Chapter 8
Monitoring Plan

This ASIP is required to include a plan for monitoring the implementation, effects, and effectiveness of conservation measures. The Restoration Project will include monitoring of conservation measures during construction and long-term monitoring of conservation measures following construction. Additional monitoring requirements are identified as environmental commitments as explained in the project description (see Chapter 2). This chapter identifies conservation measures for resources that will require monitoring; describes the purpose and types of monitoring that will be implemented; outlines performance standards; explains the process for reporting monitoring results; and recommends a process for integrating monitoring results into the CALFED monitoring program.

Monitoring Conservation Measures during Construction

A qualified contractor designated by Reclamation will be responsible for monitoring conservation measures that will be implemented during project construction. Construction monitoring will be required to ensure that appropriate conservation measures are implemented to avoid or minimize construction-related effects on covered species and covered NCCP communities. Construction monitoring will be required for the following covered species and habitat conservation measures, which are described in detail in Chapters 4 and 5 of this document, respectively.

- Implement construction BMPs including SWPPPs, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in-channel and on levee embankments (AFISH1).
- For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) (AFISH2).
- Implement the USFWS's guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for CALFED impacts on the species (AVELB1).

- To the extent practicable, capture western pond turtles from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat (AWPTU1).
- Avoid or minimize disturbances that could be associated with implementing CALFED actions within 0.5 mile of active bald eagle nest sites during the nesting period (February–July) (ABAEA1).
- Avoid or minimize disturbances that could be associated with implementing CALFED actions near active Cooper's hawk nest sites during the nesting period (March–August) (ACOHA1).
- Avoid or minimize disturbances that could be associated with implementing CALFED actions near active osprey nest sites during the nesting period (March–August) (AOSPR1).
- Avoid or minimize disturbances that could be associated with implementing CALFED actions near active peregrine falcon nest sites during the nesting period (March–August) (APEFA1).
- Avoid or minimize disturbances to nesting yellow-breasted chat pairs that could be associated with implementing CALFED actions during the nesting period (mid-April–August) (AYBCH1).
- Avoid or minimize disturbance to existing yellow-breasted chat habitat (AYBCH2).
- Avoid or minimize disturbances to nesting willow flycatcher pairs that could be associated with implementing CALFED actions during the nesting period (mid-May–August) (AWIFL1).
- Avoid or minimize disturbance to existing willow flycatcher habitat (AWIFL2).
- Avoid or minimize disturbance to existing nontidal freshwater permanent emergent habitat (ANFPE1).
- Avoid or minimize disturbance to existing natural seasonal wetland habitat (ANSWE1).
- Avoid or minimize disturbance to existing montane riparian habitat (AMORI1).
- Avoid or minimize disturbance to existing valley/foothill woodland and forest habitat (AVFWF1).

Detailed monitoring protocol for the conservation measures listed above will be developed through coordination with USFWS, NOAA Fisheries, and DFG. In general, monitoring during construction will include, but may not be limited to, the recommendations described below.

- **Monitoring for Conservation Measure AFISH1.** Reclamation and/or a qualified contractor will be on site to monitor all construction activities each workday. If a hazardous material spill occurs, the appropriate agencies will be contacted and immediate measures will be taken to minimize the affected

area. During construction, the in-water or near-water work areas will be scoped to assess the appropriate contingency and emergency plans should an accidental spill occur. Reclamation will also monitor construction activities to ensure that all BMPS and SWPPPs are properly enforced.

- **Monitoring for Conservation Measure AFISH2.** Reclamation and/or a qualified contractor will monitor water turbidity during construction immediately above and 500 feet downstream of the construction site a minimum of two times each workday. If downstream turbidity levels are found to exceed a turbidity increase of 15 NTUs over background turbidity, construction activities will cease until turbidity decreases to acceptable levels. Reclamation will also monitor construction activities to ensure that stream barriers, sediment traps, sediment control measures, wind erosion and dust control measures, and BMPS are properly enforced. Reclamation will ensure that sediment control measures remain in place through the first high-flow season. The appropriate agencies will be contacted if erosion concerns develop.

- **Monitoring for Conservation Measure AVELB1.** Throughout project construction, a qualified biologist will routinely monitor construction near the 100-foot no-disturbance buffer between potential valley elderberry longhorn beetle habitat and construction activities to prevent removal and disturbance of elderberry shrubs not approved by USFWS.

- **Monitoring for Conservation Measure AWPTU1.** If preconstruction surveys detect northwestern pond turtles near the construction area, a qualified biologist will routinely monitor construction near exclusion zones for the duration of project construction to prevent the turtles from entering the construction area. A qualified biologist will also monitor upland habitats up to 100-feet between aquatic habitat and construction areas to relocate turtles throughout upland areas.

- **Monitoring for Conservation Measure ABAEA1.** Throughout project construction, a qualified biologist will routinely monitor construction near the 0.5 mile–radius direct-line-of-sight buffer for active bald eagle nests to ensure the effectiveness of the buffer. The biologist will also monitor a 0.5-mile direct-line-of-sight helicopter-exclusion zone around active nests. The buffer will be readjusted if the nesting birds appear agitated from construction and other operations. If monitoring shows no impacts, the buffer distance may be reduced if approved by DFG and USFWS.

