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Review of Ecological Restoration Strategies for Lapwai and Big Canyon Creeks

Projects
Protect & Restore Lapwai Creek, 199901700
Lapwai Cr. Anadromous Habitat, 200207000
Protect & Restore Big Canyon Creek Watershed, 199901600
Big Canyon Fish Habitat, 199901500

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Review of Ecological Restoration Strategies for Lapwai and Big Canyon Creeks

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Review Background

At the Council's October 23, 2007 request, the ISRP reviewed documents supporting the Nez Perce Tribe (Tribe) and Nez Perce Soil and Water Conservation District's (District) projects in Lapwai and Big Canyon creeks. These documents are the *Strategy for the Ecological Restoration of Lapwai Creek Watershed* and *Big Canyon Creek Ecological Restoration Strategy*. These were submitted for review in response to the Council's FY 2007-09 recommendations on the Tribe's projects:

- 1999-016-00, *Protect & Restore Big Canyon Creek Watershed*
- 1999-017-00, *Protect & Restore Lapwai Creek Watershed*

And the District's projects:

- 1999-015-00, *Big Canyon Fish Habitat*
- 2002-070-00, *Lapwai Cr. Anadromous Habitat*

The Council's and Bonneville's funding decisions were to fund the projects in FY 2007 to complete reports on abundance, habitat status, and a comprehensive presentation of prioritized restoration projects and that Fiscal Year 2008 and 2009 funding for restoration actions is contingent on "favorable ISRP and Council review of a revised proposal linked to completed reports (per ISRP comments)." The ISRP's FY 2007-09 final comments (ISRP 2006-6; August 31, 2006) can found at: www.nwcouncil.org/library/isrp/isrp2006-6.htm (pages 477-481).

The ISRP understands that the Lapwai and Big Creek strategy documents constitute the project sponsors' submittal to address the Council and BPA's conditions and ISRP's previous concerns. That is, the documents in concert with the original FY 2007-09 proposals serve as justification for their proposed actions. Revised proposals were not submitted.

The October 2007 strategy documents for the Big Canyon and Lapwai Creek restoration projects were often quite similar and many of the passages shared identical language. Despite this (indeed, to some extent because of it), the ISRP finds the need to separate its comments by project location, and gives one series of comments for the set of two Lapwai Creek strategy proposals (from Tribe and District combined) and another set of comments for the two Big Canyon strategy proposals.

Summary ISRP Recommendations

For the two Lapwai Creek projects (199901700 - Protect & Restore Lapwai Creek Watershed; 200207000 - Lapwai Creek Anadromous Habitat) the ISRP finds that they *Meet Scientific Review Criteria (Qualified)*. The qualification is based on the need for revising the strategy document to incorporate (a) biological objects for the focal species (abundance and productivity for *O. mykiss*), (b) an evaluation of how and to what extent project actions will specifically ameliorate steelhead limiting factors by life-stage and lead to achieving abundance and productivity objectives, (c) separate prioritizations for both preservation and restoration, and (d) basic yet meaningful monitoring of stream habitat and steelhead responses to project actions. Such a revision could take the form of an addendum to the document and be reviewed prior to initiating restoration actions.

For the two Big Canyon Creek projects (199901500 - Big Canyon Fish Habitat; 199901600 - Protect & Restore Big Canyon Creek Watershed) the ISRP finds that they *Do Not Meet Scientific Criteria*. Reviewers feel the expressed goal of improving 400 stream miles to good or excellent condition is highly unrealistic. The strategy document does not attempt to identify and ameliorate the factors limiting steelhead. It does not incorporate or address the requirements of the three life stages (adult spawning, summer rearing, winter rearing) the fish spend in the watershed, and consequently there is no clear basis to conclude that improved environmental conditions that might result from restoration actions would yield demonstrable benefits. Steelhead/rainbow trout were clearly more abundant in lower Big Canyon and Little Canyon creeks than in the headwaters, and the upper watershed appeared to have few fish upon which to rebuild the population when habitat is improved. The fish distribution map shows the upper watershed to be nearly devoid of *O. mykiss*. In fact, there appears to be little surface water flowing in much of the drainage network. Furthermore, no information was given in the strategy document as to whether the fish in the upper watershed had adopted a resident rainbow trout life history or in fact were anadromous. Information from other reports documents they are resident fish. Therefore, the ISRP questions whether giving top priority to the headwaters of Big Canyon Creek will be the most effective way (if, in fact, there is any effective way) to rebuild the steelhead population. The Big Canyon Creek monitoring plan is inadequate in its present form. No monitoring program is described for the focal species. Habitat monitoring should be conducted that is sufficient to determine if work elements have achieved improved environmental conditions. In particular, the monitoring programs were inadequately described and limited to a single short paragraph in both strategy documents under the Toward the Future chapters. These paragraphs imply that effectiveness monitoring would take place after 10 years. That interval is much too long for fish populations; more frequent population assessments are needed to evaluate restoration effectiveness. Additionally, habitat assessments are needed that can show whether desired improvements are really taking place.

Lapwai Creek (1999-017-00, *Protect & Restore Lapwai Creek Watershed, and 2*002-070-00, *Lapwai Creek Anadromous Habitat)*

Project Background

FY 2007-09 Proposals
The Tribe proposed to continue actions to protect, restore, and return critical spawning and rearing habitat using a ridgetop to ridgetop approach, based on a complete watershed assessment and following the Clearwater Subbasin Management Plan. The District intended to restore, protect, and enhance steelhead spawning and rearing habitat in the Lapwai Creek Watershed, with the specific task to fill data gaps through data collection and to implement BMPs on agricultural and forestlands to achieve biological objectives.

October 2007 Strategy Documents
Due to a checkerboard ownership of private and tribal lands in the Lapwai Creek Watershed, the Tribe and District work together to protect and restore habitat in the area. Consequently, the Tribe and District undertook an extensive effort to determine the distribution and abundance of fish populations, as well as habitat quality to collaboratively develop the strategy documents under review. The document is intended to outline high priority actions in high priority areas over the next ten years.

Reviewers note that much of the information in the strategy document is devoted to describing the existing condition of the watershed and presenting the method used to prioritize assessment units (AUs) for restoration within Lapwai Creek. The AUs roughly corresponded to subwatersheds or major channel sections within each drainage system. The Lapwai Creek watershed contained 10 AUs.

It was clear from the strategy document that the sole focal species for restoration was naturally spawning A-run steelhead (He'-yey). Although the report noted the presence of other native and non-native fishes in these systems, the prioritization approach was based entirely on restoring *Oncorhynchus mykiss*. Information on the abundance of other species was not given and did not figure into establishing priorities among AUs in each system. The ISRP thus has no basis for judging if the restoration strategies are adequate for fishes other than steelhead. The strategies also acknowledge that some *O. mykiss* in the watershed exhibit resident (non-anadromous) characteristics; however, neither the monitoring data nor the results of the prioritization make a clear distinction between resident and anadromous steelhead/rainbow trout.

