Using Analytical Tools in Subbasin Planning

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SUMMARY

This paper presents the recommendations of the Northwest Power and Conservation Council (Council) staff concerning the use of analytical tools in subbasin assessment and subbasin planning.

An assessment of fish and wildlife resources and their habitats is the first step toward completing a subbasin plan. The assessment involves compiling existing biological data and making inferences about the status of species and habitats based on these data. Techniques for making inferences run the gamut from professional judgment to the use of sophisticated computer models. Collectively, these techniques are termed "analytical tools." Decisions regarding which tools to use have major implications in terms of time, cost, and quality of product. It is not surprising, therefore, that subbasin planners have given considerable attention to this topic. This paper seeks to provide subbasin planners with information that can help them make decisions on the use of analytical tools in preparing fish and wildlife assessments.

Any discussion of analytical tools invariably expands to involve a host of related concerns -- scientific standards, data, and documentation being three germane examples. This paper considers analytical tools from this broader perspective.

INTRODUCTION

This past fall, subbasin planners in the Kootenai and Flathead subbasins requested that the Council clarify its position on the use of analytical tools in conducting subbasin assessments.[1] Specifically, the Kootenai/Flathead planners wanted to know if specific tools would be required or would increase the likelihood that a subbasin plan would meet requirements of the Council, the ISRP, or others in a position to review subbasin plans. Underlying the Kootenai/Flathead request to the Council was the concern that scheduling and budget constraints may preclude the use of sophisticated analytical tools. This issue is not unique to the Kootenai/Flathead. Planners in other subbasins have also asked for clarification regarding how analytical tools fit into the subbasin assessment and planning process.

Prompted by the Kootenai/Flathead concern, Council staff prepared a draft recommendation on the use of analytical tools in subbasin planning. This draft recommendation was presented at the October 22, 2002, Regional Coordination Group meeting in Boise. After that discussion, it was concluded that Council staff should revise the recommendation to incorporate issues raised at the meeting, then distribute the

[1] As used here, the term analytical tools refers to models, methodologies, and procedures used to examine data and draw conclusions concerning the status of a species (or population), a habitat, or a biological system in a given subbasin.

revised draft to level 2 coordinators and federal partners for comment, with the intent of bringing a revised version to the Council for its endorsement.

A revised paper was forwarded to affected parties on October 24, with a request to distribute it to interested parties and return comments by November 4. Approximately 20 people representing states, tribes, and federal agencies provided comments. Reviewers generally approved of the paper's contents. Some reviewers, however, requested that topics be described in greater detail. Others recommended that the paper be expanded to address additional related issues such as information development and strategies for archiving products. Council staff considered each of these comments and in some cases contacted the writers for additional information. Comments were then incorporated into the draft, and new sections were also added to address related topics suggested by reviewers.

This paper is the product of that effort. The Council staff is confident that the issues raised by affected parties have been addressed in this version of the paper and that, as revised, the paper contains a set of recommendations that can provide the necessary guidance to subbasin planners as they develop their strategies for conducting biological assessments in each subbasin. There is often a fine line between too much guidance and not enough. The Council staff is hopeful that the recommendations contained in this paper strike the proper balance.

BACKGROUND

This section presents a brief history of the region's involvement with analytical tools related to subbasin planning and identifies key questions.

In June 2000 the Columbia Basin Fish and Wildlife Authority (CBFWA) released a white paper entitled *A Template for Subbasin Assessment*, which identified a range of analytical tools that might prove useful in completing subbasin biological assessments. The emphasis was on fish and, more specifically, anadromous fish. Tools identified in that report included:

- Cumulative Risk Initiative (CRI), developed by NOAA Fisheries
- Process for Analyzing and Testing Hypotheses (PATH), developed by members of the Columbia Basin Fish and Wildlife Authority
- Hierarchical Linear Modeling (H-VSP, which later became the Salmon Watershed Assessment Method, or SWAM), developed by NOAA Fisheries
- ICBEMP Classification Regression Tree Method (CART) developed by the Forest Service and BLM.
- ICBEMP Bayesian Belief Network Model (BBN) developed by the Forest Service and BLM.
- Ecosystem Diagnosis and Treatment (EDT) developed by Mobrand Biometrics, Inc.
- Opinions of local fish managers (also referred to as professional judgment or expert opinion).

This paper does not include descriptions of these analytical tools but does suggest where more information may be found. (As a general reference, see the Independent Scientific Advisory Board's *Model Synthesis Report, 2001-1* for a general discussion of analytical tools, including summaries and critiques of CRI, PATH, BBN, and EDT. This report is available at www.nwcouncil.org.) Of these tools, SWAM, CART, BBN, EDT, and professional judgment are the tools most closely related to the subbasin-level issues that are of concern here. It is important to note that (1) the above list does not include all of the available analytical tools; wildlife tools are noticeably lacking, and (2) each tool focuses on a specific aspect of biological assessment – they are *not* interchangeable.

