Naches	Fine Sediment	Riparian / LWD	Max Temperature	Carcass Deficiency	Low Flow

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	SF Little Naches	Carcass Deficiency	Flashiness	High Flow	Low Flow	
	Matthew Cr.	Bed Scour Depth	Fine Sediment	Riparian / LWD	Low Flow	
	Pileup Cr.	Bed Scour Depth	Fine Sediment	Low Flow	LWD Deficiency	
	Quartz Cr.	Fine Sediment	Bed Scour Depth	Low Flow	Embedded	
Lower Yakima	**Yakima River 1 A - 1F**	Max Temperature	Water Quality	Predation & Comp.	Hyporheic Discontinuity	
	Yakima R. 2 A - 2E	Max Temperature	Water Quality	Predation & Comp.	LWD Deficiency	Hyporheic Discontinuity
	Yakima R.-3	Max Temperature	Predation Risk	Fine Sediment	Predation & Comp.	
	Yakima R.-4	Max Temperature	Fine Sediment	Predation & Comp.	Water Quality	LWD Deficiency
	Yakima R.-5	Riparian / LWD	Max Temperature	Predation & Comp.	Fine Sediment	
Manastash	**Manastash Creek**	Passage & Screening	Max Temperature	Low Flow	Riparian / LWD	Confinement
	NF Manastash Cr.	Fine Sediment	Riparian / LWD	Max Temperature	Low Flow	Confinement
	SF Manastash	Passage & Screening	Fine Sediment	Riparian / LWD	Max Temperature	Low Flow
Middle Yakima	**Yakima R. 6**	Max Temperature	Fine Sediment	Predation & Comp.	Confinement	Hyporheic Discontinuity
	Yakima R.-7	LWD Deficiency	Fine Sediment	Max Temperature	Confinement	
	Yakima R.-8	LWD Deficiency	Fine Sediment	Max Temperature	Predation & Comp.	
Naches	**Buckskin Slough**	Fine Sediment	Riparian / LWD	Confinement	Max Temperature	
	Naches R	Max Temperature	Riparian / LWD	Confinement	Fine Sediment	Flow
	S Naches Channel	Screening	Max Temperature	Riparian / LWD	Confinement	Fine Sediment
Nile	**Nile Cr.**	Max Temperature	Fine Sediment	Hatchery Fish	Carcass Deficiency	Low Flow

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
Rattlesnake	**Hindoo Cr.**	Fine Sediment	Carcass Deficiency			
	Little Rattlesnake Cr.	Max Temperature	Fine Sediment	Confinement	LWD Deficiency	Turbidity
	Rattlesnake Cr	Max Temperature	Fine Sediment	Hyporheic Discontinuity	Low Flow	Carcass Deficiency
Satus	**Bull Creek**	Max Temperature	Riparian / LWD	Low Flow	Fine Sediment	
	Dry Creek	Max Temperature	Riparian / LWD	Fine Sediment	Low Flow	Confinement
	Kusshi Creek	Max Temperature	Riparian / LWD	Low Flow	Confinement	
	Logy Creek	Fine Sediment	Max Temperature	Riparian / LWD	Confinement	
	Mule Dry Creek	Low Flow	Max Temperature	Riparian / LWD	Confinement	
	Satus Creek	Max Temperature	Riparian / LWD	Fine Sediment	Confinement	Low Flow
	Wilson Charlie Cr	Max Temperature	Riparian / LWD	Low Flow	Predation Risk	
Swauk	**Iron Creek.**	Fine Sediment	Max Temperature	LWD Deficiency	Confinement	
	Williams Creek	Fine Sediment	Riparian / LWD	Confinement	Bed Scour Depth	Low Flow
	Swauk Creek	Screening	Fine Sediment	Max Temperature	Riparian / LWD	Low Flow
	Taneum Creek	Max Temperature	Riparian / LWD	Fine Sediment	Confinement	Carcass Deficiency
	Taneum Creek SF	Fine Sediment	Max Temperature	Confinement	Riparian / LWD	
Teanaway	**Bear Ck (Teanaway)**	Fine Sediment	Max Temperature	Confinement	LWD Deficiency	Carcass Deficiency
	Dickey Creek	Max Temperature	Confinement	Riparian / LWD	Fine Sediment	
	Indian Ck (Teanaway)	Max Temperature	Confinement	Fine Sediment	LWD Deficiency	
	Jack Creek.	Max Temperature	Fine Sediment	Confinement	LWD Deficiency	

