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12.0 Introduction

This chapter provides guidance on determining and describing the net effects to covered species. Net effects are the effects that remain after balancing both the negative effects of take and the positive effects associated with the Habitat Conservation Plans (HCP) conservation program. This analysis is needed to fulfill the incidental take permit regulation which states that the applicant must specify in the HCP, the impact that will likely result from such taking [50 CFR 17.22 (b)(1)(iii)(A) and 17.32(b)(1)(iii)(C)(1) for U.S. Fish and Wildlife Service (FWS); and 50 CFR 222.307(b)(5)(i) for National Marine Fisheries Service (NMFS)]. It is also used to help the Services decide and determine if the permit application meets certain issuance criteria [50 CFR 17.22 and 17.32(b)(2) (B) and (D) for FWS and 50 CFR 222.307(c)(2)(ii) and (iii) for NMFS] (see section 10 regulations in the [HCP Handbook Toolbox](#)).

Determining net effects to covered species can be broken down into the following steps:

1. Determine the type and amount of take.
2. Describe the impacts of the taking.
3. Describe the expected benefits of the conservation program.
4. Determine the net effects to covered species.

The Services will review the quality of and certainty associated with applicants' analysis of net effects to covered species, including:

- quality of the information used to support the effects analysis;
- transparency and repeatability of calculations associated with take and effects;
- whether the effects analysis used common accounting measures related to species reproduction, numbers, and distribution;
- whether the net effects support recovery of the species in the wild;
- strength of logical arguments used to reach conclusions; and
- high and equivalent standards.

In this chapter we also briefly compare and contrast the HCP effects analysis with that of the section 7 intra-Service consultation processes as well as the National Environmental Policy Act (NEPA) (see the [HCP Handbook Toolbox](#)) and National Historic Preservation Act (NHPA) (see the [HCP Handbook Toolbox](#)) effects analysis.

The last part of this chapter addresses permit duration considerations. While permit duration discussions usually start early in the planning process, we waited until this part of the Handbook to discuss it because determining the appropriate permit duration is intertwined with the effects analysis.

12.1 Determine the Type and Amount of Take

The types and amount of take are initially determined (see Chapter 8) to help make better informed decisions during the development of the HCPs conservation program (see Chapter 9). Like many other aspects of the HCP planning process, determining the extent of take and development of the conservation program are a dynamic and iterative process. As the conservation program is developed, the applicant and the Services may find more ways to reduce take. Once the take has been minimized, the applicant can determine the final type and amount of anticipated take. This is the amount of take that they anticipate will occur from covered activities over the life of the permit after accounting for the minimization measures that they commit to implement. Keep in mind that the conservation program, while intended to be beneficial overall, may also have some take associated with it, such as harassment of individuals or temporary habitat degradation during restoration activities that rises to the level of harm. Take from implementation of conservation actions must be added to the total amount of take associated with the project.

For each covered species the description of anticipated take must include:

- both direct take and indirect take, e.g., bats being killed by a wind turbine blade; bat pups dying due to the loss of a parent bat;
- the type of take (e.g., injury, mortality, harm, harassment);
- the amount of take (e.g., number of individuals) or if this cannot be determined then another appropriate take surrogate such as acres of habitat or stream miles;
- the age and sex of individuals taken, if known;
- the specific causes or components of covered activities associated with take; and
- the duration of the take.

12.2 Describe the Impacts of the Taking

Once the types and amounts of anticipated take of individuals has been determined, the Services and the applicant can analyze the impact of the taking on the covered species. As described in more detail in Chapter 8, the impacts of the taking should be described in the HCP relative to a species reproduction, numbers, and distribution, which are usually interdependent e.g., reducing a species reproduction will reduce its population size; reducing a species population size will reduce its reproduction, particularly if those reductions decrease the number of breeding females or the number of young that recruit into the breeding population; and reductions in a species reproduction and population size normally precede reductions in a species distribution.

Helpful Hint: Analyze the impact of the taking in a stepwise fashion e.g., impacts to individuals, local population, recovery unit, and finally on the species as a whole. Be sure the applicant understands that the impacts of the take analysis must consider both current and probable future conditions and trends that span the entire duration of the requested take.

12.3 Describe the Expected Benefits of the Mitigation Program

In the HCP, the description of benefits to the species is an accounting of the expected results of the conservation program. To determine the benefits of the mitigation program it may be necessary to start by considering the benefits to individuals, then to the local population, and finally to the species as a whole. This is the same approach we use to determine the impacts of the taking on the listed entity.