Using the *Template* as a foundation, in October 2001 the Northwest Power Planning Council (Council) released a subsequent report entitled *Technical Guide for Subbasin Planners.* That report identified the elements of a subbasin plan, including those elements related to biological assessment. The only analytical tool specifically referenced in the *Technical Guide* was EDT.

As suggested above, the tools referenced in *A Template for Subbasin Assessment* focused on fish. Over the past year the Council has collaborated with the Northwest Habitat Institute (NHI) and regional wildlife biologists to develop a suite of tools for determining the relationship between wildlife and the environment, identifying interactions between fish and wildlife, and assessing ecosystem functions. Collectively this suite of tools is called the Interactive Biological Information System (IBIS). More recently, SITES, an analytical tool developed by the Nature Conservancy, has also been proposed for use in subbasin planning. SITES seeks to identify geographic areas that should be considered for conservation based on ecological and demographic factors.

As part of the regional (level 3) Subbasin Planning Master Contract, the Council has established contracts with NHI and the USDA Forest Service Olympia Forest Sciences Lab to provide technical assistance with IBIS and with Mobrand Biometrics (MBI) to provide technical assistance with EDT. The assistance available through these contracts includes instruction on the use of these tools -- primarily through educational workshops, access to these tools via the Internet, a limited amount of direct support in applying the models, and, in the case of IBIS, the development of a set of preliminary subbasin and provincial products. This level of assistance typically will not allow for applying these tools at the subbasin level without additional resources and/or in-kind support from subbasin planners. The Council has also worked with NHI and MBI to make tools and products available via the Internet.

As subbasin planners prepare to initiate the assessment phase of subbasin planning, several important questions have arisen:

- Are there differences in assessment requirements for anadromous fish, resident fish, and wildlife?

- What analytical tools should be used to assess anadromous fish, resident fish, and/or wildlife?

- What level of consistency should be maintained, both across species and across subbasins?

- How will the results of these assessments be synthesized?

- What level of documentation is needed?

- How will information compiled through these assessments be maintained?

The remainder of this paper presents Council staff recommendations on how subbasin planners might address these inter-related questions. The next section of the paper provides general recommendations applicable to all species groups. Following this, more specific recommendations are offered for each species group: anadromous salmonids, resident salmonids, other fish, and wildlife. The final section of the paper identifies areas where future work may be warranted.

RECOMMENDATIONS APPLICABLE TO ALL SPECIES GROUPS

- **Selection of Tools**. The key message of this paper is that *no single analytical tool is required for assessing fish and wildlife resources*. *The key concern is that analytical products present an accurate depiction of the status of fish and wildlife resources in the subbasin.* In determining which tools or techniques to apply, planners should consider (1) what tools are available and applicable, (2) the extent to which their use will result in a scientifically rigorous product, (3) whether tools and techniques will produce products that are compatible with the Council's *Technical Guide,* (4) opportunities for consistency with other subbasins in the province, (5) the applicability of available tools to local species and environmental conditions, (6) the availability of data and local technical expertise needed to apply a given tool, and (7) practical considerations including cost and schedule. It is also important to note that there may be instances where more than one tool could be applied, either to verify results or to approach the issue from different perspectives.

- **Responsibility for Selecting Analytical Tools**. Within each state, subbasin planning is being organized in response to its unique situation, and it is inevitable that administrative and technical approaches will differ across state lines. It is not, therefore, possible to make a blanket statement about who has the authority to make the decision on the use on analytical tools. In general, the subbasin planning team within a given subbasin will decide which analytical methods and tools to employ; however, this is subject to review by and consultation with level 2 coordination groups. Level 2 groups typically exert influence over methods used by level 1 planners by virtue of (1) having responsibility for technical approval of contracts and products, and (2) being in a position to provide technical support. Regardless, within each state there must be an identified process for making decisions on the use of analytical tools and other similar issues. The level 2 group should assume responsibility for ensuring that such a process is in place.

- **Standards**. Once completed, subbasin plans will be subjected to review through a Council-sponsored process involving, at a minimum, the Independent Science Review Panel (ISRP). In addition, in subbasins containing federally listed threatened or endangered species, plans will likely be integrated with Endangered Species Act (ESA) recovery plans being prepared under the direction of the U.S. Fish and Wildlife Service (FWS) and NOAA Fisheries (NOAA). These plans may, therefore, be subjected to additional scrutiny related to ESA requirements. Because it makes obvious sense that standards for both Council Fish and Wildlife Program and ESA reviews be consistent, the Council staff will compile all existing information on ISRP and ESA standards and make this available to subbasin planners. Staff will also work with the ISRP, the FWS, and NOAA to provide further clarification on the standards that each will use and will seek to ensure that there is consistency between these standards. The discussion of standards is broader than the limited scope of this paper. However, to the extent that the selection of analytical tools has a bearing on the quality of the assessment, there is a direct link and planners should be mindful of these standards when considering the use of analytical tools.

  Regarding the use of individual analytical tools, it is the Council staffs' understanding that the Council, the IRSP, and, in the case of ESA-related issues, the FWS and NOAA are more concerned that the products be of high quality and well documented than that planners use any particular analytical tool. Should they have questions concerning whether a specific analytical approach will meet ISRP or ESA recovery standards, subbasin planners are encouraged to bring these to the attention of Council staff, who will seek clarification.

