Chapter 4. Benefits Analysis

INTRODUCTION

In order to assist with selection of a Preferred Alternative, a cost benefit analysis was prepared. The benefits analysis is a qualitative study of habitat values or benefits over time, associated with implementation of the conceptual alternatives presented in Chapter 3. The results of this analysis act as a tool for discriminating among the alternatives, based on each alternative's potential to provide environmental benefits in a cost-effective manner.

This chapter describes:

- methods and analytical tools used to conduct the benefits analysis;
- information that was used to conduct the benefits analysis;
- assumptions regarding future habitat conditions under the No-Project Alternative and the three Project Alternatives;
- a discussion of the results of the analysis; and
- recommendations on how to proceed with development of the conceptual alternatives based on the results of the benefits analysis.

Approach to the Benefits Analysis

The benefits analysis was conducted to identify wildlife habitat values that would be provided over a 50-year period (i.e., the assumed life of the project) under the No-Project Alternative and would be provided over a 50-year period under the three Project Alternatives (Alternatives 1, 2, and 3) described in Chapter 3.

The results of the alternatives benefits analysis of the alternatives are expressed as:

- the absolute wildlife habitat values of the alternatives expressed as average annual habitat units (AAHUs) provided by each habitat;

- the absolute change in AAHUs from the No-Project conditions to conditions after implementation of the Project Alternatives; and
- restoration cost per AAHU generated by habitats restored under each alternative.

Habitats Evaluated in the Benefits Analysis

Six habitat types were evaluated in the benefits analysis:

- mixed riparian woodland
- seasonal wetland
- permanent wetland
- valley oak/sycamore woodland
- valley oak/sycamore savanna
- herbaceous upland

Habitat nomenclature used in the benefits analysis and habitat nomenclature used to describe existing and restored habitats is presented in Table 4-1. A description of existing and restored habitats is provided in Chapters 2 and 3.

General Assumptions Used to Conduct the Benefits Analysis

To conduct the benefits analysis, it was necessary to use the best available information to make assumptions about how habitat structure will develop over time for the No-Project and Project Alternatives. Assumptions were based on information in Chapters 2 and 3, past experience, and professional judgement. This section describes major assumptions used to conduct the benefits analysis for the alternatives. Specific assumptions are presented in Appendix D.

Habitat Area. To conduct the analysis, it was necessary to define the habitat types present or proposed under each alternative (Table 4-2). The quantity of habitat acres to be preserved under the No-Project Alternative and to be restored under the Project Alternatives are presented in Table 3-2. The restoration methods assumed for each Project Alternative and restored habitat are described in Appendix D.

No-Project Alternative. Existing habitat types and their distribution under the No-Project Alternative are described in Chapter 2. The No-Project Alternative assumes that the quantity and quality of the existing project area habitats will not change over the 50-year evaluation period. Existing habitats include annual grassland and irrigated pasture, riparian woodland, and non-jurisdictional seasonal wetlands.

Alternatives 1 and 2. Restoration of habitats under Alternatives 1 and 2 were assumed to be the same as described in Chapter 3.

Alternative 3. Alternative 3 assumes the study area will be mined for gravel and then restored when mining has lowered the floodplain surface to an elevation most favorable for the establishment and long-term maintenance of riparian vegetation. The benefits analysis assumes the project area will be mined over a 10-year period. At the end of 10 years the restoration plan would be implemented for all habitat types. Under this alternative, the existing grade over most of the project area would be lowered to an elevation that would allow for frequent inundation of the floodplain during periods of high flow.

Cost Estimates Used to Conduct the Benefits Analysis. Cost estimates for restoration implementation and maintenance were prepared for each Project Alternative and are presented in Chapter 3. No long-term maintenance, remedial actions, or contingency costs were included in these cost estimates. The cost estimates do not include any costs associated with vegetation, hydrology, or wildlife monitoring surveys and were based on estimates prepared for similar projects.

BENEFITS ANALYSIS METHODS

Habitat Quality and Habitat Suitability Index Models

Habitat present under the No-Project Alternative and the Project Alternatives were measured to determine the habitat values provided by each habitat. The benefits analysis was conducted using an approach similar to the U.S. Fish and Wildlife Service's Habitat Evaluation Procedures (HEP) methodology. Five habitat quality index (HQI) models and a habitat suitability index (HSI) model, developed for similar analyses, were used to conduct the benefits analysis (Table 4-3).

HQI and HSI models measure habitat values by combining ratings for a set of habitat variables that are important in determining habitat quality. HQI models evaluate the value of a specific habitat type (e.g., Seasonal Wetland Habitat Quality Index Model). HSI models evaluate the habitat value of an area for a specific species or guild of species (e.g., Riparian Songbird Guild HSI model).

Quality ratings for each habitat variable are determined by assigning a numerical value (i.e., 0–1), with a value of 1 representing the highest quality attainable for that characteristic. Quality ratings for each model variable are mathematically combined to derive an HQI or HSI value. The per-acre HQI/HSI value is multiplied by the number of acres of habitat to produce an overall quality rating expressed in habitat units (HUs). Average annual habitat units (AAHUs) are the average number of HUs produced annually from target year (TY) 0–the year before restoration construction begins–to any specified future TY. Changes in preproject and postproject AAHUs reflect the magnitude of habitat quality change that can be expected with implementation of an alternative, and they serve as the basis for evaluating the relative wildlife benefits provided by each project alternative.