The strategy document provides some very useful information about the condition of the Lapwai Creek watershed. Watershed assessment information previously assembled by Ecovista (2001) and that included in the Clearwater Subbasin Plan (2002) was repeated and upgraded. Data on juvenile *O. mykiss* abundance gathered in 2003-04 was included, along with summarized indices of water quantity, water quality, and watershed condition derived from a large number of attributes.

ISRP Recommendation and Summary

For the two Lapwai Creek projects (199901700 - Protect & Restore Lapwai Creek Watershed; 200207000 - Lapwai Creek Anadromous Habitat) the ISRP finds that they *Meet Scientific Review Criteria (Qualified)*. The qualification is based on the need for revising the strategy document to incorporate (a) biological objectives for the focal species (abundance and productivity for steelhead), (b) an evaluation of how and to what extent project actions will specifically ameliorate steelhead limiting factors by life stage and lead to achieving abundance and productivity objectives, (c) separate prioritizations for both preservation and restoration, and (d) basic yet meaningful monitoring of stream habitat and steelhead responses to project actions. Such a revision could take the form of an addendum to the document and be reviewed by the ISRP prior to initiating restoration actions.

In its present form the strategy document does not meet many review criteria. There are no specific biological objectives related to fish and wildlife. The assessment does not incorporate the range of life stages of steelhead that occupy the habitat and address the critical factors limiting their abundance, so consequently there is not sufficient information to conclude that improved environmental conditions from restoration actions will yield demonstrable benefits. There are no clearly defined objectives and outcomes. Sponsors propose to upgrade the poor and fair rankings of environmental attributes to good or excellent for 90% of the stream reaches in the priority assessment units within ten years. This seems an inappropriate (and unrealistic) goal. On one hand, it is not clear that this is sufficient to achieve biological improvement in the focal species. On the other hand, it is possible that this might be more than is needed for a healthy steelhead population. There appears to have been too little consideration of passive restoration, instead relying primarily on active approaches. Finally, there are not adequate provisions for monitoring and evaluation of results, both for changes in steelhead abundance and habitat.

However, the review panel feels there are several reasons to support an amended effort on Lapwai Creek. Because of its size and inherent potential for aquatic production, it is the dominant lower Clearwater tributary for A-run steelhead. There is close proximity of cropland and rangeland to steelhead-occupied stream reaches, resulting in impacts that can be reduced with conventional habitat restoration methods, and with habitat preservation. There is relatively easy access to the stream.

Notably, basic information on steelhead run size and natural production goals for Lapwai Creek was conspicuous by its absence, yet reviewers note that estimates of smolt capacity, and average percent of that realized, have been generated for lower Clearwater tributaries (Clearwater Subbasin Plan, Table 50). This information, including results of any adult or smolt trapping, should be incorporated into the amended strategy.

A set of comments was assembled by the review panel in an effort to identify deficiencies in the prioritization process that are potentially amendable, without the need to gather new data, and to suggest changes that would strengthen the process and make it more

scientifically defensible and supportable. These are summarized here and are supported by additional detail in subsequent sections of this review.

The authors of the strategy should be commended for their efforts to collect data and take initial steps to use it in an objective process to prioritize locations within these watersheds where restoration would be of greatest benefit to steelhead. With a few possible exceptions, sufficient information should now be in hand to identify those habitat attributes of greatest significance to steelhead and use these parameters to prioritize AUs for restoration.

That said, the review panel had some issues with the actual approach used to assign priorities, especially with the habitat assessment that was largely without scientific basis. It seemed that staff collected habitat data on every parameter they could think of and then combined these variables to generate three habitat scores (water quantity, water quality and AU condition). However, comparing the habitat ranks with the steelhead density information (as shown below), indicates that there is no relationship, suggesting that the habitat scores do not adequately characterize steelhead habitat.

Each of these four general categories of factors was weighted equally in the prioritization approach, which involved a numerical summation of the rankings for each category in a given AU to determine overall assessment unit ranking within the watershed as a whole. The ISRP feels this could lead to well-intentioned but misguided prioritization if the top ranked areas are not placed in a broader context of important limiting factors within the entire watershed. For example, the prioritization method itself was very clear, but no justification for assuming that the categories were equally important in determining overall restoration priority was given.

The ISRP wonders if a “fatal” problem such as a complete fish passage barrier downstream from a high priority AU could obviate the best intentions of the restoration program (in this example, steelhead could not access a high priority AU). For this reason there should have been some means of identifying critical problems downstream from or within each AU that would prevent focal species from spawning or rearing, and that would need to be addressed before restoration in the AU is likely to succeed. The restoration strategy document did not appear to consider such scenarios in weighting each assessment category equally and assuming that steelhead had equal access to every AU.

The Lapwai Creek situation is relatively straightforward because there is only one focal species, steelhead, and three life stages, spawning, summer rearing, and winter rearing. By understanding the few factors likely limiting fish production for each life stage it is possible to assess the existing status of each vital attribute and formulate a meaningful assessment of habitat status. Then, prioritization needs to be done separately for stream reaches that are most critical for (a) preservation and (b) restoration. The approach used in the document is to attempt to roll both up together, and it clearly does not accomplished what is required. Stream reaches identified in the “legacy” category in the document would form the core of the preservation sites. It is not clear if administrative

capabilities (easements, etc.) currently exist to preserve quality habitat, but needs should be identified and the process initiated.

Reviewers were especially concerned about water temperature and its role in steelhead rearing in Lapwai Creek and other lower Clearwater tributaries. No summary of summer water temperature was presented although it is clear that data are available. Because this is such a powerful "legislative" factor (fish at lower-elevation AUs are so close to the "edge" now and conditions appear to worsen year-to-year), much more analysis is needed now at the prioritization stage. This should minimize the risk that elaborate and expensive project actions might be completed in a stream reach but then have no benefit to steelhead because high temperature prevents the fish from using what is otherwise excellent habitat.

Possible effects of other fish species on rearing steelhead were not mentioned. Northern pikeminnow in particular might seem capable of negating habitat improvement if predation and/or competition in rearing habitat are substantial, especially at warmer temperatures. Were data gathered? Is this a significant issue? If so, it should be incorporated into the prioritization.

The general treatments within each assessment unit are provided – improve passage, fence riparian zones, plant riparian zones, address sedimentation, and nutrient pollution. However, as the sponsors acknowledge, identification of specific actions that would lead to improvement in the focal species status in the three top-ranked AUs within a defined period of time are now needed.