- **Products**. Irrespective of the tool(s) selected, the resultant products should be a series of assessment findings that are consistent with guidance provided in Council's *Technical Guide for Subbasin Planners*. While analytical procedures may vary between species groups, the final products are the same. For each focal species,[2] products should include (1) the biological status of each population, (2) the life history of the population, (3) the relationship between the population and its environment, (4) the factors that limit productivity, and (5) the geographic areas where productivity can be sustained and/or increased through actions aimed at protection or restoration.

- **Documentation**. Irrespective of the tool(s) selected, planners should follow accepted scientific protocol for describing and documenting data and analytical procedures used to produce biological assessment findings and preserve and make available all applicable data, analytical findings, technical reports, and documentation.

- **Use of Data**. Assessments should be built upon a foundation of quantitative measures. Quantitative data should be used to characterize both the fish and wildlife resources (using such measures as abundance, productivity, and distribution) and the physical environment that support these species. Data

[2] The focal species concept is discussed later in this paper. See the Council's *Technical Guide* for a complete explanation.

availability varies across subbasins and deficiencies exist, to one degree or another, in all subbasins. Assessments should make use of the best *available* data. Data used in the assessment should be well documented, and deficiencies should be clearly identified. It is important to note that, while essential, the compilation of data does not, in and of itself, constitute an assessment. As suggested earlier, assessment involves synthesizing and interpreting data to draw inferences concerning the status of the environment and its implications for future management actions.

- **Information Access and Archive**. The Council is committed to ensuring that important material prepared through subbasin planning are preserved and made accessible for future use. The Council has designated the StreamNet Library to assume this responsibility. The Library is managed by the Columbia River Inter-tribal Fish Commission (CRITFC) and is located in Portland, Oregon. The Council will work with the StreamNet Library and state subbasin planning coordinators to develop procedures for transmitting germane material. Although more specific information will be provided at a later date, planners should retain copies of all important source materials -- especially gray literature and data sets that are not readily available outside of the local area -- and final products, including spreadsheets and databases, spatial data, technical reports, and final plans. There is no requirement that these products adhere to standard data exchange protocol or be in a specific format, but there is a strong preference for materials in electronic format.

  Planners have considerable leeway concerning how – or if – they store and provide access to materials generated through development of subbasin plans within their subbasin or state. Many may simply wish to delegate this to the StreamNet Library as described above. Others may see value in archiving materials locally or at the state level (this would be *in addition to* the regional archive at the StreamNet Library). In this case, it will be important to coordinate with the StreamNet Library in order to increase efficiency and reduce redundancy.

- **Differences Among Species**. While consistency in analytical approach and assessment products across species is desirable and something to strive for, it is important to recognize that there are significant differences in the behavior and biology of the various species groups. There are also differences in management emphasis and the availability of biological data. These distinctions are particularly pronounced between wildlife and fish, though there are also distinct differences between resident fish and anadromous fish, and even between individual anadromous or resident species. In selecting and applying analytical tools, planners should take into account these variations. Often this will mean the use of different analytical tools for different groups of species.

- **Consistency Across Subbasins**. In selecting analytical tools and assessment methods, planners must recognize that assessment results will be used for applications at scales larger than the subbasin, including: (1) provinces, (2) salmon and steelhead evolutionarily significant units (ESU), (3) bull trout planning units and distinct population segments (DPS), and (4) for salmon and

steelhead, the anadromous zone of the Columbia River Basin. Accordingly, planners should seek to employ analytical tools -- and develop products -- that are compatible with those in other subbasins. As a general rule, the ecological province is an appropriate geographical unit within which to seek consistency, as this unit is a central unifying concept for all Fish and Wildlife Program activities. Further, bull trout planning units are consistent with province boundaries, as are most ESUs. In those instances where the ESU straddles two provinces, or states, planners should attempt to apply consistent anadromous fish assessment methods throughout the ESU. While consistency in analytical approach throughout a province is desirable, there may be situations where, for any number of reasons, this is not possible. Therefore, consistency across subbasins is *not required*, although it is *strongly encouraged* – particularly within a given province.

- **Province-level and Multiple Subbasin Analysis**. There may be situations where an economy of scale can be achieved by applying analytical tools at the province or some other multiple subbasin level. This is particularly the case with wildlife. Planners are encouraged to consider multiple-subbasin assessment opportunities that could result in cost savings and/or increased consistency, especially if this can be accomplished without sacrificing the quality of the product.