Evaluation Period and Model Target Years

The benefits analysis measures the wildlife habitat values that would be provided by each habitat over a 50-year evaluation period, under each alternative. The habitat variable values for each model are measured or estimated during specific years, (i.e., TYs), within the 50-year evaluation period. Existing conditions represent TY0. TYs are selected to reflect points in time, during the evaluation period, at which habitat values are expected to change substantially, as the restored habitat matures (e.g., they predicted for the year in which planted oak trees would produce acorns, thus providing substantial additional forage for wildlife). The TYs selected for each habitat type are identified in Table 4-4.

BENEFITS ANALYSIS RESULTS

Analysis of the Project Alternatives

The AAHUs provided by each habitat for the No-Project and Project Alternatives are presented in Table 4-5 and Figure 4-1. The net changes in AAHUs from the No-Project Alternative to each of the Project Alternatives, are presented in Table 4-6. The costs per AAHU for each habitat by alternative are presented in Table 4-7 and Figure 4-2.

AAHUs for the habitats (excluding herbaceous upland) restored under the Project Alternatives increase in AAHUs from the No-Project conditions. AAHUs provided by habitats vary among the Project Alternatives based on the quantity and quality of habitats restored. For example, Alternative 3 provides the largest number of AAHUs for mixed riparian woodland because it restores a greater area of riparian woodland and creates conditions more suitable for the establishment and growth of riparian vegetation habitat than the other alternatives.

Herbaceous upland AAHUs decline under all alternatives compared to the No-Project Alternative because almost all of the existing herbaceous upland would be restored to other habitat types. Seasonal wetland AAHUs also increase slightly from No-

Project conditions under Alternatives 1 and 2 because substantially fewer but higher quality wetlands are restored under these alternatives than are present under No-Project conditions.

DISCUSSION OF RESULTS FOR ALTERNATIVES ANALYSIS

As presented in the beginning of this chapter, this analysis was intended to assist in selecting a Preferred Alternative. Each alternative should be measured not only by the numerical results of the benefits analysis, but also by its ability to satisfactorily meet the project goals presented in Chapter 1. Table 4-8 provides a summary of the alternatives measured against the project goals. The goals and results of the benefit analysis are discussed below.

Project Goals

Generally, each project alternative satisfies the project goals, but the degree to which each accomplished this varies. All the project alternatives achieve the recreation and public access goals to equal degree, with the exception of Alternative 3. In this alternative, trail construction may not begin until after mining has been completed, and public access may be limited during flood events, depending on the final placement and elevation of the trail.

All the project alternatives meet wildlife and vegetation goals. Although Alternative 3 provides the greatest amount of riparian habitat, it is somewhat less ecologically diverse than the other alternatives. Either the patch size of an individual habitat or a more complex habitat mosaic must be considered more important–both have value.

With regard to hydraulics and flooding goals, all three alternatives may meet these goals. However, it cannot be determined with any degree of certainty that Alternative 3 would not effect flooding on adjacent lands until this alternative is tested in the current HEC2 hydraulic and hydrology model for the San Joaquin River. It is assumed at this time that all the alternatives will maintain the existing settling capacity of the DK area channel, however the details of this will need to be worked out during the detailed design phase of the project.

Each alternative is intended to be a self-sustaining system. However, natural process will ultimately determine what plant community persists in the various niches across the project site and it is difficult to determine if this will equate to the original restoration intent. The alternatives at this time are conceptual and developed on the best available information for this level of planning. With this in mind, Alternative 3 has the greatest potential for natural recruitment of riparian vegetation because the site would be connected to the current hydrology and dynamics of the San Joaquin River. Alternatives 1 and 2 would remain high terrace with little or no opportunity to be affected by river process. However, the oak woodland and savanna habitats on these alternatives would likely regenerate and provide a self-sustaining system.

Benefits Analysis

Alternative 1 includes the restoration of all six habitat types and results in a net increase in habitat values for five of the six habitat types (Table 4-6). Alternative 1 also has the lowest cost per AAHU for all habitat types with the exception of valley oak/sycamore savanna and native perennial grassland, which are slightly higher than those identified in Alternative 2 (Table 4-7).

Alternative 2 includes the restoration of five habitat types and results in a net increase in habitat values for four of the five habitat types (Table 4-6). Except for mixed riparian woodland and valley oak/sycamore savanna, which are less than those identified in Alternative 1, Alternative 2 also has a moderate range cost per AAHU for the remaining habitat types (Table 4-7). No perennial wetland will be restored under this alternative.

Alternative 3 restores the greatest area of riparian habitat and results in the greatest increase in AAHU values for two habitat types, mixed riparian woodland and seasonal wetland. It provides the smallest increase in valley oak/sycamore woodland area and AAHU values and does not include restoration of valley oak/sycamore savanna habitat. Unfortunately, with the inclusion of mining costs, Alternative 3 is the least cost effective per AAHU (Table 4-8). If mining costs are not included (e.g., the sale of the material pays for the cost of excavation and hauling), the cost per AAHU for mixed riparian woodland is the lowest of the three alternatives at $81,993 per AAHU. The per AAHU costs also would decrease for the seasonal wetland and valley oak/sycamore woodland, but the amounts are still greater than alternatives 1 and 2.

Based on the project goals and the cost benefit analysis, Alternative 1 appears to be the most beneficial and cost-effective. It also meets all the project goals. The other alternatives have merits that need to be carefully considered before selecting the preferred alternative. There are also different methodologies for implementing the construction of each habitat type and this will affect the cost per AAHU. The following chapter describes and examines several different methodologies for implementing the restoration elements that make up each alternative. Although consideration of construction methodology is an important issue, it is a separate decision and should not influence the selection of the preferred alternative because the construction methodology can be applied to any of the alternatives and is independent of the final selection.