

*Appendix H*

**Limiting Factors Crosswalk and Methodology**



# Appendix H

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### Background and Purpose

To facilitate the use of a common parlance in discussing limiting factors in all Northwest Region salmon and steelhead recovery plans, the NMFS Northwest Fisheries Science Center developed a standardized set of limiting factors (also known as ecological concerns) that affect salmon and steelhead (Hamm 2012; see Appendix G).<sup>1</sup> NMFS refers to this standardized list of limiting factors as a “data dictionary” and intends to use it to track and report on recovery plan limiting factors and actions regionwide.

For the Lower Columbia River ESU recovery plan, NMFS Northwest Region staff developed a set of limiting factor “crosswalk” tables that correlate population-specific limiting factor information from the Oregon, Washington, and White Salmon management unit plans (ODFW 2010, LCFRB 2010a, and NMFS 2011b) with the terms in the data dictionary. The crosswalk tables indicate the limiting factors that affect each population, as well as the life stage affected, the degree and location of the impact, and, in certain cases, uncertainty regarding data and whether limiting factors have been accurately identified. The crosswalk tables served as the basis for the summaries of stratum- and ESU-level limiting factors and threats in Chapters 6 through 9 of the Lower Columbia River ESU recovery plan.

This appendix presents the crosswalk tables and describes the methods NMFS Northwest Region staff used to develop them.

### Crosswalk Methodology

**Step 1:** *Developed “crosswalks” that correlated the limiting factor terms used in each management unit plan with the ecological concerns terminology of the NMFS data dictionary (Hamm 2012; see Appendix G) and made minor adjustments to the data dictionary as indicated below.*

To accomplish this, NMFS Northwest Region staff correlated limiting factor codes used in the management unit plans with ecological concern subcategories in NMFS’ initial data dictionary (which was limited to habitat-related concerns) by keying the data dictionary’s lists of “alternate terms” to terms used in the management unit plans. The Oregon management unit plan’s limiting factor terms (see Table 5-1 of ODFW 2010) correlated relatively directly with the habitat data dictionary’s alternate terms, although in some cases NMFS Northwest regional office staff added subcategories to the data dictionary to better reflect the level of specificity in the Oregon plan. (This was the case mainly for estuary limiting factors). The limiting factors described in the Washington management unit plan also crosswalked readily with the data dictionary’s ecological

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<sup>1</sup> For the purpose of the crosswalk tables, the terms “limiting factor” and “ecological concern” are interchangeable. The latter is perhaps a more appropriate term, but the former has become widely accepted through common usage and is employed throughout the Lower Columbia River ESU recovery plan.

concerns but were sometimes broader than the ecological concerns listed in the data dictionary (see Table 1 in Appendix E of LCFRB 2010a). Many of the terms used to describe limiting factors in the White Salmon management unit plan are the same as those in the Washington management unit plan (see Tables 5-2 and 5-3 in NMFS 2011b). The only adjustment needed in the crosswalks to accommodate the White Salmon populations was the addition of an ecological concern subcategory that specifically addresses excessive sediment issues associated with removal of Condit Dam.

**Step 2:** *Developed color codes to denote a limiting factor’s priority and the life stage affected.*

	Adult	Juvenile	A&J
Primary	X	X	X
Secondary	X	X	X

**Step 3:** *Completed crosswalk tables to display limiting factors for each population and applied color coding as indicated in Step 2.*

The Oregon management unit plan identified all limiting factors as either primary or secondary, so these categorizations were transferred directly from the Oregon management unit plan (ODFW 2010).

For Washington populations, NMFS Northwest Region staff worked with LCFRB staff and consultants to determine whether a particular habitat limiting factor should be designated as primary or secondary in the crosswalk. Washington habitat limiting factor information was drawn from the Washington management unit plan’s Ecosystem Diagnosis and Treatment (EDT) habitat factor analysis tables (see individual chapters of LCFRB 2010a, Volume II), which identified limiting factors as primary, secondary, or tertiary, and also from the impact percentages in the baseline impact tables in Chapter 6 of LCFRB 2010a, which identified population-level impacts for tributary and estuary habitat. In the crosswalk tables, baseline impacts of between 10 and 35 percent are classified as secondary, and any impact greater than 35 percent is classified as primary. Some professional judgment was required to populate the crosswalk tables for Washington populations. In addition, in some cases, LCFRB staff and consultants considered the EDT results highly uncertain. Limiting factors where this is the case are indicated in the crosswalk tables with a question mark, rather than an “X.”

For estuary limiting factors, NMFS Northwest Region staff assumed that all populations are subject to the same threats. Furthermore, because the Oregon management unit plan had integrated information from the *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead* (NMFS 2011a) with more specificity than did the Washington management unit plan, NMFS used estuary data from the Oregon plan to fill some gaps for Washington populations. Owing to the complex nature of estuarine habitat, the Oregon management unit plan relied on some general limiting factors to describe issues

that salmonids face in the Columbia River estuary. One of these “catchall” factors is “physical habitat quality (impaired habitat complexity and diversity, including access to off-channel habitats).” This limiting factor was used to provide a general sense of the overall conditions faced by all salmon populations in the estuary.

**Step 4:** *Incorporated draft data dictionaries for hydropower, harvest, and hatchery concerns developed by the NMFS Northwest Fisheries Science Center into the crosswalk tables.*

This resulted in a more comprehensive list of limiting factors, or ecological concerns. NMFS Northwest Region staff then correlated the management unit plans’ hydropower, harvest, and hatchery limiting factor terms to the relevant data dictionary terms and added a column to the crosswalk tables to display the threats associated with each of the ecological concern subcategories.

**Step 5:** *Populated the rest of population-level crosswalk tables (i.e., the hydropower, harvest, and hatchery rows) as described above.*

**Step 6:** *Developed stratum-level summary tables of limiting factors and incorporated them into Chapters 6 through 9 of the Lower Columbia River ESU recovery plan.*

The stratum-level summary tables organize the ecological concerns into six categories (tributary habitat, estuary habitat, hydropower, harvest, hatchery, and predation concerns), in most cases employing the broader ecological concern categories from the data dictionary, with a few exceptions where added specificity was desired (such as the case with peripheral and transitional habitats and direct mortality).

Because the stratum-level limiting factor tables are summaries, they do not include all the information contained in the population-level tables. NMFS selected ecological concerns for inclusion in the stratum-level limiting factor tables based on the severity and/or scope of impact on individual populations. For example, typically, only one or two populations in a given stratum experience the deleterious effects of obstructed passage because of the presence of a large dam, but those populations may experience these effects to a high degree. In this case, the ecological concern merits inclusion in the summary tables because of the severity of the impact, even though its scope is limited. The opposite may also hold true.