Benefits associated with conservation measures that avoid or minimize take should already have been accounted for by reducing the amount of anticipated take. It is important not to double count them when describing the benefits of the mitigation program designed to offset impacts of that remaining take.

You should also consider the timing of mitigation when assessing benefits. Mitigation that occurs prior to the taking is typically more desirable than mitigation that just keeps pace with it. As you do when assessing negative impacts, the benefits of the conservation program should be placed in the context of current and anticipated future conditions and trends over the duration of the permit.

Accounting for benefits should also be relevant to species reproduction, numbers, and distribution because these factors are associated with recovery of the species in the wild. Following are a few examples of accounting benefits related to species reproduction, numbers, and distribution.

Examples of benefits related to reproduction include: Increase in acres of suitable breeding habitat or numbers of breeding territories; increase in numbers of offspring or survival rates; reduction of threats to breeding areas.

Examples of benefits related to species numbers include: Increase in number of individuals or breeding pairs in a population; improved sex ratios, age distribution, or other demographics.

Examples of benefits related to population or species distribution include:

Percent reduction in habitat fragmentation; enhancement of species numbers at the edges of their distribution to allow for future range expansion, providing for stepping stone habitat and populations that can interbreed; expanding a species range back into areas from which they were extirpated, or into new areas that provide suitable conditions; achievement of recovery plan distribution goals.

12.4 Determine the Net Effect to Covered Species and Critical Habitat

The net effects are an accounting of the impact of take in comparison to the benefits of the HCPs conservation program. This gives you the expected end or net result of implementation of the HCP.

negative impact of the taking + benefits of the conservation program = net effect of HCP

The applicant must include this accounting for each covered species in the HCP. The analysis must be transparent, reasonable, and repeatable, and use common accounting measures. Net effects should also account for any expected changes in structure or function of critical habitats.

If the accounting used to describe negative effects to a covered species is different than that used to describe the benefits, you resolve this by establishing a common accounting system, which makes it possible to compare “apples with apples.” Habitat equivalency analysis (HEA) and resource equivalency analysis (REA) (see the [HCP Handbook Toolbox](#)) are examples of tools that applicants may use to assist with common accounting.

The analysis of net effects must also account for the requested duration of the permit. Anticipated positive and negative effects must be considered for the entire permit duration to determine net effects. Predicting species populations or survival needs into the future is very difficult and usually leads to greater uncertainty regarding effects associated with permits of long duration or for covered species of greatest concern. The conservation program, particularly the monitoring and adaptive management, should be especially robust in these situations.

12.5 Effects Analysis and Permit Issuance Criteria

Two of the most important and difficult decisions the Services must make are determining to what extent the proposed minimization and mitigation offsets the impacts of the take, and whether or not it is the maximum that can be practically implemented by the applicant. Fundamental to making these decisions is a thorough understanding of how the taking impacts the species reproduction, numbers, and distribution, and the point at which, if any, minimization and mitigation become impracticable from biological, economic, or technological perspectives. Our reasoning and conclusions are documented in the section 10 findings and recommendations memorandum. Two of the issuance criteria: (B) and (D) found at 50 CFR 17.22(b)(2)(i) and 50 CFR 17.32(b)(2)(i) for FWS; and (ii) and (iii) found at 50 CFR 222.307(c)(2) for NMFS), are

closely tied to the impact of the taking and net effects analysis in the HCP, and the jeopardy analysis in the section 7 biological opinion.

“(B) The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking” (FWS); “(ii) The applicant will, to the maximum extent practicable, monitor, minimize, and mitigate the impacts of such taking” (NMFS).

As discussed in Chapter 9, maximum extent practicable (MEP) is the statutory standard in section 10 of the ESA that establishes the level of minimization and mitigation that a permit holder must achieve to receive an ITP from the Services. For the Services, minimize and mitigate are part of a single finding when determining MEP. In practice however, sequential approaches are usually applied, where impacts are first avoided, then minimized, and finally mitigated. Though not necessarily required by the ESA, sequential approaches are required by a number of federal laws, regulations, agency directives, and policies, and thereby an important consideration for applicants seeking efficiencies through concurrent and integrated environmental review/permitting processes. For example, U.S. Army Corps of Engineers and Environmental Protection Agency regulations for mitigation under Section 404 of the Clean Water Act (see 40 CFR part 230) (see the [HCP Handbook Toolbox](#)) provides that “compensatory mitigation is not considered until after all appropriate and practicable steps have been taken to first avoid and then minimize adverse impacts.” Further, when carrying out the procedural responsibilities under the NEPA, federal agencies must apply the mitigation meanings and consider the hierarchal approach in the CEQ regulations (40 CFR 1508.20).