Assessment of abundance

The coverage of steelhead/rainbow trout abundance surveys within the two watersheds was quite good. Samples were obtained at fairly regular spacing throughout the entire drainage network. These juvenile abundance data are from only one electrofishing pass and thus represent an index of actual abundance. That observation should be made more clearly in the document, and the issue of what fraction of the true population is represented by the 1-pass data should be addressed. First- and second-order streams were not sampled, so the ISRP had to assume they were too small to hold fish.

It appeared that each sample site was visited only once, at summer low flow, over a two year period – 2003, 2004. Given the generally low abundance of *O. mykiss* in the watersheds and the large year-to-year variation in recruitment that would be expected at the reach scale, comparisons of abundance among AUs must be viewed with some caution because sites were sampled only once over a two-year period, and some surveys may have reflected anomalous densities. The ISRP strongly encourages project sponsors to repeat their watershed-wide abundance surveys to determine if the same distribution and abundance patterns exist as were exhibited by the 2003-2004 surveys. Furthermore, such abundance surveys should form the backbone of project monitoring and evaluation.

It appears possible from a comment in the document that a network of monitoring sites exists for Lapwai Creek with better data for several years that would be helpful to evaluate between-year variability and to calibrate the 1-pass data, but for some reason those data are not given. Reviewers are aware that lower Clearwater sites are being sampled as part of the Idaho Natural Production Monitoring and Evaluation program (199107300), and wonder why those data (perhaps those alluded to above) were not put forth.

Assessment of habitat status

The assessment of habitat status was comprehensive and generally helpful. Details of habitat assessments are found in the appendices. It would also have been useful to have included an explanation of how each category of data was used in figuring the habitat rankings of individual AUs (or, even better, summary AU rankings for each factor) in the appendices.

Furthermore, it would have been helpful to have included a means of assessing the potential seriousness of a habitat problem; for example, a water withdrawal that resulted in complete stream dewatering, an impassable road culvert, or a stream reach that routinely exceeds 26^{o} C could be considered a very serious problem that requires immediate attention before other restoration measures such as streambank stabilization can achieve restoration objectives. The numerical prioritization method did not seem to be able to make allowances for unusually critical problems that could effectively trump all other considerations. As a result the ISRP could not know the type and location of the most important limiting habitat factors within the Lapwai watershed, based on the information in the documents.

The parameters included in the habitat assessments were combined in a scoring system intended to identify the most degraded sites. The highest restoration priority was assigned to the most degraded AUs. The choice to use extent of habitat degradation as a primary factor in assigning priorities for restoration should have been justified more fully in the strategy. Why would it not be preferable to first focus on AUs where habitat conditions are moderately degraded and a more modest slate of restoration projects would be sufficient to restore habitat condition? Is there any evidence that the relative benefit for steelhead would be greatest by focusing on the most degraded sites first? Better empirical (or lacking that, theoretical) support for this position would be required if it is retained by sponsors.

The habitat assessments incorporated a large number of variables describing the physical, chemical, and biological characteristics of the streams and the land use features of the surrounding landscape. Ideally, the habitat assessments and the scoring and ranking process should produce an indication of the relative quality of the habitat for steelhead. However, the habitat assessment description never addresses the question of which of the measured habitat parameters are actually significant to steelhead. Rather, the assumption

seems to be made that all the parameters are important to the fish. However, the relevance to steelhead of some of the variables included in the habitat assessment is questionable. For example, the relationship between the diatom multimetric index and steelhead is unclear, as is the relationship between the fish and *E. coli* levels. Granted, all the measures included in the habitat assessment do relate in some manner with human impacts. However, as the purpose of this assessment is to identify those locations and actions that would be of greatest benefit to steelhead, the assessment should focus on the habitat features that are of greatest significance to the fish.

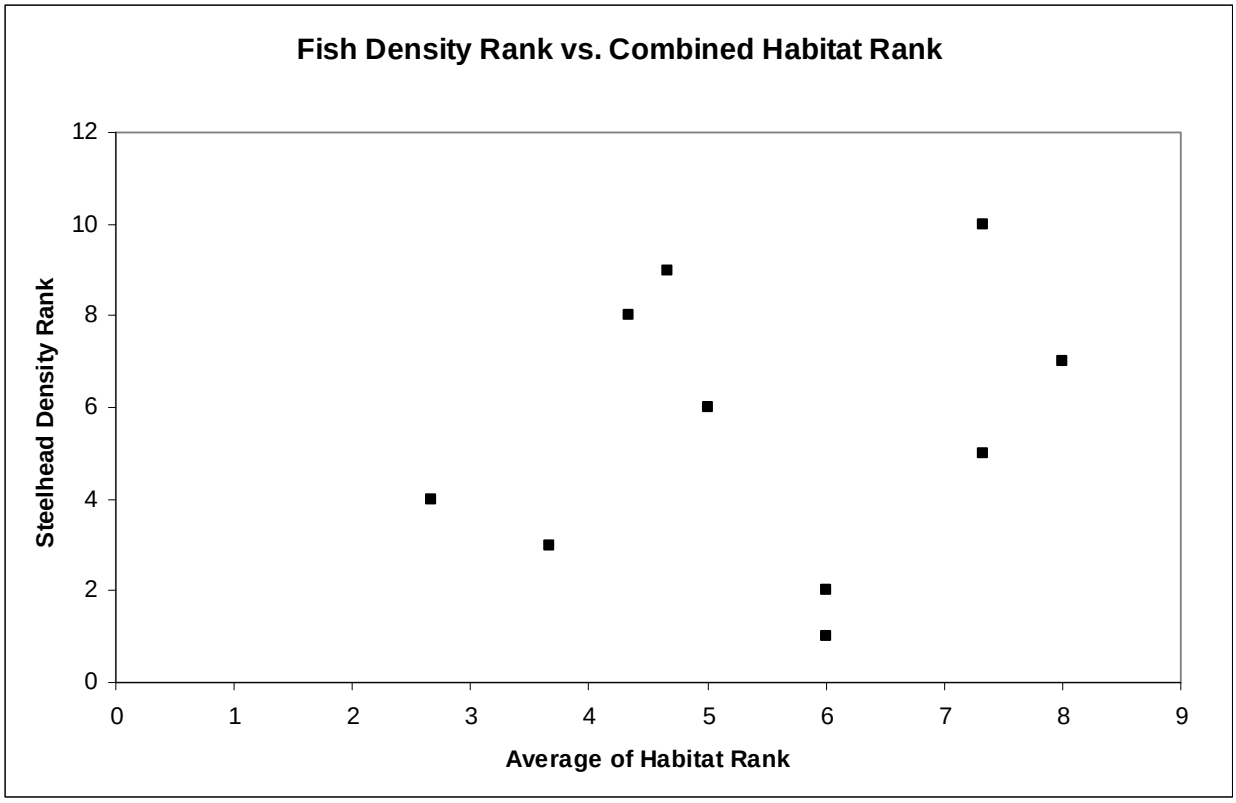
The specifics of the method used to derive scores from the measured parameters were not fully explained. For example, a diatom multimetric index, total invertebrate taxa richness, EPT richness and Hilsenhoff pollution intolerant metrics were combined into a biological indicator score, but how each of the parameters is used in the score calculation was not described. Similarly, no detail is provided as to how a water quality score was derived from measures of *E. coli*, temperature, chemical pollutants and sediment. Ideally, the method used to combine the habitat data into scores and, ultimately, AU ranking, should weight those habitat factors of greatest importance to the fish most heavily. However, there is no indication whether or not this type of weighting was used in the score computation.