- **Professional Judgment and Qualitative Assessment Techniques**. There may be occasions where planners in a given subbasin conclude that no existing analytical tool or method will serve their purpose, either because the tools do not fit the application or because of time or resource constraints. In these instances, planners may elect to use professional judgment. (The 2000 *Template for Subbasin Assessment* referenced the use of "opinions of local fish managers" as an analytical tool. In this paper we use the broader and more generic term "professional judgment." Others may prefer to use the term "expert opinion." For this purpose they are synonymous. Use of professional judgment is often criticized for being subjective and lacking consistency. Employing what we will call -- for lack of a better term -- a "structured qualitative assessment" can minimize these problems. A structured qualitative assessment is a systematic and objective assessment of population status and/or species habitat relationships that relies principally on existing local professional knowledge and judgment but that "structures" the process by: (1) following a logical and replicable sequence, (2) using the best available quantitative data as the basis for decisions, (3) generating a product that is similar in form to products resulting from other more quantifiable approaches, and (4) documenting the decision process. In the resident salmonids section of this paper, there is a discussion of an analytical tool that seeks to use professional judgment to characterize species-habitat relationships.

  It is important to remember that, regardless of the analytical tool(s) selected, professional judgment will play a part in all assessments, if only to validate ("ground truth") the results of more quantitative approaches.

- **Integration of Fish and Wildlife Assessment Results**. Assessment products should be constructed such that they can "stand alone" for a given species or be aggregated into a larger ecosystem framework. There are potentially several

levels at which assessments for individual species might be aggregated, the main ones being: (1) species groupings, i.e., anadromous fish, resident fish, or wildlife; (2) multiple species across groups; and (3) the overall ecosystem.[3] Stand-alone products for a given species will be particularly useful in providing input into ESA recovery plans. Indeed, if subbasin assessments and plans are to be used in recovery plans, it is *essential* that species-specific assessments be employed in those subbasins inhabited by listed steelhead, salmon, or bull trout populations. In the final analysis, however, subbasin plans must consider multiple species and broader ecosystem implications. Subbasin plans should, in particular, be able to identify: (1) locations where the needs of multiple species might be served by the same set of strategies and actions, and (2) locations where potential strategies and actions might benefit some species while harming others. Specific guidance on how to aggregate assessment findings into a multiple-species framework has not been developed and is beyond the scope of this paper. It is proposed that the Council staff work with subbasin planners to develop technical guidance on this subject.

- **Development of New Analytical Tools**. Subbasin assessment and planning funds are limited. These funds should be used for assessment and planning, not for the design and testing of new analytical tools.

- **Major Components of an Assessment**. Two important factors form the basis for a fish and wildlife assessment: 1) population status, and 2) species-habitat relationships. Different analytical tools are typically employed to assess each factor. In the following sections population status and species-habitat relationships are therefore dealt with separately.

ASSESSING ANADROMOUS SALMONIDS

- **Focal Species**. The Council's *Technical Guide* recommends using one or more focal species as a means to focus biological assessments. (The *Technical* Guide defines a focal species as a fish or wildlife species that has special ecological, cultural, or legal status and that can be used to evaluate the health of the ecosystem and the effectiveness of management actions.) In subbasins with an anadromous species that is listed as threatened or endangered under the ESA, it is strongly recommended that the listed species be identified as a focal species. While this may have merit in its own right, it also provides a mechanism for coordinating subbasin planning with recovery planning.

- **Population Status**. For ESA listed stocks, the NOAA Fisheries-sponsored technical recovery teams (TRTs) will, in some cases, take the lead in determining tools and methods for defining populations and determining the status of populations with regard to abundance, productivity, diversity, and spatial structure. The TRTs will also usually take the lead in conducting population status assessments. Level 2 teams should coordinate with the TRTs to determine if this is the case in their area. In cases where TRTs are working on population

[3] As will be discussed later, the IBIS (wildlife) methodology takes a multi-species perspective. This is not typically the case for fish assessment tools, which more often focus on individual species.

status the role of the subbasin planning team is to: (1) participate in these assessments as appropriate, (2) review results, and (3) integrate findings into subbasin assessments and plans. To make this effective, TRTs and subbasin planners will need to keep in close communication concerning schedules and methods to ensure that TRT products are available when needed for input into subbasin plans.

Subbasin planners should not be constrained by the TRT process if they can produce products at finer resolution or need products sooner than can be developed through the TRT process. In these instances, however, consultation with the appropriate TRT is still advisable. For non-listed stocks, subbasin planners should follow the same procedures used by the TRTs whenever it is practical to do so. Otherwise, they may use other applicable analytical tools and/or conduct a structured qualitative assessment, as described earlier, that relies on available data and best professional judgment.

- **Species-Habitat Relationships**. As described in the Council's *Technical Guide for Subbasin Planners*, analytical tools for assessing species-habitat relationships for anadromous salmonids should: (1) consider anadromous populations over the entire life cycle, (2) consider the response of anadromous populations to environmental factors, and (3) present findings in terms of accepted biological measures, i.e., abundance, productivity, diversity, and spatial structure. Analytical procedures that have been proposed for assessing species-habitat relationships for anadromous salmonids include BBN, CART, SWAM, EDT, and professional judgment.

