CHAPTER 14

INTRODUCTION TO THE

DESIGNATED CRITICAL HABITAT EFFECTS ANALYSIS

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14 INTRODUCTION

The National Marine Fisheries Services (NMFS) critical habitat analysis determines whether the proposed action is likely to destroy or adversely modify critical habitat for Endangered Species Act (ESA)-listed species by examining potential reductions in the conservation value of the essential features of designated critical habitat. “Destruction or adverse modification” means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat as a whole for the conservation of an ESA-listed species (50 C.F.R. §402.02).

In this section, NMFS evaluates the potential consequences to designated critical habitat from exposure to the stressors of the proposed action. Each risk hypothesis is based on primary biological features (PBF) and is evaluated across the entire species critical habitat. The critical habitat effects analysis concludes with our determination of the risk posed to all the PBFs taken together. In the integration and synthesis section (Chapter 16) we combine the effects analysis with the baseline status of the habitat and the cumulative effects to evaluate the potential consequences to designated critical habitat as a whole.

As described in the preamble to the updated regulations: “Consistent with longstanding practice and guidance, the Services must place impacts to critical habitat into the context of the overall designation to determine if the overall value of the critical habitat is likely to be appreciably reduced. The Services agree that it would not be appropriate to mask the significance of localized effects of the action by only considering the larger scale of the whole designation and not considering the significance of any effects that are occurring at smaller scales (see, e.g., Gifford Pinchot, 378 F.3d at 1075). The revision to the definition does not imply, require, or recommend discounting or ignoring the potential significance of more local impacts. Such local impacts could be significant, for instance, where a smaller affected area of the overall habitat is important in its ability to support the conservation of a species (e.g., a primary breeding site). Thus, the size or proportion of the affected area is not determinative; impacts to a smaller area may in some cases result in a determination of destruction or adverse modification, while impacts to a large geographic area will not always result in such a finding” 84 Fed. Reg. 44976, 44983 (Aug. 27, 2019).

A diagram of our analysis framework is shown in Figure 1. It is similar in structure to the jeopardy analysis, but focuses on whether the proposed action is likely to destroy or adversely modify designated critical habitat for listed species. NMFS reviews the status of designated and proposed critical habitat affected by the proposed action separate from species effects by examining the condition and trends of the designated essential physical and biological features (PBFs) of critical habitat throughout the action area.

