Appendix B: EDT Applications and Use in the Upper Cowlitz Cispus Habitat Strategy

Introduction

The purpose of this document is to provide supporting details to the Upper Cowlitz Cispus Habitat Strategy regarding the use of the Ecosystems Diagnosis and Treatment (EDT) model output. This document develops context around EDT applications, model development, and evaluation of the results.

EDT Applications

EDT modeling informs restoration and protection priorities in the Regional Habitat Strategy for the Lower Columbia River region. With so many salmon and steelhead populations spread across such a wide area, it is difficult to find fish and habitat information that aligns in methods and timeframes across the region. A lack of standardization makes it difficult to assess priorities across and within watersheds. This is especially an issue in watersheds where populations are extremely limited in numbers and distribution, such as the Upper Cowlitz and Cispus spring Chinook, coho, and winter steelhead populations. These populations are in the recolonization phase, and e contemporary available data sets may provide more information on opportunistic fish use of habitat rather than pinpoint the highest quality habitat to support productive populations. EDT modeling can support assessment of fish use within watersheds by modeling potential fish behavior under different environmental scenarios, and by incorporating information from a variety of sources, such as past field survey data, modeled fish behavior and habitat conditions from similar systems, and expert opinion. In the case of the Upper Cowlitz and Cispus watersheds, EDT is one of the most comprehensive assessments we have, as current and historical data sets are often patchy in spatial coverage, limiting conclusions to fish presence rather than relative productivity across all habitat. The Upper Cowlitz Cispus Habitat Strategy builds on EDT information developed by Tacoma Power specifically for the Upper Cowlitz and Cispus watersheds, by reviewing EDT results in the context of other fish use and habitat condition information as well as watershed processes, as summarized in the Habitat Strategy Report, and applying all of this information to recommended habitat actions. This approach recognizes the limitations of EDT, and augments its application with other available information and data.

Species Reach Potential (SRP) ratings are assigned for stream reaches based on the estimated population response if habitat is restored and protected in a particular reach relative to all other reaches in a watershed. These ranking values represent the coarse-scale priority of restoring or protecting a stream reach, and do not capture the full picture of habitat restoration and protection considerations. For example: they do not consider the feasibility of restoring or protecting habitat, what the population performance response may be if some (versus all) habitat in a reach is protected or restored, nor the relationship of habitat conditions and watershed processes across stream reaches unless these linkages were specifically considered during the development of EDT habitat attributes. However, they do help identify stream reaches to consider for future review and potential habitat work. Watershed assessments like the Habitat Strategy help pick up where

EDT outputs leave off by reviewing EDT within the context of landscape processes, other modeling or empirical fish use information, and habitat condition information such as levee locations, historical beaver pond complexes, and results from field surveys. This additional context allows technical teams such as the Upper Cowlitz Cispus work group to develop more specific habitat actions to support salmon and steelhead recovery that are not possible to glean from relying on just the Regional Habitat Strategy information, which is in part based on EDT.

EDT Methods

The Recovery Plan includes details on EDT model methods, assumptions, and validation work where Washington Department of Fish & Wildlife (WDFW) and the Lower Columbia Fish Recovery Board (LCFRB) led EDT development efforts (Volume III, Appendix E, Chapter 6 and Chapter 7). Detailed descriptions on EDT methodology can also be found in Lestelle et al., 1996, Lestelle and Mobrand, 2005, and Blair et al., 2009.

EDT models can be developed using a variety of data sources, which is both a strength of the model and a weakness. This approach allows for modeled conditions to be analyzed when there is limited existing data for the stream reach of interest, but it can also result in coarse-scale assumptions about habitat conditions and fish behavior to be applied to fine-scales, leading to less than precise predictions. To increase the quality of information and confidence in a built EDT model, it is recommended that local experts attend workshops to discuss model inputs and results (Lestelle et al., 1996). Workshops took place in the Lower Columbia region, led by the agencies that developed the models. For full transparency, the Recovery Plan includes details on data sources and model assumptions where WDFW and LCFRB led the EDT model process (see Volume III, Appendix E, Chapter 7). A Fisheries Technical Team led by Tacoma Power was convened to review risks/benefits modeled by EDT from different Cowlitz River Hydroelectric Project relicensing alternatives (Cowlitz River Fisheries Technical Team, 1998). However, concerns have been raised regarding the quality of information used to develop the EDT model, and thus EDT results, as well as transparency in model analysis.