  BBN and CART. BBN and CART are analytical tools that were used by the U.S. Forest Service/Bureau of Land Management team to prepare several of the environmental datasets for the Interior Columbia Basin Environmental Management Plan (ICBEMP), which covered all areas in the Columbia Basin east of the Cascade ridge. BBN and CART are general analytical tools that the study team adapted for use in the ICBEMP project.[4] The ICBEMP versions of BBN and CART were designed specifically for that purpose. They are *not* off-the-shelf software packages that can be easily transportable to other applications such as subbasin planning. This does not mean that they are not applicable to subbasin planning, only that planners desiring to use these tools will need expertise in developing – and adapting – analytical tools. Even if planners do not plan to use these tools, they may wish to consult datasets developed through ICBEMP.[5] It must be understood that ICBEMP analyses and data development were conducted at a broad (landscape) scale. Planners may find that this resolution is too coarse

[4] For a description of BBN modeling as used in USDA Forest Service species assessments, see Marcot et al. (2001). A preprint manuscript is available at http://www.spiritone.com/~brucem/bbns_ms.htm. One commercial vendor that sells a BBN modeling shell called Netica is Norsys, Inc. Information on BBN can be found on the Norsys web site at www.norsys.com/netica.html. ICBEMP products prepared using BBN and CART can be accessed through www.ICBEMP.gov. Click on "Spatial Data" and then "Information" and scroll to "Available Theme Groups." Scroll to "EIS Directions and Outcomes Group" and look for "SEIS Aquatic Effects Analysis Database." Also see related spatial data products.

[5] In the "Available Theme Group" described in the previous footnote, see especially the EIS Directions and Outcomes Group, the Species Group, the Hydrologic Group, and the Fisheries Group.

to be of much use at the finer scales that will predominate in subbasin planning. These datasets will, however, be very useful for reconnaissance, particularly for placing a subbasin within the larger regional context.

SWAM. SWAM offers a means to explore relationships among anadromous salmonid abundance, landscape characteristics, and land use patterns. For a description of SWAM, see Pess et al, 2002. SWAM was developed by the NOAA Fisheries NW Science Center and has been applied in five Columbia Basin subbasins: the John Day (chinook and steelhead), the Salmon (chinook), the Wenatchee (chinook), the Willamette (steelhead), and the Yakima (chinook). These analyses were performed at a landscape scale; more specific analyses are possible for applications demanding a finer resolution but are not planned at this time. NOAA Fisheries is in the process of devising mechanisms for making SWAM results available to subbasin planners and is prepared to apply the methodology in additional subbasins, contingent on interest and resources. The Council staff urges planners to make use of SWAM results in all subbasins where these are available. Subbasin planners who have interest in SWAM analyses in other subbasins should contact the Council or SWAM developers at the Science Center.

EDT. EDT is the tool that most closely conforms to the three criteria identified in the first paragraph of this section. Coarse-scale EDT analyses have been conducted for all Columbia Basin provinces within the anadromous zone. See www.edthome.org for a description of EDT and to gain access to coarse-scale results. While potentially useful for reconnaissance, EDT coarse-scale results are more applicable to a provincial scale. While these coarse-scale results may prove informative to subbasin planners, analysis at a subbasin scale will normally require more detailed data and analysis. The application of EDT at a scale useful for subbasin planning requires commitment on the part of planners, particularly in the development of the necessary environmental datasets. It will be up to planners to determine the appropriate level of resolution for EDT analysis based on unique circumstances within the subbasin such as the size of the subbasin, the availability of data, the number of distinct populations, and other factors. EDT is being considered in most, if not all, Oregon and Washington anadromous zone subbasins. The Council staff recommends use of EDT in subbasins where necessary resources are available and encourages collaboration at the provincial level in order to produce products that are consistent throughout the province. A province-wide approach also offers economies of scale.

Professional Judgment. A final possibility is to rely on professional judgment as described earlier in the Recommendations Applicable to All Species Groups section. The Council and Mobrand Biometrics have been working on developing a structured format for applying professional judgment to resident salmonid-habitat relationships. (See the section on Resident Salmonids, below.) This procedure may also be applicable to anadromous salmonids, especially if other methods are unavailable or if time and staff resources are limited.

Planners should recognize that each of the analytical tools discussed above looks at reality from a different perspective, i.e., these tools are not interchangeable.

Ideally, planners will make use of a variety of tools, including both quantitative methods and professional judgment. For example, planners may initially wish to use existing BBN and CART products to focus attention on the unique qualities of the subbasin as compared to others in the province and then proceed to other tools. In those subbasins where SWAM products are available and where EDT is being applied, planners may wish to make use of both products. It would, for example, make sense to use SWAM to inform the EDT analysis and, following EDT analysis, to compare EDT and SWAM results. Planners may, at their discretion, use other tools that accomplish similar objectives as long as methods are adequately described and documented.

- **Relationship to Other Species**. While subbasin assessment teams in subbasins with anadromous fish will undoubtedly spend considerable time on these species, it is important to remember that these subbasins also have resident fish and wildlife and that assessments should also address these other groups of species. Ecological relationships between anadromous salmonids and other species should also be considered. A salmon-wildlife module is included in the IBIS methodology to assist with this.