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	Johnson Creek.	Fine Sediment	LWD Deficiency	Max Temperature	Carcass Deficiency	Confinement
	Jungle Creek.	Max Temperature	Confinement	Riparian / LWD	Hatchery Fish	
	Lick Creek	Max Temperature	Confinement	Fine Sediment	LWD Deficiency	
	Middle Creek	Max Temperature	Confinement	Riparian / LWD	Fine Sediment	
	Stafford Creek	Riparian / LWD	Fine Sediment	Confinement	Low Flow	Carcass Deficiency
	Teanaway R MF	Max Temperature	Fine Sediment	Carcass Deficiency	Riparian / LWD	Confinement
	Teanaway R NF	Max Temperature	LWD Deficiency	Fine Sediment	Confinement	Carcass Deficiency
	Teanaway R WF	Max Temperature	Carcass Deficiency	Riparian / LWD	Fine Sediment	
	Teanaway River	Max Temperature	LWD Deficiency	Flow	Predation Risk	Confinement
Tieton	**Clear Cr**	Carcass Deficiency	Non-Native Fish Spp			
	Indian Cr	Fine Sediment	Bed Scour Depth	LWD Deficiency	Carcass Deficiency	Non-Native Fish Spp
	Oak Cr.	Max Temperature	Hatchery Fish	Carcass Deficiency	LWD Deficiency	Confinement
	Tieton R	Riparian / LWD	Confinement	Fine Sediment	Low Flow	
	Tieton R NF	Carcass Deficiency	Max Temperature	Fine Sediment	Riparian / LWD	Confinement
	Tieton R SF	Passage	Fine Sediment	Max Temperature	Riparian / LWD	Carcass Deficiency
	Wildcat Cr.	Fine Sediment	Riparian / LWD	Carcass Deficiency		
Toppenish	**Agency Creek**	Max Temperature	Fine Sediment	Riparian / LWD	Confinement	Low Flow
	NF Simcoe Creek	Passage	Max Temperature	Fine Sediment	Low Flow	Riparian / LWD
	NF Toppenish Creek	Fine Sediment	Max Temperature	Confinement	Low Flow	Riparian / LWD

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	Simcoe Creek	Max Temperature	Riparian / LWD	Fine Sediment	Confinment	Hyporheic Discontinuity
	SF Simcoe Creek	Passage	Max Temperature	Riparian / LWD	Low Flow	Hyporheic Discontinuity
	SF Toppenish Creek	Carcass Deficiency				
	Toppenish Creek	Max Temperature	Riparian / LWD	Fine Sediment	Hyporheic Discontinuity	Low flow
	Wahtum Creek	Fine Sediment	Max Temperature	Riparian / LWD	Low Flow	
	Willy Dick Canyon	Fine Sediment	Max Temperature	Riparian / LWD	Flow	Carcass Deficiency
Umptanum	**Umtanum Creek**	Max Temperature	Fine Sediment	Riparian / LWD	LWD Deficiency	Confinment
Upper Yakima	**Big Creek**	Passage & Screening	Fine Sediment	Riparian / LWD	Max Temperature	Flow
	Gold Creek	Fine Sediment	Max Temperature	Carcass Deficiency	LWD Deficiency	Minimum Width
	Little Creek	Fine Sediment	Max Temperature	Riparian / LWD	Carcass Deficiency	Hyporheic Discontinuity
	Tucker Creek	Fine Sediment	Carcass Deficiency	Riparian Degradation	Low Flow	
	Yakima R.-9B	Max Temperature	LWD Deficiency	Confinement	Hyporheic Discontinuity	Hatchery Fish
	Yakima R.-10	LWD Deficiency	Max Temperature	Hyporheic Discontinuity	Fine Sediment	
	Yakima 11A - 11C	Fine Sediment	LWD Deficiency	Max Temperature	Confinement	Carcass Deficiency
	Yakima R.-12	Fine Sediment	LWD Deficiency	Confinement	Max Temperature	
	Yakima R. 13A - 13B	Riparian / LWD	Fine Sediment	Max Temperature	Carcass Deficiency	
	Yakima R.-14	LWD Deficiency	Fine Sediment	Max Temperature	Natural Confinement	
	Yakima R.-15	Fine Sediment	LWD Deficiency	Confinement	Bed Scour Depth	
	Yakima R.-16	Fine Sediment	Carcass Deficiency	Riparian / LWD		