Documentation from the Upper Cowlitz EDT model development process includes the data sources for each attribute value for current conditions (Patient) and historical conditions (Template) model runs for the 53 EDT stream reaches in the Upper Cowlitz and Cispus subbasin (Upper Cowlitz Data Documentation provided by Tacoma Power, dated January 4, 2007). Environmental Attributes for the Patient scenario were primarily populated using empirical observations (28%) and expansion of empirical observations (38%), with 28% of attributes populated based on derived information and 6% based on expert opinion. Attributes populated based on expansions of empirical observations appear to be developed by applying attribute ratings for similar systems (i.e. other tributaries in the Upper Basin), photos and aerial imagery of the basin, topographic maps, known infrastructure locations and land use (i.e. campgrounds, roads, and bridges as well as harvest locations), and local reports and data sets (i.e. Harza report, Cowlitz Falls Study, USFS and Ecology reports). Some empirical observations are not referenced (i.e. “brook trout have been found in drainage” and “agriculture has changed riparian habitat dramatically”), making it difficult to assess the quality of data inputs. Some of the attributes relying on expert opinion are referenced though, including information from watershed analyses conducted by the USFS. Ratios and data sources are similar for the Template scenario: 39% of attributes are populated based on expansions of empirical observations, while 28% are based on derived information, 27% from empirical observations, and 6% based on expert opinion.

Evaluation of EDT

Sensitivity analyses of EDT assess the degree to which model results change when different inputs are adjusted. In general, sensitivity analyses of EDT conclude that we can be confident in the relative outputs (i.e. more fish are produced in one stream reach or one watershed than another) from EDT, rather than the absolute estimates (i.e. the number of fish) (McElhany et al., 2010). However, it's also important to understand the sensitivity of EDT results to different attributes, and how these may be important to management questions in case separate analyses are necessary to information fish-habitat relationships (Steel et al., 2009). WDFW found that Puget Sound Chinook population performance inputs ranged in coefficient of variation from 3.5% to 10.5% when biologists with EDT experience were asked to estimate stream channel Environmental Attribute scores, suggesting that uncertainty in stream attribute variables does not necessarily lead to large uncertainties in population performance (Steel et al., 2009). WDFW also found from the same study that stream reaches identified as having high priority for restoration and protection actions were not influenced by the changes in stream attribute values, although reaches ranked as mid-priority or lower were affected, suggesting caution when applying these recommendations (Steel et al., 2009). When assessing model sensitivity to specific attributes, WDFW found that capacity estimates were most sensitive to uncertainty in habitat type attributes and productivity estimates were most sensitive to uncertainty in channel stability and sediment ratings. In reviewing the sensitivity of the Puget Sound model work as well as Yakima Basin modeling, macroinvertebrate diversity had negligible impact to model outputs (Steel et al., 2009). A sensitivity analysis was also conducted on EDT runs for East Fork Lewis River fall Chinook, Germany Creek coho, and West Fork Washougal River mainstem steelhead in the Lower Columbia River region (McElhany et al., 2010). Models were found to be insensitive to changes in habitat condition variables, although model outputs were sensitive to more coarse-scale constants such as adult survival parameters and life stage performance benchmarks under ideal environmental conditions, which may relate to the degree of confidence in these two different data sets (McElhany et al., 2010). As EDT outputs are primarily used to develop coarse-scale priorities for the Regional Habitat Strategy (i.e. the High, Medium, and Low SRP ratings), with fine-scale information considered in the context of other resources when available (i.e. limiting factor identification from EDT is reviewed along with new monitoring information and landscape-scale process trajectories), the LCFRB attempts to account for these sensitivity concerns when implementing the Regional Habitat Strategy.

Comparing modeled data to empirical information can help understand the accuracy and precision of predicting real world scenarios. EDT model results generated by WDFW and LCFRB were evaluated to ensure this comparison occurred (see Volume III, Appendix E, Chapter 6 of the Recovery Plan). Tacoma Power and its Fisheries Technical Committee also compared EDT results to empirical data. Modeled abundances were compared to historical population data for fall Chinook (Cowlitz River Fisheries Technical

Team, 1998). EDT modeling results estimated 5,143 fall Chinook adults (5,143 hatchery origin fish and 1,487 natural origin fish) could return to the Cowlitz River each year under current environmental conditions. This is a little lower than the most recently available data from the Cowlitz (1991 – 1995), which indicated an average of 6,891 total fall Chinook returned to the basin (range of 5,503 to 7,315 total fish). Variability in adult return data is likely due to changes in hatchery management, ocean conditions, harvest, and detection efficiency rates (Cowlitz River Fisheries Technical Team, 1998). Information was not found indicating comparisons were made for other species in the basin.

EDT in the Upper Cowlitz Cispus Habitat Strategy

EDT is one piece of information used by the Habitat Strategy work group to identify habitat priorities in the basin. EDT informs relative Regional Habitat Strategy priorities through the development of Species Reach Potential Ratings, a management application that is supported by sensitivity analyses (McElhany et al., 2010). Restoration and protection priorities identified through SRP ratings, as well as habitat limiting factors and life stage presence, are gleaned from EDT models to compare to and to be built upon by other fish and habitat resources, like historical fish survey information, local knowledge of quality habitat areas, field surveys, and how watershed processes at landscape (versus stream reach scales) may affect habitat conditions. The work group format allows for discussion on differences among these different resources when developing recommendations on priority actions for the strategy. Balancing these different resources allows project managers, work group members, and future habitat project sponsors to consider what is known, the source of information, and how different information relate to each other. Together, these resources support more fine-scale and up to date habitat action development than can be developed from relying just on EDT or other resources as standalone information sources.

References

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