- **Out-of-Subbasin Conditions**. The Fish and Wildlife Program references the need for subbasin plans to take into account biological constraints on the survival of migrating fish after they leave their natal subbasin. For anadromous fish, factors that may affect survival beyond the natal subbasin include mainstem, estuary, and ocean conditions, ocean and inriver harvest, and interactions with other populations and hatchery fish. Out-of-subbasin conditions might be treated in two basic ways. First, planners in each subbasin could develop their own set of assumptions concerning mortality outside of the subbasin. Second, planners in the various subbasins with anadromous populations could all use the same set of assumptions, with adjustments made to account for the position of the subbasin in relationship to mainstem dams. The Council staff concludes that there are significant advantages to a consistent set of assumptions. While there would be an economy of scale by only considering this issue once (instead of the thirty-plus times that would be required if addressed at the subbasin level), the most persuasive reason is that this approach would promote consistency in findings across subbasins.

  With this in mind, the Council intends to work with agencies and tribes from the anadromous portion of the Columbia Basin to expeditiously develop a set of "parameter estimates" that would characterize the survival of anadromous fish populations in relation to the various environments and conditions that anadromous salmonids encounter from the time they leave the natal subbasin to the time they return. The intent is to generate a product that works for both subbasin planning and subsequent recovery planning. Parameter estimates should, therefore, take into account applicable information from NOAA's Federal Columbia River Power System Biological Opinion. In the event that a regionally consistent set of parameter estimates is developed -- and agreed to by applicable agencies and tribes -- subbasin planners should use these numbers to evaluate overall survival. While use of these regionally consistent parameters is strongly

encouraged, planners should feel free to explore alternative survival scenarios using other parameter estimates as long as (1) methods and data are well documented, and (2) findings using regionally consistent parameters are also presented. Should regionally consistent out-of-subbasin survival estimates not be available, subbasin planners may use estimates of their choosing, taking care to adequately describe and justify all estimates and assumptions.

ASSESSING RESIDENT SALMONIDS

- **Focal Species**. The Council's *Technical Guide* recommends using focal species as a means to conduct biological assessments. At least one resident fish species should be included as a focal species, regardless whether there are anadromous fish present. Bull trout, in particular, should be used as a focal species as these fish are listed as threatened under the Endangered Species Act and this will provide a means to interface with recovery planning for that species. Planners may also wish to designate additional resident salmonids as focal species.

- **Population Status**. Population status may be determined using a variety of tools or techniques. Quantitative population assessment is preferred but may be limited by the lack of appropriate tools. In this case a structured qualitative assessment that relies on the best available data and professional judgment may be appropriate. For bull trout, the most recent technical information on population delineation and status can be found in the recently released bull trout recovery plan, which also identifies population levels necessary to achieve recovery and factors that limit bull trout productivity. The plan may be accessed at www.pacific.fws.gov/bulltrout/.

- **Species-Habitat Relationships**. The available tools for assessing resident salmonids-habitat relationships are similar to those available for anadromous salmonids. ICBEMP CART and BBN analysis and products are the same as described earlier for anadromous fish. While SWAM was developed with anadromous fish in mind, and has only been applied to salmon and steelhead, the method would also theoretically work with resident species as well.

  Likewise, EDT was originally developed for anadromous fish, but it has been adapted for resident salmonids on at least one occasion. The major prerequisite to using EDT for resident salmonids is the availability of "biological rules" that are specific to each resident species. Preliminary biological rules are available for cutthroat and rainbow/redband. While preliminary, these are at a point where they can be applied to subbasin planning. Rules are also being developed for bull trout and should be available for use in subbasin planning. While planners are free to use EDT to assess resident salmonids-habitat relationships in any subbasin, the Council staff recommends that use of EDT for resident salmonids focus on those subbasins where (1) there is a commitment to developing (or securing) the necessary expertise and (2) there is adequate data and staff resources to create the necessary environmental datasets. Use of EDT for resident salmonids should be especially considered in subbasins where EDT is already being used for anadromous fish, as the necessary expertise will be in place, and environmental

datasets will already have been created. Using EDT for both anadromous and resident salmonids in the same subbasin will also help bring about consistency across species. For subbasins with resident populations upstream of anadromous populations, the issue of whether or not to include resident salmonids should be discussed early on, because this will affect the strategy for developing environmental datasets. If EDT will only be used for anadromous fish, there is less need to create datasets for areas upstream of the anadromous zone. However, if headwater resident fish are to be part of the EDT analysis, planners will want to develop the datasets for the entire subbasin.

For any number of reasons, professional judgment will often be the tool of choice for assessing resident salmonid-habitat relationships, especially outside of the anadromous zone. Recognizing this, the Council has collaborated with Mobrand Biometrics to develop a format for structuring a professional judgment assessment. This tool, coined "Qualitative Habitat Assessment Method" (QHA), is essentially a spreadsheet that correlates stream segments (or small watersheds) with important population and habitat factors. The QHA provides a systematic means to record data and make qualitative decisions concerning the relationship between environmental attributes and species survival; it also provides the opportunity to record the confidence level of all data entries. QHA was designed to conform to existing assessment guidelines and to serve as a jumping-off point for more rigorous quantitative analysis, either as a component of subbasin planning or as a future exercise. Although this tool is a simple, low-tech approach, its use could be streamlined further through development of an automated electronic data entry mechanism. This could be considered if there is sufficient interest.