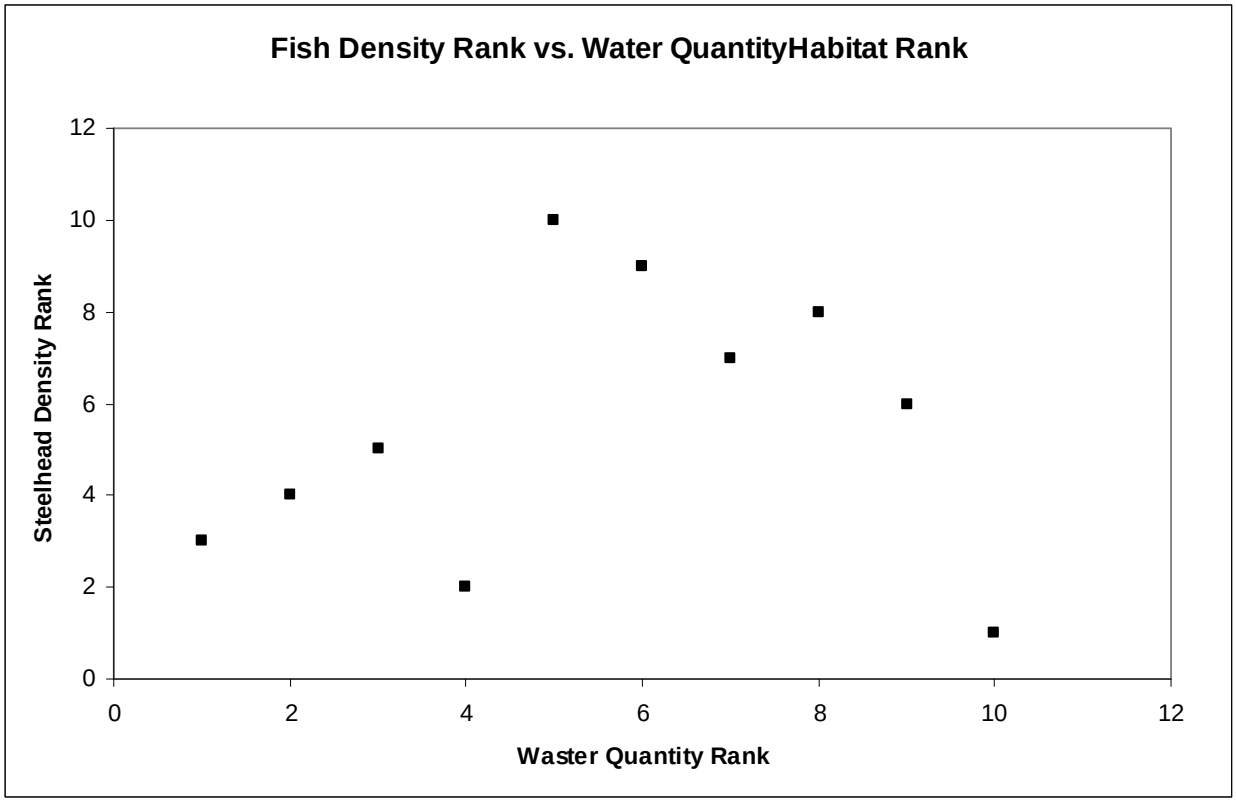
There also were some critical habitat parameters that were apparently omitted from the assessment. There is no discussion about the availability or quality of spawning gravel, a serious omission. The water temperature data that were gathered are never presented (in a summarized format), also a significant omission.

If the habitat assessment and ranking process accurately portrays habitat quality for steelhead, there should be some correspondence between the ranking of habitat quality and steelhead abundance ranking. The ISRP assessed whether such a relationship exists by using the ranking information provided in Table 16 in the Lapwai Creek report. These data reveal relatively little relationship between any of the individual habitat category ranks, or a combined habitat ranking based on an average all three category ranks, and steelhead abundance for Lapwai Creek (Figure 1). AUs with the worst habitat were assigned the highest rank for habitat and AUs with the highest steelhead density were assigned the highest rank for population. Therefore, if the habitat ranking accurately reflects habitat condition for steelhead, steelhead density rank should decrease as the habitat rank increases. However, there is no discernable relationship between steelhead abundance and any of the habitat ranks provided in the Lapwai Creek assessment. The lack of a relationship between the fish population data and the habitat assessment creates some doubt about the adequacy of the process used to assess habitat.

Figure 1: ISRP analysis of the relationship between ranking of habitat quality and steelhead parr abundance for the 10 AUs in the Lapwai Creek watershed (data from Table 16; Strategy for the Ecological Restoration of Lapwai Creek Watershed). The combined habitat rank in the first panel is an average of the ranks assigned for water quality, water quantity, and AU condition. The habitat ranking process assigned the highest value to the most degraded AU. The fish ranking assigned the highest value to the

AUs with the highest density. Therefore, if the assessment scores accurately reflect habitat quality for steelhead, then steelhead rank should decrease with increasing habitat degradation rank. There is no apparent relationship between the habitat ranking and fish abundance rank.