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	Yakima R. 17A - 17B	Fine Sediment	Riparian / LWD	Low Flow	Max Temperature	Carcass Deficiency
	Yakima R.-18	Fine Sediment	Low Flow	Carcass Deficiency	Riparian Degradation	Pathogens
	Yakima R.-19B	Gradient	Fine Sediment	Confinement	LWD Deficiency	Hyporheic Discontinuity
	Yakima R.-20	Fine Sediment	Riparian / LWD	Confinement	Carcass Deficiency	
	Yakima R.-21	Carcass Deficiency	Max Temperature	Fine Sediment	Non-Native Fish Spp	
Wenas	**Wenas Creek**	Max Temperature	Screening & Passage	Low Flow	Riparian / LWD	Fine Sediment
	Wenas Creek NF	Max Temperature	Confinement	Fine Sediment	Riparian / LWD	
Wide Hollow	**Wide Hollow Creek**	Screening & Passage	Max Temperature	Confinement	Fine Sediment	Water Quality
Wilson	**Badger Creek**	Fine Sediment	Max Temperature	Confinement	Riparian / LWD	Screening & Passage
	Bull Ditch	Confinement	Riparian / LWD	Fine Sediment		
	Cabin Creek	Max Temperature	Riparian / LWD	Low Flow	Confinement	
	Caribou Creek	Fine Sediment	Max Temperature	Confinement	Riparian / LWD	Flow
	Cherry Creek	Fine Sediment	Max Temperature	Screening & Passage	Confinement	Riparian / LWD
	Coleman Creek	Max Temperature	Fine Sediment	Screening & Passage	Confinement	Riparian / LWD
	Cooke Creek	Fine Sediment	Max Temperature	Screening & Passage	Confinement	Riparian / LWD
	East Branch Wilson Creek	Fine Sediment	Riparian / LWD	Max Temperature	Screening & Passage	Flow
	Lower Naneum Creek	Max Temperature	Fine Sediment	Screening & Passage	Confinement	Riparian / LWD
	Mercer Creek	Fine Sediment	Confinement	Riparian / LWD	Screening & Passage	
	Park Creek	Fine Sediment	Max Temperature	Confinement	Riparian / LWD	Screening & Passage

Watershed	Stream Name	Limiting Factors 1	2	3	4	5
	Taneum Creek NF	Fine Sediment	Max Temperature	Carcass Deficiency	Riparian / LWD	
	Upper Naneum Creek	Fine Sediment	Max Temperature	Hyporheic Discontinuity	LWD Deficiency	
	Wilson Creek	Screening & Passage	Fine Sediment	Confinement	Max Temperature	Riparian / LWD

APPENDIX D:

DRAFT WATERSHED SUMMARY PLAN FOR COWICHE CREEK

APPENDIX D: DRAFT WATERSHED SUMMARY PLAN FOR COWICHE CREEK

Watershed summary plans will be developed over time and will be reviewed and approved by the Technical Advisory Group. Over time this guidance will replace appendix C. Below is an example of a watershed plan for Cowiche Creek.

COWICHE CREEK ASSESSMENT AND INTERIM STRATEGY	
Native species: Steelhead, chinook (rearing), coho (extirpated and reintroduced), resident rainbow trout, westslope cutthroat trout, and possible bull trout.	Drainage area: ###,000 acres
STATUS: High priority for passage restoration for steelhead	
SIGNIFICANT SUBWATERSHEDS: South Fork Cowiche, Reynolds, and North Fork Cowiche (restoration and protection efforts should be focused on SF Cowiche and Reynolds Creeks)	