At their discretion, subbasin planners are free to devise their own method of qualitative assessment; however, for reasons of both efficiency and consistency the Council staff recommends that planners contemplating the use of professional judgment as the primary tool for assessing species-habitat relationships consider use of the QHA tool described above. While developed for resident salmonids, this tool could potentially be adapted to other resident or anadromous fish. It is anticipated that a similar tool will not be needed for wildlife, as other available tools should work throughout the Basin.

- **Tools for Assessing Relationships Between Fish and Large Lakes and Reserviors**. While a variety of analytical tools exist for modeling hydrologic processes in lakes and reservoirs, fisheries biologists working in subbasins with large lakes and/or reservoirs have suggested that there is a need for better procedures to assess the relationship between resident salmonids and lake/reservoir habitats. Within the confines of subbasin planning, there is neither the time nor the money to develop new quantitative tools for this purpose. There are, however, two near-term options. First, it may be possible to develop a simplified procedure for integrating lake/reservoir habitat analysis into EDT. Second, it may be possible to adapt the QHA procedure described above for use with lakes. Planners with an interest in this should contact the Council.

- **Out-of-Subbasin Conditions**. The migration patterns of resident salmonids differ markedly from those of anadromous fish, but these fish do at times migrate outside of their natal subbasin. Recent evidence indicates that this is particularly so with bull trout. In those cases where a resident species migrates beyond the subbasin, planners should consider the environmental conditions of the mainstem and other factors (e.g., harvest and competition) that might influence survival outside of the subbasin. Given the wide variety of effects that can be anticipated and the uniqueness of these effects for each species and subbasin, the Council staff concludes that developing a consistent set of out-of-subbasin assumptions for resident fish is not warranted at this time. Rather, it is proposed that each subbasin planning team develop their own assumptions for out of subbasin mortality to that subbasin's resident fish. The only requirement is that these assumptions be described and documented in the subbasin plan. There may be situations where a consistent approach between two or more subbasins (or all subbasins within a province) is warranted. In these situations, planners are encouraged to collaborate with neighboring subbasins. If subbasin planners are interested in developing a Basin-wide approach to this issue, please contact Council staff. Otherwise, it is assumed that planners can proceed independently with development of out-of-subbasin assumptions as per above.

ASSESSING OTHER ANADROMOUS OR RESIDENT FISH

Although much of the proceeding discussion is applicable to non-salmonids as well as salmonids, at times planners may decide to treat non-salmonids differently from salmonids. This section is included to highlight issues that are specific to non-salmonids.

- **Focal Species**. Subbasin planners may elect to designate non-salmonid fish species as focal species *if* they conclude there is merit in doing so. As with other species, criteria that should be considered include: (1) being designated as a federal endangered or threatened species, (2) being designated or recognized as being local sensitive, (3) having special cultural significance, or (4) having special ecological significance.

- **Assessment Strategy**. Assuming that there is not the same need for regional consistency for non-salmonids as for salmonids, planners can use individual discretion in selecting applicable tools for characterizing population status and species-habitat relationships. For species listed as threatened or endangered species, such as Kootenai River sturgeon, or other particularly sensitive species such as burbot and lamprey, specialized tools, methods, and/or analytical results may already be in place; planners are encouraged to use these existing methods and results whenever possible. EDT would be an option if species-specific rules existed and an effort has begun to develop EDT rules for sturgeon. If interest in using EDT proves to be significant, the Council staff will work with interested parties to try to develop an appropriate strategy. Where appropriate analytical tools do not exist, planners should perform a structured qualitative assessment that relies on available data and professional judgment.

ASSESSING WILDLIFE

- **Focal Species**. The Council's *Technical Guide* recommends using focal species as a means to conduct biological assessments. Whereas fish assessment models focus on individual species, and are therefore compatible with the focal species concept, IBIS considers multiple wildlife species. If IBIS or similar multi-species methods are used for wildlife assessment, this can be considered an acceptable alternative to focal species assessment. Regardless of whether they use IBIS, planners may, at their option, consider one or more focal wildlife species. This would be particularly appropriate where there is an individual wildlife species that should receive special consideration in the management plan, for example, a listed endangered or threatened species, a species with high ecological or cultural significance, or a species that is subject to special management. At a minimum, a list of wildlife species present in the subbasin should be produced, highlighting species that fall within any one of these classifications.

- **Population Status**. Abundance and productivity data are typically not collected except for a few select wildlife species. Due to this lack of data, population status assessment is not viewed as an essential element of the wildlife assessment in all subbasins. Rather, assessments should focus on species-habitat relationships. There may, however, be situations where local issues suggest a need for the assessment to include population data and/or population status analysis for a particular species. A good example is the presence of an endangered or threatened species that has been designated a focal species. Where population data and/or quantitative analytical findings exist from readily available sources for a focal species, and where these are directly relevant to local issues, they should either be included in the plan or cited.