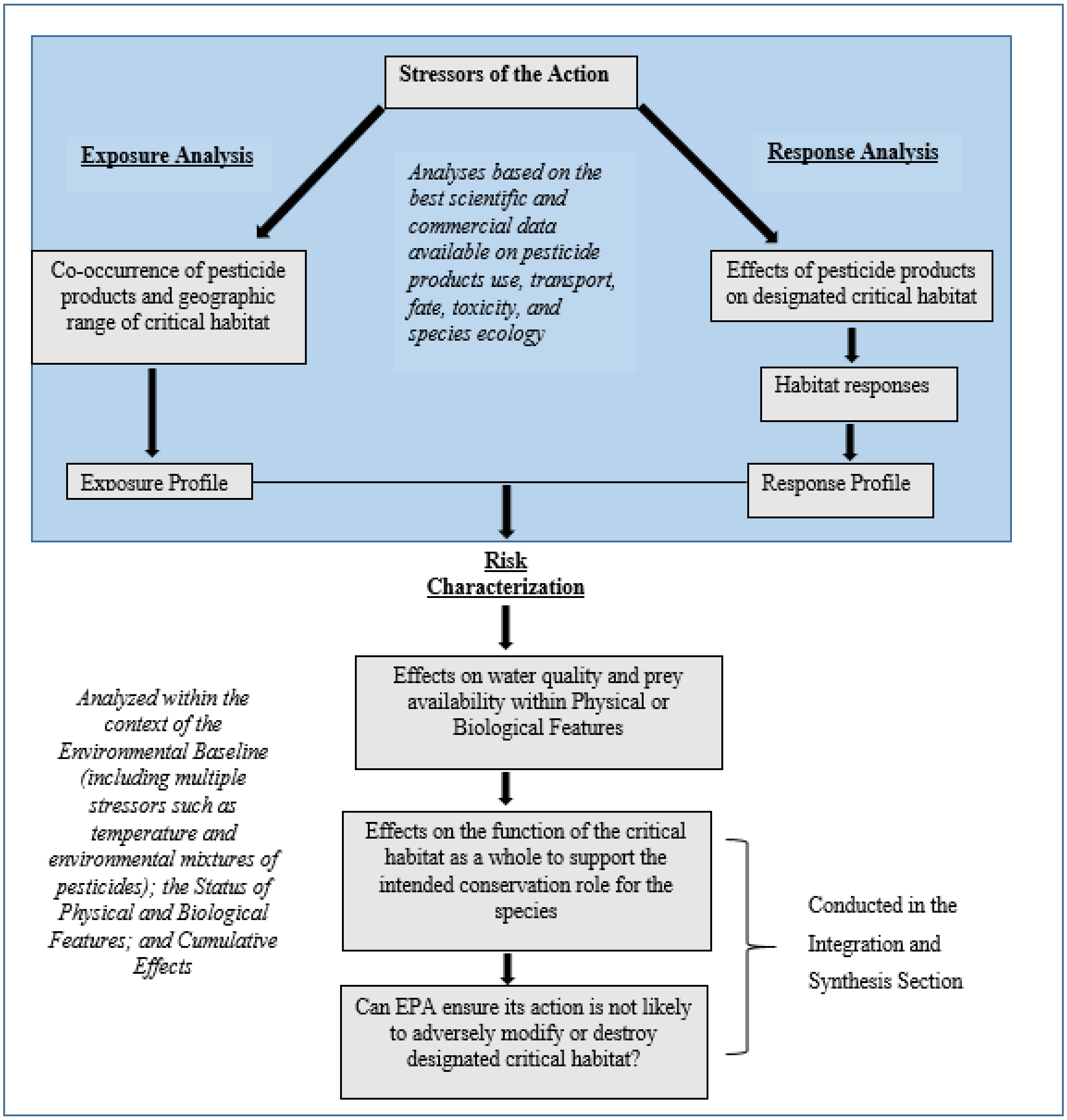

Figure 1. Assessment Framework for Designated Critical Habitat

We first determine whether critical habitat is likely to be exposed to the stressors of the proposed action (exposure profile). To conduct this analysis, we relied on R-plots showing expected pesticide concentrations in the species' designated critical habitat. If we find that critical habitat is likely to be exposed, we determined the relevant PBFs for each species' designated critical habitat that would be at risk from this proposed action and assess the consequences of that exposure on the quality, quantity, or availability of those PBFs (response profile). We relied on Environmental Protection Agency (EPA)-provided contractions of United States Department of

Agriculture's (USDA) Crop Land Data Layers of crop uses and conducted an overlap of critical habitat analysis to determine exposure potential to designated critical habitat.

Salmonid designated critical habitat PBFs for many species[1] include:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.

(2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

(4) Estuarine areas free of obstruction with water quality, water quantity and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

(5) Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

(6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

(7) Spawning and juvenile rearing areas which include cover/shelter, food availability, riparian vegetation, space, spawning gravel, water quality, water temperature, and water quantity.

(8) Adult and juvenile migration corridors which include essential site attributes such as cover/shelter, food (juveniles) riparian vegetation, safe passage, space, substrate, water quality, water quantity, water temperature, and water velocity.

[1] See Status of the Species – Chapter 8.

(9) Areas for growth and development to adulthood in ocean areas including nearshore marine areas for juvenile rearing and migration.

In all of the critical habitat designations that are exposed to the stressors of this action, water quality, prey availability, and aquatic vegetation are key attributes that are either designated as PBFs of the critical habitat, or are relevant to the PBFs. Water quality encompasses a range of typically measured parameters, including dissolved oxygen, temperature, turbidity, and presence of contaminants. Insects and phytoplankton development is critical for the aquatic ecosystem, in particular as prey for juvenile salmonids which are essential to their growth and survival. Aquatic vegetation provides substrate for insect production, and also cover to juvenile salmonids, which is important for their avoidance of predators (i.e., survival). Here, we use the presence of chemical contaminants as an indicator of degraded water quality. The proposed action could degrade water quality by introducing prometryn, bromoxynil (and bromoxynil esters) and other associated chemicals into designated critical habitats. Therefore, we use the pesticide concentrations likely to adversely affect listed species, prey (e.g. juvenile fish and invertebrates), or aquatic vegetation as measures of degraded water quality.

We translated each PBF into a risk hypothesis (Table 1) to assess potential impacts on designated critical habitat. The assessment first considers the "effect of exposure", and then considers whether that effect may occur at a larger scale by evaluating the "likelihood of exposure". By combining the effect of exposure and likelihood of exposure we arrive at an overall determination of risk and confidence for each of the risk hypotheses.