Fish Density Rank vs. Water QuantityHabitat Rank
Steelhead Density Rank
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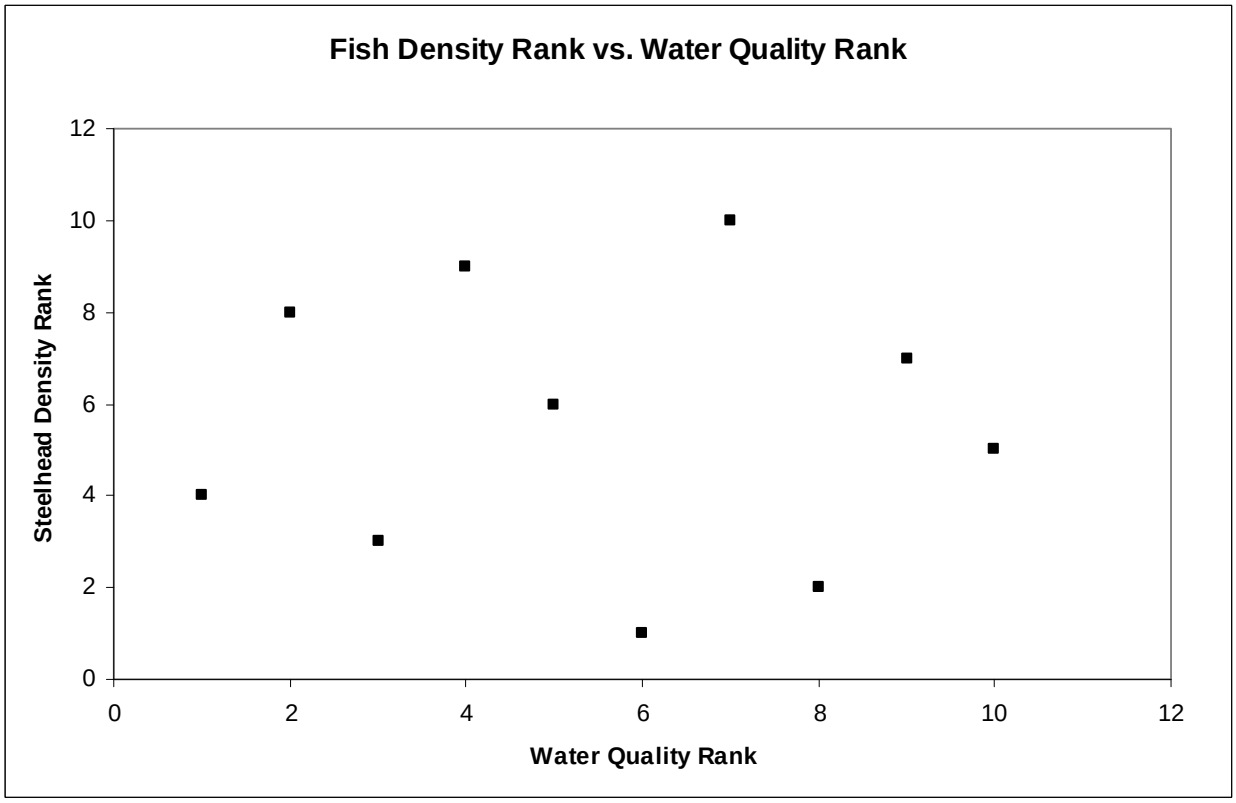
Fish Density Rank vs. Water Quality Rank
Steelhead Density Rank
Water Quality Rank
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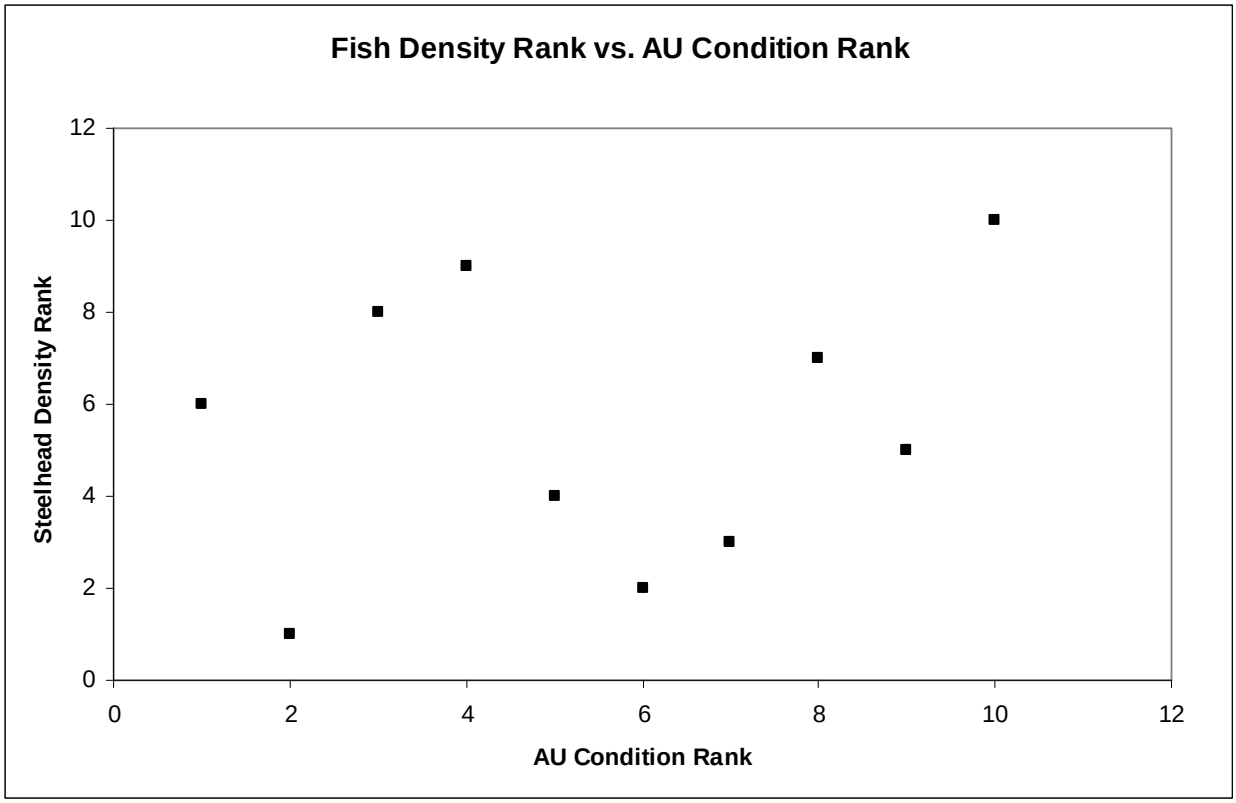

The availability of comprehensive fish population data within each of the assessment units could have been used to determine the suite of habitat parameters most closely related to steelhead abundance. The sponsors may wish to consider doing that for existing data.

Comprehensive presentation of prioritized restoration projects

As noted above, there is an apparent lack of correspondence between the rankings of the habitat assessment and steelhead abundance. If the process is intended to specifically identify those locations of greatest benefit to steelhead, an initial evaluation of which habitat attributes are most closely aligned with steelhead density would be very worthwhile and should be a major focus if the project moves forward. Using these habitat characteristics as the focus of the habitat assessment would help ensure that restoration priorities are being based on factors that are of primary importance to steelhead recovery. Such an analysis also may help to identify the suite of specific restoration actions most likely to benefit steelhead.

There are several issues with the overall approach used for assigning AU priorities that may render this process less effective than it might be, especially given the wealth of information available for the watershed. The process's stated objective is to identify sites that have high steelhead populations and sites that have the most degraded habitat. The

implied intention is that current fish abundance and habitat condition are considered equally in the ranking process. However, the approach used actually weights habitat degradation much more heavily than steelhead abundance. The AU prioritization uses four components in the ranking process. Because three of the four elements in the prioritization ranking scheme are habitat based, habitat degradation gets higher weight in the process than fish population density. If current population status is considered to be co-equal with habitat condition in priority setting, the ranking scheme would need to be altered to give equal weight to habitat and fish abundance.