ACTORS AFFECTING HABITAT CONDITION: ▪ Passage give description ▪ Screening needs give description ▪ Low instream flows in mid and lower reaches of Cowiche and SF Cowiche. ▪ Dikes and riprapped in places resulting in a highly simplified channel. ▪ LWD levels and recruitment potential below desired amounts due to riparian degradation in mid and lower reaches of Cowiche and SF Cowiche. ▪ High temperature associated with low flows and degraded riparian and floodplain. ▪ Other water quality issues - 303(d) ▪ Beaver activity is limited where riparian vegetation is cleared in mid and lower reaches of Cowiche and SF Cowiche ▪ Some road placement constricts the stream channel & increases sediment input
LEVEL OF CERTAINTY: ▪ Field surveys by YTAHP have been conducted. Surveys identified barriers, screening needs, and riparian habitat condition. This survey provides a high confidence level in assessment of limiting factors for restoration projects and assessment of habitat function for protection projects. ▪ Some uncertainty exists on relation of instream flows and fish habitat.

RECOMMENDATIONS (IN PRIORITY):

1. Remove passage barriers
2. Address screening needs
3. Improve instream flow conditions in the mid and lower reaches of Cowiche and the SF Cowiche.
4. Protect and restore access to floodplains, side channels, and riparian areas
5. Reduce road densities, improve roads, and relocate problem roads to reduce their effects on hydrology and instream sediment conditions.
6. Monitor baseline water quality parameters throughout the watershed.

PROJECTS PROPOSED, FUNDED, AND IMPLEMENTED:

- Cowiche Creek barrier and screening project – will provide passage and screening on two irrigation diversion (funded by SRFB – implementation is waiting for irrigation efficiency opportunities to be evaluated)
- Snow Mt Ranch restoration and protection project – will restore passage, improve instream flows, and protect quality habitat (proposed and being considered by SRFB)
- Yakima Tributary Access and Habitat Program (YTAHP) – will survey passage and screening needs, survey habitat conditions, and seek funding to address passage, screening, and habitat needs (funded by BPA – surveys on Cowiche Creek are nearly complete and proposals are being developed to seek funding)

MEANS TO MEASURE EFFECTIVENESS:

- Monitor passage at fixed barrier sites and throughout the Cowiche and SF Cowiche
- Conduct spawning survey for both steelhead and coho yearly.
- Monitor screening effectiveness
- Monitor stream flows at fixed stations year-round.
- Monitor stream channel sinuosity, width/depth ratio, riparian coverage from fixed stations and with remote sensing on a periodic schedule (i.e., every 3 or 5 years).
- Monitor Road improvements and relocation efforts.
- Monitor selected water quality parameters (temperature, turbidity, etc.) at fixed stations.

APPENDIX E

STOCK STATUS SUMMARY

APPENDIX E: Stock Status summary

Bull Trout

The Yakima River population of bull trout is considered a distinct stock within the threatened Columbia River Distinct Population Segment (DPS). The USFWS (Service) listed bull trout in the Columbia River Distinct Population Segment, which includes the Yakima River Basin, as threatened on June 10, 1998 (63 FR. 31647; June 10, 1998). The status of Yakima River bull trout is considered critical based on ESA listings and chronically low numbers of fish encounters (WDFW and WWTIT 1994, Busby et al. 1998).

Bull trout have been reported to use habitat in 67 streams of the Yakima watershed, although few areas have been consistently indexed for use (http://query.streamnet.org/Request.cfm?cmd=BuildPicklist&PicklistItem=DataCategory&Steps=Query,MainStates=Yes&Required=Species,ColumbiaSubbasin2001&ColumbiaSubbasin2001=48&Species=14). Native bull trout inhabiting the upper mainstem are believed to be fish that have outmigrated from the upper river tributaries as juveniles or were flushed out of headwater reservoirs. The upper mainstem Yakima River fluvial population is comprised of fish that inhabit the mainstem between Rosa Dam and the Cle Elum, Kachess, and Keechelus dams. Isolated resident populations are recognized within the North Fork Teanaway River, Ahtanum Creek, Bumping Lake, Cle Elum Lake, Kachess Lake, and Keechelus Lake (Busby et al. 1998). These stocks are considered at risk of stochastic extirpation due to their inability to be refounded, their single life-history form, their low abundance, and their limited spawning area (Busby et al. 1998). In addition to these stocks, the Service recognizes sub-populations in the Naches River and Rimrock Lake Basin, which are consistent with the stocks identified by WDFW (1998). The sub-populations in Rimrock Lake (south fork Tieton River/Bear Creek and Indian Creek)are considered stable while the subpopulations in the Naches River (Rattlesnake Creek, American River and Crow Creek) are classified as unknown (USFWS 1998). Construction of dams without fish passages, unscreened irrigation diversions, and increased temperatures caused by development and diking along shorelines are considered the major factors responsible for the critical status of this species in the Yakima watershed. Additional threats facing bull trout in the basin include agricultural practices and associated water withdrawal, forestry practices, grazing, roads, mining, illegal harvest, non-native species, and residential development (USFWS 2002).