Table 1 Example summary of designated critical habitat risk hypotheses

	Risk-plot Derived		**Risk Hypothesis Supported? Yes/No**
Designated Critical Habitat; Risk Hypotheses	**Risk**	**Confidence**	
1. Exposure to the stressors of the action is sufficient to reduce the conservation value via reductions in prey in migration and rearing sites.	low, medium, high	low, medium, high	Yes/no
2. Exposure to the stressors of the action is sufficient to reduce the conservation value via degradation of water quality in migration, spawning, and rearing sites.	low, medium, high	low, medium, high	Yes/no
3. Exposure to the stressors of the action is sufficient to reduce the conservation value via impacts to vegetative cover in migration, spawning, and rearing sites.	low, medium, high	low, medium, high	Yes/no

To determine the effect of exposure, we used Risk-plots, when available, to evaluate the support for effects to species' PBFs. As with the species assessment, each use site is evaluated to determine whether the effect of exposure is low, medium, or high based on the EECs and the toxicity information. Consideration was given to the duration of exposure when determining which EECs were relevant for comparison.

To determine the likelihood of exposure, we evaluated four factors to arrive at a low, medium, or high finding. Unique combinations of the four likelihood factors result directly in the likelihood of exposure being characterized as either low, medium, or high according to the decision key in Table 5. The likelihood of exposure assessment allows us to consider whether effects may occur across the critical habitat by taking into consideration the extent of exposure, the chemical properties (e.g. persistence), as well as the proximity of use sites to PBFs (when spatial data are available). The four factors considered are:

1. Percent overlap of a designated critical habitat range with a pesticide's approved uses. Each use is assigned a category of 1, 2, or 3 depending on the degree of geographic overlap of use acreage with the species' U.S. range acreage (aggregation of HUC-12s that delineate the species range). Use acreage comes from EPA-derived GIS layers and is presented on the left Y-axis of the Risk-plot. Designated critical habitat range comes from NMFS listing documents.

2. Persistence of the pesticide based on environmental fate issues. We evaluated the environmental fate information provided in the BE to determine whether the pesticide is considered persistent. As a rule of thumb, we answered yes to persistence if the pesticide has a half-life greater than 100 days.

3. Number of applications allowed. We reviewed EPA approved labels to determine whether multiple applications were allowed on each use site.

4. Proximity analysis: for use sites with less than 1 percent overlap within designated critical habitat. NMFS used GIS mapping and critical habitat information to determine whether sites were aggregated in proximity to sensitive areas (e.g., known spawning areas). When evaluating a map, we classified use sites as "in proximity" when they were either: 1) within 300 meters of the sensitive habitat and exposure was deemed likely due to runoff or drift; or 2) chemical fate, hydrologic properties, and the proximity of use sites upstream from sensitive habitat suggested exposure was likely through the downstream transport pathway.

Percent Overlap Category	Persistence	Multiple Applications	Proximity Analysis	Likelihood of Exposure
3	yes	yes	NA	**High**
3	no	yes	NA	**High**
2	yes	yes	NA	**High**
1	yes	yes	yes	**High**
1	no	yes	yes	**High**
3	no	no	NA	**Medium**
2	no	yes	NA	**Medium**
1	no	no	yes	**Medium**
2	no	no	NA	**Low**
1	yes/no	yes/no	no	**Low**

Figure 2. Decision key for likelihood of exposure finding for designated critical habitat

The effect of exposure and likelihood of exposure determinations are then combined for each use site to determine the overall risk associated with the risk hypothesis. This is done following the same criteria as with the species assessment (described earlier). Once we have determined the risk ranking for a risk hypothesis, we then evaluate the level of confidence we have in that ranking. The level of confidence underscores the level of certainty we have in the risk determination for each risk hypothesis. The confidence level in the risk determination is evaluated and assigned a low, medium, or high level. The factors evaluated in characterizing confidence in the critical habitat assessment are similar to those used in the species assessment (described above).

Similar to the effects of the action on the species, the arrangement of risk and confidence pairing of the risk hypotheses dictated the placement of a risk bar along a risk continuum. The graphic denotes the overall risk identified in the effects analysis section of designated critical habitat (see Figure 3). Each pesticide and designated critical habitat pairing receives a risk bar.