One factor that appears to be missing in the strategy is some consideration of feasibility. Feasibility might be a relevant factor in both the process for identifying priority AUs and in the development of AU-specific restoration plans. For example, if an AU received a high score for habitat degradation largely based on a water quantity score but the factors responsible for low water availability are natural or otherwise not considered correctable, this AU may not warrant a high priority. If such conditions do exist, they should have been incorporated into the priority ranking. At the project scale, feasibility also may limit what can be accomplished at a given site and should be incorporated into future efforts to identify key projects in priority AUs.

The strategy authors make the statement that it is appropriate to implement restoration actions in AUs not ranked as high priority if an opportunity presents itself. However, it would not be fruitful to undertake such a project without some sense of the relative benefits it was likely to produce. If the authors feel strongly that certain projects outside the priority AUs should be considered, then they should develop a process for identifying those actions outside of the priority AUs that would have the potential to offer ecological benefits equal to or greater than the implementation of projects within the priority AUs. There may well be projects that fit these requirements. But a process for identifying them should be included in the assessment and prioritization process to provide justification. A willing landowner alone is not sufficient reason to implement a project at a non-priority site.

Specific restoration actions within the priority AUs are not prioritized in the strategy. Rather, the possible types of restoration projects that could be implemented are listed and the amount of habitat where such a project would be appropriate is provided for each priority AU. Prioritization of the restoration action types within each AU and identification of those specific locations within an AU where a given project would be expected to have the greatest impact would be the ideal final product of a restoration strategy document. However, it is understandable that the authors were not able to generate this level of detail in this document. However, such a prioritization should be done for each priority AU as specific restoration projects are planned.

Finally, there appears to be some confounding of resident and anadromous populations of *O. mykiss* in the document. For example, based on the distribution of resident vs. anadromous fish (Figure 30 in Ecovista (2001), for some reason not included in the strategy document), Mission #2 AU contains only resident rainbow trout. If that is

correct, this AU may warrant lower priority as the primary objective of this plan is to restore steelhead.

Specific recommendations (toward the future)

The three highest ranked assessment units were located in the lowermost portions of the watershed (Lapwai 1, Lapwai 2, and Sweetwater 1).

Assessment Unit	Ranked Priority	Fish Priority Species	Water Quantity	Water Quality	AU Condition	Composite Ranking Mean
Lapwai 2	1	10	5	7	10	8.00
Sweetwater 1	2	7	7	9	8	7.75
Lapwai 1	3	5	3	10	9	6.75
Mission 1	4	9	6	4	4	5.75
Mission 2	5	8	8	2	3	5.25
Webb 1	6	6	9	5	1	5.25
Lapwai 3	7	2	4	8	6	5.00
Mission 3	8	1	10	6	2	4.75
Sweetwater 2	9	3	1	3	7	3.50
Webb 2	10	4	2	1	5	3.00

In effect, this means that habitat restoration priorities in Lapwai Creek restoration will begin with the downstream reaches before advancing to the upper watershed. In terms of recovering naturally spawning steelhead, the Lapwai Creek restoration priority seemed logical. Fish numbers were higher in the lowermost reaches, and building outward from a core of relative strength makes intuitive sense (and is a cornerstone of Council restoration policy, as well). However, as discussed above, reviewers have issues with the process used to select those three AUs.

Moving forward, the ISRP recommends that sponsors prepare an addendum to the current document that pursues the following approach. Initially sponsors should verify the choice of these three AUs by a more focused analysis of the population and habitat data. This may largely be a qualitative analysis, but existing data on parameters such as summer temperature should also be emphasized. The addendum could contain the improved prioritization process and rankings and then proceed through the identification of reach-level limiting factors and projects to address them.

First, it would be useful to delineate the portions (by reach, or similar, hopefully incorporating stream gradient and Rosgen classification, if the data exist) of the AUs where existing stream habitat is most worthy of preservation (based on steelhead production needs) and discuss how that might be accomplished.

Next, address fish passage issues for adult steelhead and identify situations where major gains could be made by restoring passage. As mentioned earlier, the ISRP wonders if a

"fatal" problem such as a complete fish passage barrier downstream from a high priority AU could obviate the best intentions of the restoration program (in this example, if steelhead could not access a high priority AU). For this reason there should be a means of identifying critical problems downstream from or within each AU that would prevent focal species from spawning or rearing, and that would need to be addressed before restoration in the AU is likely to succeed.

Then for each of the three life stages of steelhead separately, assess what are the most likely limiting factors for each stream reach. Also required is an evaluation of how much change (improvement) in the pertinent attribute (say summer temperature, or winter concealment cover) would be required to enable a meaningful increase in steelhead abundance. At this stage a "triage" approach may be most useful. For example, for summer steelhead rearing in reach X in AU Y, summer water temperature might be (a) adequate, (b) too warm to be reasonably ameliorated, or (c) high but potentially fixable. Distinguishing between options b and c might be done by applying a stream temperature model (US EPA, US Fish & Wildlife Service and various other organizations have constructed such models), which would then indicate how much potential change could be expected from restoration actions, say if shading was to be increased. For sites with adequate water temperature currently, the reach should then be evaluated for the next most likely limiting factor, such as pool quality and quantity, and that reach should be considered for habitat preservation. Reviewers suggest that the report "A Review of Strategies for Recovering Tributary Habitat" (ISAB 2003-2) and the EDT handbook might serve as valuable sources of information.

Finally, habitat monitoring should be conducted that is sufficient to determine if work elements have achieved improved environmental conditions. The monitoring program was inadequately described and limited to a single short paragraph in the strategy document under the Toward the Future chapter. This paragraph implies that effectiveness monitoring would take place after 10 years. That interval is much too long for fish populations. More frequent population assessments are needed to evaluate restoration effectiveness. Additionally, habitat assessments are needed that can show whether desired improvements are really taking place. A systematic collection of habitat site photography at a series of photo-points, conducted at the same time each year, would be essential and require little effort. For some types of projects, assessments are not required each year, but for others such as increasing instream flows, annual measurements are necessary to document improvements in surface flow. The ISRP recommends that more detailed monitoring programs be drawn up, with an emphasis on demonstrating restoration effectiveness.

Big Canyon (1999-016-00, *Protect & Restore Big Canyon Creek Watershed, and* 1999-015-00, *Big Canyon Fish Habitat)*

Project Background

FY 2007-09 Proposals
The Tribe proposed to continue actions to protect, restore, and return critical spawning and rearing habitat using a ridgetop to ridgetop approach, based on a complete watershed assessment and following the Clearwater Subbasin Management Plan. The District's approach was to implement best management practices (BMPs) to address agricultural and forestry related habitat degradation.