In light of these sequential approaches, the Services responsibility is to ensure that all practicable measures to avoid and minimize adverse effects to covered species and their habitats are considered, in that sequence, before mitigation. Notwithstanding, there may be some limited circumstances where mitigating for species impacts may take precedence before avoidance or minimization. In such circumstances, mitigating for impacts may be more practicable, and better serve the conservation needs of the species. These may include, but are not limited to:

- when a species occurs at a location not critical to achieving the conservation objectives for that species,
- when offsetting species impacts would be much more effective off-site, or
- when the affected site will be difficult to maintain based on projected land use changes (e.g., the site is likely to be isolated from the population in the near future) or climate change impacts (e.g., the site is likely to be unsuitable for the species in the near future).

In other circumstances, minimization may be the only practicable way to address the impacts of take. These may include, but are not limited to:

- when the take is associated with a critically endangered species,
- when the impacts of take are highly controversial, or unknown, or
- when practicable ways to mitigate the impacts of take simply do not exist.

Conservation of species and habitats within ecologically functioning landscapes is essential to sustaining populations over the long-term, especially in the face of new diseases, invasive species, habitat loss, and other threats. Minimization and mitigation decisions must be informed

by knowledge and assumptions about factors influencing the ability of landscapes to not only sustain covered species and produce conservation outcomes necessary to offset the impacts of take, but also sustain ecological conditions necessary for the minimization and mitigation to succeed. Factors to consider include, but are not limited to, the spatial and temporal extent of the minimization and mitigation, and how it addresses ecological conditions, trends, and conservation objectives at the landscape scale.

(D) (FWS) or (iii) (NMFs) “The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.”

As discussed in more detail below and in Chapter 15, the Services finding for this permit issuance criterion is a summary of the biological and conference opinion conclusions regarding jeopardy or destruction/adverse modification of critical habitat. The impact of the take and net effects analysis in the HCP, and the section 7 analysis in the biological opinion, are important parts of the administrative record for the permit decision. How well these analyses support the findings regarding this issuance criterion is dependent on the quality of the analysis. To avoid any surprises regarding these findings, we should include section 7 personnel early in the HCP development process so that issues can be addressed as early as possible.

12.6 Comparison of HCP Impact of the Take Analysis with Section 7 Analysis of Effects.

12.6.1 Impacts to Covered Species

In accordance with the requirements of section 10(a)(2)(A) of the Endangered Species Act (ESA) (see the [HCP Handbook Toolbox](#)), the applicant must specify in the HCP the impacts that will likely result from the take of a covered species, and what steps they will take to minimize and mitigate the impacts of the taking. Our section 7 analysis determines if the impacts of take, when combined with other past, present, and future impacts, are likely to jeopardize the continued existence of the covered species in the wild (also known as a “jeopardy determination”) or result in the destruction or adverse modification of critical habitat. Under the ESA, jeopardy occurs when an action is reasonably expected, directly or indirectly, to diminish a species’ numbers, reproduction, or distribution so that the likelihood of survival and recovery in the wild is appreciably reduced. Note, the Services section 7 analysis must analyze the effects of the proposed permit on all listed species and designated critical habitat that are reasonably certain to be impacted by the covered activities, whether included in the HCP or not. If we conclude that the incidental take permit would result in jeopardy or destruction/adverse modification of critical habitat, we cannot issue the permit.

Helpful Hint: When the impact of take and section 7 analysis are done simultaneously, the effects analysis can be completed in an efficient manner. However, achieving this efficiency requires considerable coordination and trust between the applicant and Service staff.

12.6.2 Impacts to Critical Habitat

The term “critical habitat” for a threatened or endangered species means:

(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species (ESA §3 (5)(A)).

Under section 7 of the ESA, Federal agencies must ensure that their activities, including activities that involve a Federal authorization or permit such as an incidental take permit, are not likely to destroy or adversely modify critical habitat. To make this determination in cases where a formal consultation is required, our biologists evaluate the impacts that are likely to be caused by the proposed action to the physical and biological features or the intended recovery support function of the affected critical habitat. For multi-year HCPs, this analysis includes the extent to which there is rigorous monitoring to detect adverse effects to habitat and specific adaptive management measures to respond to those effects, particularly where the effectiveness of the conservation measures are uncertain.