Historically, bull trout were more widely distributed in the Yakima Basin than is currently observed. Five of the subpopulations (Bumping Lake, Rimrock Lake, Cle Elum Lake, Kachess lake, and Keechelus Lake) are isolated behind impassable storage dams which have fragmented habitat and eliminated migration opportunities. Two others (North Fork Teanaway and Ahtanum Creek) are seasonally isolated by low flow conditions and thermal barriers. The Service considers isolation by dams to be a major threat to bull trout in the Yakima Basin. Survey data from 2000 identified only 4 bull trout (Anderson 2000, personal communication) distributed over 2 redds in the headwaters of the mainstem below Easton; however, this index area was not adequately monitored so other fish may have been overlooked. Combining the data from all other headwater areas where bull trout were indexed in 2000, a total of 711 bull trout redds were recorded.

Steelhead Trout

Summer-run Yakima River steelhead are a distinct stock based on their geographical isolation. No winter-run steelhead utilize the Yakima River. Yakima River steelhead are part of the mid-Columbia ESU, and are hence considered 'threatened' under the ESA. The population status of Yakima steelhead is considered depressed based on fish passage counts at Prosser Dam, and on sport/Tribal estimates (WDFW and WWTIT 1994). Native steelhead escapement into the Yakima was below the 2,000 fish goal for 11 out of the 12 years between 1980 and 1992 (WDFW and WWTIT 1994). Historically, the Yakima River produced an estimated 80,000 to 100,000 adult steelhead annually, but the total annual run size is now around 1,700 fish. In the past five years, the escapement reaching the upper Yakima basin (above Rosa Dam) has not exceeded 125 fish.

At the Prosser diversion dam, which is downstream of any of the significant mainstem or tributary spawning streams, native steelhead adult escapement to the Yakima River averaged 1335 fish between 1984 and 1999. Between 1983 and 1995 an average of 55, 532 native smolts were counted at the Prosser diversion. These data would suggest a smolt-to-adult survival rating of approximately 2.4 percent. Tributaries to the middle basin such as Satus Creek and Toppenish Creek consistently support native spawning populations. For example, between 1988 and1995 an average of 266 native steelhead redds have been counted in Satus Creek. In addition to the depressed native steelhead stock, the co-managers of the basin, the Yakama Nation and WDFW have released hatchery-origin steelhead into the basin for many years. An accurate estimate of annual releases of hatchery-bred smolts was not found over this same period; however, between 1983 and 1995 an average of 12,469 hatchery smolts were counted at the Prosser diversion. Between 1987 and 1999 the adult return of hatchery steelhead counted at the Prosser diversion has averaged 2,618 fish. Based on these data, the smolt-to adult survival of hatchery steelhead in the basin is approximately 20.9 percent. This return is exceptional and likely reflects a gross underestimation of the hatchery releases of steelhead smolts.

The combined sport harvest of native steelhead in the Yakima and Naches basins from 1986 to 1994 averaged 13 fish. The freshwater sport harvest of hatchery steelhead in the Yakima basin, including the Naches River, averaged 164 fish from 1986 to 1994. The freshwater sport harvest of hatchery steelhead in the Yakima basin, including the Naches River, averaged 164 fish from 1986 to 1994. (Stream Net: http://query.streamnet.org/Request.cfm?cmd=BuildPicklist&PicklistItem=DataCategory&Steps=Query,MainStates=Yes&Required=Species,ColumbiaSubbasin2001&ColumbiaSubbasin2001=48&Species=3&Run=2).