October 2007 Strategy Document
Due to a checkerboard ownership of private and tribal lands in the Big Canyon Creek watershed, the Tribe and District work together to protect and restore habitat in the area. Consequently, the Tribe and District undertook an extensive effort to determine the distribution and abundance of fish populations, and assess habitat quality to collaboratively develop the strategy documents under review. The document is intended to identify high priority areas where a suite of restoration actions will be implemented over the next ten years.

Reviewers note that much of the information in the October 2007 strategy document covered the existing condition of the watershed and the method used to prioritize the five assessment units (AUs) for restoration. The AUs roughly corresponded to sub-watersheds or major channel sections.

The sole focal species for restoration was naturally spawning A-run steelhead (He'-yey). Although the reports noted the presence of other native and non-native fishes in these systems, the prioritization approach was based on restoring *Oncorhynchus mykiss*. The strategy also acknowledges that some *O. mykiss* in the watersheds exhibit resident (non-anadromous) characteristics. However, neither the monitoring data nor the results of the prioritization typically make a distinction between resident and anadromous steelhead/rainbow trout, and it was necessary for reviewers to ferret that out from other portions of the document or from supporting documents.

The strategy document provides some useful information about the condition of the Big Canyon watershed. Watershed assessment information previously assembled by Ecovista (2001) and that included in the Clearwater Subbasin Plan (2002) was repeated and upgraded. Data on juvenile *O. mykiss* abundance gathered in 2003-04 was included, along with summarized indices of water quantity, water quality, and watershed condition.

ISRP Recommendation and Summary

For the two Big Canyon Creek projects (199901500 - Big Canyon Fish Habitat; 199901600 - Protect & Restore Big Canyon Creek Watershed) the ISRP finds that they *Do Not Meet Scientific Criteria*.

Activities based on this strategy would provide minimal, if any, tangible benefits to the focal species, juvenile steelhead. There are no specific biological objectives related to fish or wildlife. The strategy document does not attempt to identify and ameliorate the factors limiting steelhead. It does not incorporate or address the requirements of the three life-stages (adult spawning, summer rearing, winter rearing) the fish spend in Big Canyon habitat so consequently there is no basis to conclude that improved environmental conditions that might result from restoration actions would yield demonstrable benefits.

Reviewers feel the expressed goal of improving 400 stream miles to good or excellent condition is highly unrealistic. As the document states, the fish habitat in both Big and Little Canyon creeks is in sub-optimal condition, and project data suggest the presence of a few thousand juvenile steelhead/rainbow trout in the two downstream-most assessment units. It portrays the system as a "normal" one in which a range of "treatments" would be successful in achieving the goal of improving 400 miles of stream to good or excellent condition. Site visits and a close examination of reports from Inter-Fluve Inc, BLM, and Ecovista provided evidence to reviewers that the physical configuration and geomorphology of Big and Little Canyons is unique among the lower Clearwater tributaries (discussed more fully below). Steelhead rearing is restricted to the lower (canyon) habitat that is the product of periodic floods and thus not conducive to the conventional fish habitat restoration treatments such as log structure placement. Steelhead rearing is further exacerbated by low summer flows. All in all, conditions in those portions of the watershed most important to anadromous fish appear to be more challenging than those portrayed in the strategy document, and they are not amenable to project "treatment" and control as is proposed in the document.

Another major issue is the fact that headwater AUs containing low densities of only resident rainbow trout received top restoration priority. Such a prioritization significantly perplexed reviewers. The numerical prioritization method led to surprisingly different results for Big Canyon Creek when compared to its companion effort in Lapwai Creek. For Big Canyon Creek, the two highest ranked assessment units were located in the headwaters (Big Canyon 3 and Little Canyon 2). For Lapwai Creek, the three highest ranked assessment units were located in the lowermost portions of the watershed. In effect, this means that habitat restoration priorities in Big Canyon Creek would be located high in the drainage network, while in Lapwai Creek restoration would begin with the downstream reaches before advancing to the upper watershed. In terms of recovering naturally spawning steelhead, the Lapwai Creek restoration priority seemed logical, although the available fish population and habitat data could have been more effectively used to support the selection of these sites. In Lapwai Creek, fish numbers were higher in the lowermost reaches, and building outward from a core of relative strength makes

intuitive sense. The logic for assigning highest priority to the headwaters of Big Canyon, however, was less clear. Steelhead/rainbow trout were more abundant in lower Big Canyon and Little Canyon creeks than in the headwaters, and the upper watershed appeared to have few fish upon which to rebuild the population if habitat was to be improved. The fish distribution map shows the upper watershed to be nearly devoid of *O. mykiss*. In fact, there appears to be little surface water flowing in much of the drainage network. Furthermore, no information was given in the strategy document as to whether the fish in the upper watershed had adopted a resident rainbow trout life history or in fact were anadromous. Information from other reports documents they are resident fish. Therefore, the ISRP questions whether giving top priority to the headwaters of Big Canyon Creek will be the most effective way (if, in fact, there is any effective way) to rebuild the steelhead population.

The review panel had issues with the actual approach used to assign priorities, especially with the habitat assessments. It seemed that they collected habitat data on every parameter they could think of and then combined these variables to generate three habitat scores (water quantity, water quality and AU condition). However, if you compare the habitat ranks with the steelhead density information you find that there is no relationship, suggesting that the habitat scores do not adequately characterize steelhead habitat.

The ISRP appreciates the opportunity taken in the strategy document to highlight project success. While not discounting the effort made in the Hatwai Creek drainage, reviewers (again, as in their review of 2007-09 proposals) note the document provided no indication of on-the-ground gains resulting from project activities in the Big Canyon watershed. If there were some evidence that habitat work completed to date had made any difference to the status of the focal species it would have helped to ease reviewers' concerns.

The Big Canyon Creek monitoring plan is inadequate in its present form. No monitoring program is described for the focal species. The proposed monitoring was identical to that proposed for Lapwai Creek, and ISRP comments from Lapwai Creek proposals also apply here.

A second set of summary comments was assembled by the review panel. It identifies deficiencies in the prioritization process that are viewed by the ISRP as potentially amendable, without the need to gather new data, and suggests changes that would strengthen the process and make it more scientifically defensible and supportable. These are discussed above in the review section on the Lapwai Creek strategy document, and to some extent in specific comments regarding this project, below. However, because of the strong concerns identified above regarding Big Canyon, the ISRP does not encourage Big Canyon project sponsors to prepare a revised prioritization strategy.