Starting the section 7 intra-Service consultation early in the HCP planning process and continuing it concurrently with HCP development helps applicants to avoid or minimize negative effects to critical habitat through project design or other measures. The applicant can then avoid a finding of destruction or adverse modification, which would prevent us from issuing an incidental take permit.

12.7 Comparison of HCP Impact of the Take Analysis with NEPA Analysis of Effects.

In the HCP, the applicant is responsible for addressing impacts associated with taking a covered species (e.g., impacts on reproduction, numbers, and distribution) that could result from the proposed issuance of the permit and implementation of the HCP (section 8.3). For example, for the federally endangered Indiana bat, the most significant impact of take pertains to the lost reproductive contribution of individual bats taken (e.g., females killed), that is, the reproductive contribution female bats would have made to the species reproduction, numbers, and distribution had they not been taken. Our analysis of effects in a NEPA compliance document addresses impacts associated with taking a covered species and impacts to other aspects of the human environment (40 CFR 1508.14) that could result from the proposed issuance of the permit and implementation of the HCP (e.g., effects caused by the conservation measures on all aspects of the human environment). Under the NEPA, we also consider effects associated with alternatives to the proposed action (40 CFR 1505.1(e)), including effects associated with not issuing a permit (e.g., the “no action or status quo” alternative)(40 CFR 1502.14(d)). For example, a wind energy facility currently avoids take of Indiana bats by curtailing their wind turbines at low wind speeds (e.g., “status quo”), which also minimizes impacts to non-listed migratory tree bats. Issuing the wind energy facility a permit to take Indiana bats when operating their wind turbines at low wind speeds (e.g., proposed action) could significantly impact non-listed migratory tree bats, which are part of the human environment.

12.8 Comparison of NHPA Section 106 Process and NEPA Analysis of Effects.

The Services' responsibilities under section 106 of NHPA and associated implementing regulations (36 CFR 800) are to identify historic properties that may be affected and to take into account the effect of issuance of an incidental take permit and implementing the HCP conservation program on these properties (e.g., the federal "undertaking"). The appropriate time to consider effects to historic properties is early in the HCP planning process when it may be possible to reduce or eliminate negative effects by modifying activities. The Services are also responsible for providing all consulting parties the documentation specified in 36 CFR 800.11(e), subject to the confidentiality provisions of 36 CFR 800.11(c), and other documentation that may be developed during the consultation to resolve adverse effects. Consulting parties include those with a demonstrated interest in the project.

There is overlap, but there are also differences, in the implementing regulations for section 106 of the NHPA (36 CFR 800) and the NEPA (40 CFR 1500-1508; 43 CFR 43) with regard to conducting an effects analysis. Section 6 of the NHPA addresses potential effects to historic properties associated with the federal undertaking (36 CFR 800.16(y)), while the NEPA considers a broader category of resources that includes historic properties and other aspects of the human environment (40 CFR 1508.14). More information on analysis process and standards under each of these laws can be found in Chapter 13 (NEPA), Appendix A, and the [HCP Handbook Toolbox](#).

12.9 Permit Duration Considerations

The regulations for incidental take permits tell us to set the duration of permits for a period long enough so that the permittee has adequate assurances to commit funding for the HCP, including conservation activities and land use restrictions. In determining the duration of a permit, the Services' decision makers consider:

- the duration of the planned covered activities;
- whether available information is sufficient to develop a conservation program and determine effects to covered species over the proposed permit duration;
- how much certainty there is that the conservation plan will enhance the habitat and increase the long-term survivability of covered species [see 50 CFR 17.22 and 17.32(b)(4) for FWS; and 50 CFR 222.307(e) for NMFS];
- how well the monitoring and adaptive management program addresses risk and uncertainty; and
- whether the funding strategy for the conservation program is sufficient for the proposed duration of the permit.

12.9.1 Duration of Activities Covered

Applicants usually request a permit duration that spans the entire length of their planned activities. Planned activities may not take very long, such as construction of one commercial building; take a moderate amount of time, such as construction and operation of a wind farm during its expected 20-year lifespan; take place over a long duration, such as forest management; or take place into perpetuity, such as county regulated activities or human occupation of new

homes in habitat that continues to be occupied by the covered species. Planned activities also include the time needed to complete mitigation, monitoring, adaptive management, other requirements or conditions, and meet goals and objectives of the conservation program. Because conservation benefits ideally occur prior to the take, conservation activities will either precede or, at a minimum, keep pace with other planned activities.