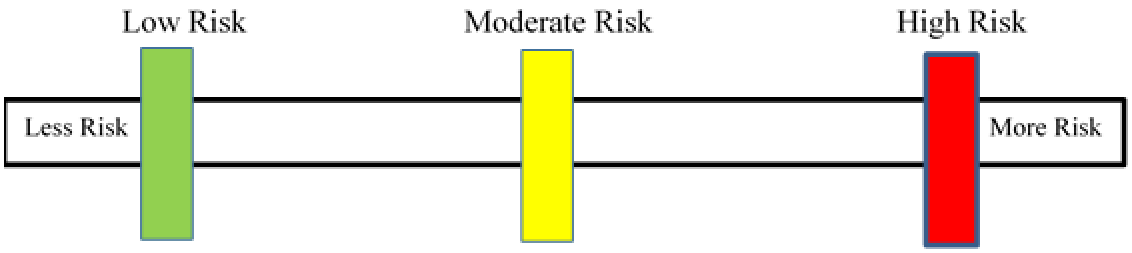

Figure 3. Depiction of risk to designated critical habitat from the stressors of the action

We conclude the Effects of the Action analysis for designated critical habitat by composing a narrative to summarize our evaluation and findings of risk hypotheses. The statement of risk for a species and chemical is carried forward in the integration and synthesis section. The risk statement is presented as a horizontal bar to denote the overall finding for risk and confidence found at the top of a score card.

The action area for this Opinion encompasses all designated critical habitat for listed Pacific salmonids in Washington, Oregon, California and Idaho. As the species of salmonids addressed in this Opinion have similar life history characteristics, they share many of the same PBFs. These PBFs include sites that support one or more life stages and contain physical or biological features essential to the conservation of the Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS). PBFs outlined above include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas.

Water quality, prey availability, and aquatic vegetation in freshwater and estuarine areas may be susceptible to pesticide effects where critical habitat overlaps with or is adjacent to use sites. Effects to water quality, prey availability, and aquatic vegetation will be evaluated to determine the likelihood of reducing the quality of freshwater, estuarine, and nearshore marine areas. Given the use and environmental fate profile of the pesticide formulations containing these active ingredients, we do not expect offshore marine areas to be directly affected. Therefore, a risk hypothesis was not developed for this area and we have determined that further evaluation of this PBF is not warranted.

Sufficient water quality is a necessary attribute of many aquatic PBFs to support the conservation role of designated critical habitat, and water quality unimpaired by toxins is necessary to the PBFs of the critical habitats affected by the stressors of this action. For example, all species of juvenile salmon need clean cold water. Clean and cold water is essential support for producing abundant prey for salmonid growth and development. Water quality is clearly degraded when pesticides and other stressors of the action reach levels in habitat that are sufficient to adversely affect aquatic vegetation, aquatic organisms, and reduce individual fitness of exposed ESA-listed species. Impacts to species fitness were evaluated earlier in the document and these impacts are used as indicators of degraded water quality. We evaluate exposure and effect concentrations to determine whether PBFs are impacted.

We evaluate effects to prey because forage is an essential attribute of many PBFs. Freshwater juvenile rearing and migratory habitats as well as estuarine and nearshore marine areas must provide sufficient forage to support growth and development of the listed species. Reductions in the abundance of prey items can decrease the quality of rearing, migration, and estuarine PBFs, as less available food will support fewer individuals. Reductions in prey can reduce a PBF's potential to support species (juvenile development, growth, maturation, survival), thereby reducing the carrying capacity of critical habitat. We evaluated the toxicity assessment endpoints including prey and fish survival to determine whether expected concentrations of the stressors of the action are sufficient to affect PBFs of species critical habitats. We also evaluate effects to aquatic vegetation because of its role in providing cover to migrating juvenile salmon from predation and as substrate to the production of some invertebrates.

Designated critical habitat is located within the action area. Many freshwater areas overlap with the allowable uses of the active ingredients. The stressors of the action contaminate these habitats via spray drift and/or runoff (including from irrigation returns), and to a lesser extent from atmospheric deposition. Once in species habitats, the active ingredients persist for varying periods of time, depending in part on the chemical, biological, and physical environment of the contaminated aquatic habitats. The most persistent of the two, prometryn (soil half-life listed as "stable") may accumulate in soils and contribute to aquatic loading in stagnate waterbodies via repeat applications and runoff months and even years after application, affecting organisms beyond those exposed initially from application events. Expected concentrations of other/inert ingredients and adjuvants added to formulations prior to application remain unknown, and are an identified data gap.

See Chapter 16 (Integration and Synthesis for Designated Critical Habitat) for the final conclusion of whether EPA's proposed action with end-use products containing prometryn and bromoxynil are likely to adversely modify or destroy a species' designated or proposed critical habitat.