- **Species-Habitat Relationships**. The Council has collaborated with a team of Columbia basin wildlife biologists involved in subbasin planning to develop a paper, *Technical Guide for Developing the Wildlife Elements of a Subbasin Plan*, that describes procedures for conducting wildlife assessments. That paper is available at www.subbasins.org.

  The wildlife *Technical Guide* recommends using of IBIS as the primary tool for assessing wildlife species-habitat relationships. IBIS is a suite of tools and databases specifically designed to assess species-habitat relationships. IBIS provides information on habitats, species, and key ecological functions, and how these have changed from historic to current times. IBIS datasets cover the entire Columbia Basin. More information about IBIS is available at www.nwhi.org. The wildlife *Technical Guide* also describes how SITES, an analytical tool developed by the Nature Conservancy, might be used in conjunction with IBIS. SITES is an eco-province planning tool that delineates potential conservation areas or protected areas using broad-scale ecological and demographic data. The Nature Conservancy has developed a series of environmental datasets for use with SITES.

While the Council staff believes that the wildlife *Technical Guide* provides excellent guidance and recommends that subbasin planners follow procedures described in that paper, there is no requirement to do so. Planners are free to use other available tools to augment IBIS and SITES or as alternatives if they produce similar results. As always, planners using alternative methods should describe these methods in the subbasin plan document.

SUMMARY TABLE

The following table summarizes recommendations provided for each species group.

	Focal Species	Population Status	Species-Habitat
Anadromous Salmonids	Especially for T&E and culturally significant species.	TRT lead for T&E species.	EDT recommended, complement with SWAM where available. Use ICBEMP CART and BBN products for regional context.
Resident Salmonids	Especially for T&E and culturally significant species.	Various methods including structured qualitative assessment. For bull trout, consult recovery plan.	Use QHA or similar professional judgment technique or EDT. Especially consider EDT in subbasins where EDT is being used for anadromous fish. Use ICBEMP CART and BBN products for regional context.
Other Resident or Anadromous Fish	Especially for T&E and culturally significant species.	Various methods. Use existing procedures where available.	Methods will vary by species and location. Use existing procedures where available. Use ICBEMP CART and BBN products for regional context where available.
Wildlife	At a minimum prepare species list and highlight T&E, ecologically significant, and/or culturally significant species.	Mainly applicable to T&E species and other species with special significance.	Follow procedures described in wildlife technical guide. Use IBIS as foundation for assessment.

LOOKING AHEAD

- **EDT Development**. To advance the region's capacity to assess resident fish-habitat relationships, the region should proceed to build capacity for applying EDT to resident salmonids. There are two components:

  a) Continue to develop resident fish rules. Currently, preliminary EDT rules are available for cutthroat trout and redband/rainbow trout; rules are being developed for bull trout. The idea of applying EDT procedures to other resident fish species, especially sturgeon, is being investigated. Rule development for resident fish should continue. Work is also needed to depict the relationships between the various life stages of resident fish and large lakes and reservoirs.

  b) Conduct prototype studies. Opportunities should be identified for conducting prototype EDT analyses for resident fish, either as a component of subbasin planning or as a parallel effort. Work is also needed to integrate EDT with resident fish population modeling and long-term biological monitoring.

- **SWAM Development**. SWAM analysis has been conducted for five Columbia Basin subbasins. Similar analysis should be undertaken for other subbasins within the anadromous zone. Conducting a similar subbasin-level analysis for a resident salmonid species would appear to be an excellent project for an enterprising graduate student.

- **Model Development and Integration**. The Council should work with the ISAB, the ISRP, and those in the region involved in development and application of biological models and analytical procedures to: (1) increase communication between developers, (2) evaluate the technical sufficiency of models and procedures, (3) propose future directions for model design, and (4) integrate analytical efforts to better meet the overall needs of the Region.

- **Data Integration**. Over the past year, the Council and NOAA Fisheries have co-sponsored an effort to look at the issue of regional data development and management; recommendations are expected this spring. Biological assessment and analysis will be primary beneficiaries of a regional data strategy, and the needs of assessment and analysis should, therefore, be considered in the development of data recommendations. In the long-run, efforts should be made to maintain communication between data management and analysis activities in order to anticipate what data will be needed for analytical purposes and to ensure that analytical exercises fit within a regional data structure.

- **Connecting Analysis to Biological Monitoring and Evaluation**. The Fish and Wildlife Program calls for the development of subbasin-level and system-wide monitoring and evaluation plans. The Council should work to ensure that analytical tools are developed and applied in ways that complement and support M&E, both in terms of the results they produce and the design of strategies for using analytical tools in monitoring and evaluation.

COMMENTS AND CLARIFICATION

If you have comments on this paper or desire additional information or clarification, please contact level 2 coordinators or Drew Parkin, Council consultant, at Drew_Parkin@msn.com.

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