12.9.2 Determining if There is Enough Available Information

Sufficient quantity and reliability of information is needed for all HCPs. In general, the longer the proposed permit duration, the more information is needed to be able to project take, analyze effects, and develop a conservation program for the duration of the permit. When analyzing the effects to covered species of implementing the HCP, we must do so in the context of other threats to the species, such as the effects of climate change, and anticipated environmental conditions over the duration of the permit. Because there is less certainty regarding predicting future conditions and effects of implementing the HCP over longer permit durations, highly reliable information and analysis is essential to adequately protecting covered species. Therefore, the amount and reliability of readily available information versus the time, money, and resources needed to gather additional information will be a factor in determining the appropriate permit duration. It is also important to consider the likelihood that the conservation measures will be effective, and the severity of species impacts if they are not effective. A long-term HCP with high certainty of effectiveness and low risk to the species may not justify a large investment in data development and analysis. We must discuss with the applicant whether it is more important to them to obtain a permit as soon as possible for a shorter duration, or whether they'd rather spend the time and money that may be needed to develop an HCP for a permit that lasts longer.

12.9.3 The Extent to Which the Conservation Plan Will Enhance the Habitat and Increase the Long-Term Survivability of Covered Species

The longer the proposed permit duration, the less certain we are likely to be about take levels, impacts of the taking, benefits of the conservation program, and the status of the covered species over the entire duration of the permit. We gain more certainty that we are adequately protecting covered species if the applicant can add conservation actions to ensure the species is adequately protected over the entire permit duration, especially if it's for a longer period. However, for species that are critically imperiled, there may be too much uncertainty regarding their future status to meet the permit issuance criteria for permits of long duration regardless of mitigation commitments.

12.9.4 How Well the Monitoring and Adaptive Management Program Addresses Uncertainty

Longer permit durations require robust and scientifically sound monitoring and adaptive management provisions to address uncertainties that increase with the duration. Robust monitoring and adaptive management plans that must be developed with the applicant:

- identify uncertainties and the associated measurable parameters to be monitored;
- identify parameter thresholds or trends that indicate alternative actions are needed; and
- provide alternative actions to meet HCP conservation goals and objectives.

12.9.5 Whether the Funding Strategy for the Conservation Program Is Adequate for the Proposed Duration of the Permit

Funding assurances, which must be guaranteed prior to permit issuance, may become more difficult to ensure over extended periods of time due to changing economies or funding sources. This is less of a concern for permits of shorter duration or for plans where all mitigation is completed upfront before any take occurs. If, however, the mitigation will be implemented over a long period of time, then the funding assurances will need to account for this.

12.9.6 Permit Duration Decision

While the Services ultimately determine the duration of incidental take permits, determining what is a necessary and appropriate duration is in close coordination with the applicant. We review the applicant's permit duration request in the context of the factors described above and any other factors necessary to ensure that the species being impacted by the plan are adequately protected for the proposed duration of the permit.

Permits of long duration can provide a commitment to conservation activities with benefits to species over a longer period of time. They can also have more uncertainties regarding future biological, physical, and socio-economic conditions which make it more difficult to predict long-term effects to covered species and availability of resources to achieve conservation objectives. If the duration of planned activities suggests a permit of long duration, then it may be possible to minimize uncertainties through additional conservation actions, a robust monitoring and adaptive management program, and a highly certain or viable long-term funding strategy. However, there may be circumstances, such as those that involve a critically imperiled species, a lack of available information, or a lack of time to plan for a longer permit duration, when it is not possible or practical to adequately reduce the uncertainty associated with the permit. Under these circumstances, it may be more appropriate for us to issue a shorter duration permit with the option to renew.

Other things being equal, HCPs with shorter duration permits are usually easier to develop and process, so they usually take less time, money, and resources to complete. This may make permits of shorter duration more attractive to applicants under some circumstances. Even though renewing a permit requires a formal review in light of current information and conditions, the time and costs to renew a shorter duration permit may be less than the additional time and costs needed to develop an HCP for a permit that covers a longer period of time.

HCP No Surprises assurances apply for the duration of a permit if the HCP is being properly implemented. When we review a renewal request, we may identify the need for amendments to the HCP and permit, including needing additional conservation commitments on the part of the applicant. Once the amendments associated with a renewal are finalized, No Surprises assurances would then apply to the amended HCP and permit for the duration of the renewal period.