Summer-run steelhead spend a significant portion of their life cycle in freshwater (up to 3 years) and are therefore particularly susceptible to alterations in their rearing habitat quality. Steelhead have been reported to use habitat in 82 of the streams in the basin, although not all areas have been indexed (Stream Net: http://query.streamnet.org/Request.cfm?cmd=BuildPicklist&PicklistItem=DataCategory&Steps=Query,MainStates=Yes&Required=Species,ColumbiaSubbasin2001&ColumbiaSubbasin2001=48&Species=3&Run=2). The species' use of rearing habitat in the lower mainstem of the Yakima River is largely compromised by the prevalence of non-native predatory fish and poor water quality (high summer temperatures primarily). Flow regulation for irrigation purposes results in peak flows in the summer in the upper and middle mainstem, and lower than normal flows in the lower mainstem (downstream of major irrigation diversions at Roza and Sunnyside). This flow regulation may be inhibiting the establishment of significant spawning populations in the upper mainstem and major regulated tributaries (e.g., Naches, Tieton, American) by causing redd scour and/or reducing post-emergent survival of fry. There may also be significant introgression with resident rainbow introduced in the basin. The species has also been greatly affected by unscreened irrigation diversions. Steelhead strongholds appear to be in those tributaries whose discharge is not regulated by headwater impoundments (e.g., Toppenish Creek). This observation supports the conclusion that the manner of flow regulation currently practiced is contrary to the production of this species across the basin. Thus, the principal loss in production potential for this species likely occurs prior to smoltification, from egg, sac-fry and fry mortality.

Coho salmon

Wild stocks of coho salmon *Oncorhynchus kisutch* were once widely distributed within the Columbia River Basin, extending upriver into the Wenatchee and Methow systems (Fulton 1970; Chapman 1986). However, coho salmon probably went extinct in the Yakima River in the early 1980s (Yakama Nation 1997 *as cited* in Dunnigan 2000). Efforts to restore coho within the Yakima basin rely largely upon releases of hatchery coho that originated from Little White Salmon river stock, and are cultured primarily in the Cle Elum and Prosser hatcheries run by the Yakama Nation. Since 1985 the Yakama Nation has released 85,000 to 1.4 million coho smolts. Prior to 1995, the primary purpose of these releases was harvest augmentation; after 1995, the primary purpose became a test of the feasibility of re-establishing natural production. The coho stock status is ever changing as a result of the Yakama Nation's hatchery supplementation efforts.

Coho salmon, like steelhead, spend one to two years of their life cycle in freshwater, generally rearing in slow moving side channels, oxbows, and pools with sufficient cover. Therefore, like steelhead, the manipulation of the hydrograph from reservoir releases that result in peak summer flows in the upper and middle mainstem is probably detrimental to this species as well as steelhead. Limited refuge from the high velocities created restricts the carrying capacity for this species that might otherwise be available in the areas affected by flow regulation. Coho smolts may outmigrate and nearly any time of the year, although spring is most common. Improvements to water quality in the lower basin would likely improve outmigrant survival of this species.

Chinook salmon

Chinook salmon in the Yakima basin are not currently listed as threatened or endangered under the ESA, although numbers are substantially depressed relative to historic population figures. Historical abundance of chinook salmon in the Yakima basin probably ranged from about 38,000 to 100,000 fish. These figures are based on two documents: Kreeger and McNeil, 1993 and the Yakima Subbasin Summary (Anonymous, 1990). Kreeger and McNeil (1993) argue that 3.8% of the historical run of salmon and steelhead in the entire Columbia Basin should have been produced by the Yakima Basin because it represented 3.8% of the historical Columbia Basin watershed. On the basis of a moving average of peak historical Columbia River catch data and assumed exploitation rates, they estimate that the historical run of summer chinook, and of spring and fall chinook combined, was on the order of 2.7 million and 2.0 million fish, respectively. If 3.8% of all spring and fall chinook entered the Yakima, the historical run to the Yakima Basin would have been 76,400.