Specific Comments

Big Canyon watershed characteristics

The Big Canyon watershed is unusual in several respects. Physically the system is in a sense "inverted," with extremely steep canyons in the lower reaches (15-16 km-long) of both. The canyons are so steep and deep as to largely preclude human activities directly adjacent to the stream. Stream gradient is moderate and in a good range for salmonids. Steelhead spawning is concentrated at the head of the canyon reach in Little Canyon. Upstream, sections of subterranean flow (in summer) are present in the mid-portion of each stream. The length of subterranean flow is 17 km in Big Canyon and much less in Little Canyon. Above that the topography moderates somewhat, with increased human occupation and effects of grazing and cultivation and a network of small tributaries holding low numbers of resident rainbow trout.

The flow regime substantially dictates the nature of the fish habitat in the middle and lower reaches, as described in the Inter-Fluve, Inc. (1994) evaluation of the situation and its restoration potential. Rain-on-snow events in winter or early spring have resulted in a catastrophic flood of 8,400 cfs in 1965 and again to a lesser, but still catastrophic, extent three decades later. Peak flow from nearly the entire catchment is funneled down the confined canyon channels that lack flood plains to dissipate its effects. Reports in 1996 indicate D-9 Caterpillars being tumbled down the channel in a torrent of water and bedload. According to the Inter-Fluve report, 30 years after the 1965 flood, the valley floor still was generally devoid of fine sediment, a single defined channel with vegetated banks was absent, and large-scale relic depositional bars were present in locations away from the current channel. Also, near the confluence of Big and Little Canyon creeks and below, riparian and in-channel habitat was heavily impacted by the levees, rip-rap, and heavy equipment excavation following flood events. The presence of the extensive sections of subterranean flow was attributed to flood-caused scouring of sealing fines and deposition of larger-diameter bedload.

Summer flow typically declines to about 4-6 cfs in each canyon channel (Ecovista 2001). Daily maximum water temperature was 25 C consistently through mid-September in 1998 and may limit salmonid rearing (Ecovista 2001). Reviewers note that recent regional trends such as decreasing summer precipitation and increasing temperature exacerbate that situation. Groundwater and surface water use in the watershed is minimal (Ecovista 2001), so any efforts to increase baseflow by acquiring water rights and leaving more flow in-channel would appear to hold little promise.

Assessment of abundance

The coverage of steelhead/rainbow trout reach surveys within the watershed was quite good. Samples were obtained at fairly regular spacing throughout the entire drainage network. These juvenile abundance data are from only one electrofishing pass and thus represent an index of actual abundance. First- and second-order streams were not

sampled, so the ISRP had to assume they were too small to hold fish. It appeared that each sample site was visited only once, at summer low flow, over a two year period – 2003, 2004. Given the generally low abundance of *O. mykiss* in the watershed and the large year-to-year variation in recruitment that would be expected at the reach scale, comparisons of abundance among AUs must be viewed with some caution because sites were sampled only once over a two-year period, and some surveys may have reflected anomalous densities.

Also, the report mentions that eight monitoring sites exist with three-pass data for the years 2003-06 but for some reason those data were not given. Reviewers note that lower Clearwater sites should be sampled as part of the Idaho Natural Production Monitoring and Evaluation program (199107300) and question why those data (perhaps those alluded to above) were not put forth. They would be valuable to enable evaluation of between-year variability and to calibrate the one-pass data. Also, the Ecovista (2001) report suggests fish density data are available from a survey in the 1980s. A review of these might have indicated changes over time.

Assessment of habitat status

The assessment of habitat status was comprehensive and generally helpful. Details of habitat assessments are found in the appendices. It would also have been useful to have included an explanation of how each category of data was used in figuring the habitat rankings of individual AUs (or, even better, summary AU rankings for each factor) in the appendices.

Furthermore, it would have been helpful to have included a means of assessing the potential seriousness of a habitat problem; for example, a water withdrawal that resulted in complete stream dewatering, an impassable road culvert, or a stream reach that routinely exceeds 26^{o} C could be considered a very serious problem that requires immediate attention before other restoration measures such as streambank stabilization can achieve restoration objectives. The numerical prioritization method did not seem to be able to make allowances for unusually critical problems that could effectively trump all other considerations. As a result the ISRP could not know the type and location of the most important limiting habitat factors within the Big Canyon watershed, based on the information in the documents.

The habitat assessment incorporated a large number of variables describing the physical, chemical and biological characteristics of the streams and the land use features of the surrounding landscape. Ideally, the habitat assessment and the scoring and ranking process should produce an indication of the relative quality of the habitat for steelhead. However, the habitat assessment description never addresses the question of which of the measured habitat parameters are actually significant to steelhead. Rather, the assumption seems to be made that all the parameters are important to the fish. However, the relevance to steelhead of some of the variables included in the habitat assessment is questionable. For example, the relationship between the diatom multimetric index and

steelhead abundance is unclear as is the relationship between the fish and *E. coli* levels. Granted, all the measures included in the habitat assessment do relate in some manner with human impacts. However, as the purpose of this assessment is to identify those locations and actions that would be of greatest benefit to steelhead, the assessment should focus on the habitat features that are of greatest significance to the fish.

There was no mention of any assessment of steelhead spawning habitat, both in terms of quality or quantity, and that would appear a serious omission. The water temperature data that were gathered are never presented (in a summary format), also a significant omission.

Comprehensive presentation of prioritized restoration projects

This restoration strategy uses both habitat and fish population data to prioritize general locations for restoration action. The authors of the strategies should be commended for accumulating the data necessary to conduct such an analysis and for developing a scoring process for objectively assigning priority rankings. That said, there were some major elements of the habitat assessment process that did not appear relevant to meeting the restoration strategy objectives.

There are several issues with the overall approach used for assigning AU priorities that may render this process less effective than it might be. The stated objective of the process is to identify sites that have high steelhead populations and sites that have the most degraded habitat. The implied intention is that current fish abundance and habitat condition are considered equally in the ranking process. However, the approach used actually weights habitat degradation much more heavily than steelhead abundance. The AU prioritization uses four components in the ranking process. Because three of the four elements in the prioritization ranking scheme are habitat based, habitat degradation gets higher weight in the process than fish population density. The unequal weighting is partially compensated in cases where composite ranking scores from two AUs are the same. The AU with the highest steelhead density is assigned the higher priority in this case. Nonetheless, if current population status is considered to be co-equal with habitat condition in priority setting, the ranking scheme would need to be altered to give equal weight to habitat and fish abundance.

The general treatments within each assessment unit are provided – improve passage, fence riparian zones, plant riparian zones, address sedimentation, and nutrient pollution. However, specific actions that would lead to improvement in the focal species status (i.e., address limiting factors) within a defined period of time are not provided.

The document states: “Fish density was internally ranked inversely to the other components. This provides a mechanism to place emphasis on protecting areas where fish are present, regardless of the condition of the habitat. Thus, an AU with high fish densities but relatively low habitat quality would receive a higher priority ranking than an area that contains relatively high quality habitat but is devoid of fish.” The confusion and

lack of logic here could have been avoided by using separate prioritizations for sites to be preserved and those to be restored.

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