It is often assumed that the historical summer chinook run was twice as large as either the spring or the fall chinook runs, which were approximately equal in size. If this held true for the Yakima, the historical run of fall chinook was about 38,000 fish. The Yakima Subbasin Summary bases its considerably higher estimate on the amount of suitable spawning habitat for chinook historically present in the Yakima Basin, and the area taken up by a typical chinook redd. This approach yields estimates of ~200,000 for spring chinook and ~200,000 for summer and fall chinook combined. If summer and fall chinook, whose spawning distributions overlapped broadly, were assumed equally abundant, the historical abundance of fall chinook would have been on the order of 100,000 fish.

Currently the Yakima River spring chinook are indexed regularly from 50 streams in the basin. From 1941 to 1994 the spring run of chinook has ranged from approximately 854 fish to 12,665, and the fall run has averaged around 2,400 fish (Lichatowich and Mobrand 1995). Between 1983 and 2000 an average of 38 hatchery-origin and 257 naturally-produced jacks have returned through Prosser, respectively (Stream-Net: http://query.streamnet.org/Request.cfm?cmd=BuildQuery&Steps=MainStates=Yes&Required=Species,Run,ColumbiaSubbasin2001&ColumbiaSubbasin2001=48&Species=1&Run=1&DataCategory=4). Over this same period, an average of 60 hatchery-origin and 3,766 naturally-produced spring chinook adults have returned through Prosser. Over half of these fish migrate upstream past the Roza diversion to the upper mainstem to spawn. From 1959 to 2000 an average of 161,887 outmigrant spring chinook smolts have been counted at Prosser, yielding a smolt-to-adult and jack survival rating of 2.54 percent, when both hatchery and naturally-produced adult returns are combined (hatchery smolts are not generally marked). This survival rating is good, particularly considering water quality and passage conditions in the Columbia River which the fish must negotiate.

The fall run Yakima chinook primarily use the lowermost 80 miles of mainstem for spawning and rearing, and are also regularly indexed in Marion Drain, Spring and Snipes Creeks, and an unnamed tributary (stream # 1199778463247). Like the spring chinook, the current fall-run chinook population, a mixed hatchery and naturally-produced stock, shows a similar level of decline relative to historical conditions. From 1983 to 2000 the average adult return to Prosser has been 154 adults and 940 jacks. Over this same period, an average of 148,682 smolts have been counted, yielding a smolt-to-adult/jack combined survival rating of around 0.7 percent. This survival would be considered generally poor, but many fall chinook spawn below Prosser and thus survival may be improved over what is indicated from the recent data.

A return to the historical abundance of Yakima chinook stocks is not likely or expected under any recovery strategy. But a substantial increase in harvestable yields is certainly attainable and very recent returns indicate this possibility. In the spring of 2001, probably as a result of good ocean survival and increased hatchery supplementation, a sport fishery was opened for chinook for the first time in over 20 years. A total of 1,918 adult spring chinook were harvested and another 105 precocious "jack" were taken by sport fishers.

Sockeye Salmon

Sockeye salmon *(Oncorhynchuys nerka)* historically utilized Lake Cle Elum as a nursery system for their early life history stages. The species was extirpated from the watershed primarily by the impoundments created in the upper basin that prevented access to Lake Cle Elum. Several stray sockeye, presumably from the Wenatchee or Okanogan systems in the upper Columbia, are regularly counted each year at the Roza diversion dam. No estimate of historical stock size was identified in the literature. With the creation of passage conditions into headwater impoundments, the reintroduction of this species into the Yakima watershed could potentially be realized.

APPENDIX F

LIST OF ACRONYMS

APPENDIX F: LIST OF ACRONYMS

Acronyms

CAG Citizen Advisory Group

DBH Diameter Breast Height

DO Dissolved Oxygen

EDT Ecosystem Diagnosis and Treatment

ESA Endangered Species Act

GIS Geographic Information System

LFA Limiting Factors Analyses

LWD Large Woody Debris

NOAA National Oceanic & Atmosphere Administration
SRFB Salmon Recovery Funding Board

SRP Scoring Rationale and Protocol

TAG Technical Advisory Group

USFWS United States Fish and Wildlife Service

WCC Washington Conservation Commission

WDFW Washington Department of Fish and Wildlife

WSP Watershed Plan

WRIA Water Resource Inventory Area

YKFP Yakima Klickitat Fisheries Program

YRSRB Yakima River Basin Salmon Recovery Board

YTAHP Yakima Tributary Access and Habitat Program