- **Monitoring for Conservation Measure ACOHA1, AOSPR1, and APEFA1.** Throughout project construction, a qualified biologist will routinely monitor construction near the 500 foot–radius direct-line-of-sight buffer for active Cooper's hawk, osprey, and/or peregrine falcon nests to ensure the effectiveness of the buffer. The biologist will also monitor a 0.5-mile direct-line-of-sight helicopter exclusion zone around active nests. The buffer will be readjusted if the nesting birds appear agitated from construction and other operations. If monitoring shows no impacts, the buffer distance may be reduced if approved by DFG and USFWS.

- **Monitoring for Conservation Measure AYBCH1 and AWIFL1.** Throughout project construction, a qualified biologist will routinely monitor construction near the 500-foot no-disturbance buffer for active yellow-breasted chat and/or willow flycatcher nests to ensure the effectiveness of the buffer. The buffer will be readjusted if the nesting birds appear agitated from construction and other operations. If monitoring shows no impacts, the buffer distance may be reduced if approved by DFG and USFWS.

- **Monitoring for Conservation Measure AYBCH2 and AWIFL2.** Throughout project construction, a qualified biologist will routinely monitor construction near the work exclusion zone for yellow-breasted chat and willow flycatcher habitat, which will be demarcated by orange fencing within 20 feet beyond the dripline of woody riparian vegetation.

- **Monitoring for Conservation Measures ANFPE1 and ANSWE1.** Resource monitors and contract compliance inspectors will routinely inspect protected areas for wetland habitats to ensure that protective measures are in place and effective.

- **Monitoring for Conservation Measure AMORI1.** Resource monitors and contract compliance inspectors will routinely inspect exclusion zones (buffers) around woody riparian vegetation to ensure avoidance.

- **Monitoring for Conservation Measure AVFWF1.** Resource monitors will routinely inspect barrier fencing around oak trees to prevent activities that result in soil compaction beneath the canopy or over the root zone. In addition, resource monitors will routinely inspect silt fencing around oak trees to prevent any soil from drifting down over the root zone.

Long-Term Monitoring of Conservation Measures

Postconstruction monitoring will be required to ensure that appropriate conservation measures are implemented to compensate for the loss of covered species or NCCP communities. Monitoring will be required for the following covered species and habitat conservation measures, which are described in further detail in Chapters 4 and 5 of this document, respectively.

- Purchase mitigation credits from the Stillwater Plains Mitigation Bank to compensate for the loss of potential valley elderberry longhorn beetle habitat. Until the valley elderberry longhorn beetle has recovered, Stillwater Plains Mitigation Bank will implement the USFWS' guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for CALFED effects on the species (AVELB1).
- Before implementing actions that could result in the loss or degradation of nontidal freshwater permanent emergent habitat, restore affected habitat on site and preserve through a conservation easement 2 acres of additional in-kind habitat for every acre of existing habitat temporarily affected by

restoration near where impacts would occur. Compensation for permanent effects will depend on Section 404 Clean Water Act requirements enforced by the Corps (ANFPE2).

- Restore affected habitat on site and preserve through a conservation easement a minimum of 2 acres of additional in-kind habitat for every acre of temporarily affected natural seasonal wetland habitat. Compensation for permanent effects will depend on Section 404 Clean Water Act requirements enforced by the Corps (ANSWE2).
- Preserve through a conservation easement 3 acres of additional in-kind habitat for every acre of affected montane riparian habitat near where adverse effects would occur before implementing actions that could result in the permanent loss or degradation of habitat. Restore affected habitat on site and preserve through a conservation easement 2 acres of additional in-kind habitat for every acre of temporarily affected montane riparian habitat (AMORI2).
- Before implementing actions that could result in the permanent loss or degradation of mixed chaparral habitats occupied by evaluated species, preserve through a conservation easement 3 acres of mixed chaparral within the current range of affected species, and near where impacts would occur. Where temporary effects to mixed chaparral habitat occur, restore affected habitat on site and preserve through a conservation easement 2 acres of mixed chaparral within the current range of affected species (AUPSC1).
- Before implementing actions that could result in the permanent loss or degradation of grassland habitats occupied by evaluated species, preserve through a conservation easement 1 acre of grassland within the current range of affected species, and near where impacts would occur. Where temporary effects to grassland habitat occur, fully restore the affected habitat on site (AGRAS1).
- Preserve through a conservation easement 5 acres of additional in-kind habitat for every acre of existing valley/foothill woodland and forest habitat that will be permanently, adversely affected by the actions near where impacts would be incurred. For temporary adverse effects to existing valley/foothill woodland and forest habitat, restore affected habitat on site and preserve through a conservation easement 2 acres of additional in-kind habitat for every acre affected (AVFWF2).

The following sections provide general information related to monitoring, performance standards, and reporting for the resource conservation measures listed above, except grasslands. Postconstruction monitoring is not required for grassland conservation measures (AGRAS1) because the environmental commitments described in Chapter 2 would restore the functions and values of this habitat type to preproject conditions. Detailed monitoring protocol will be developed through coordination with USFWS, NOAA Fisheries, and DFG.

Monitoring for Compensation Measure AVELB1

Reclamation intends to purchase mitigation credits from the Stillwater Plains Mitigation Bank to mitigate the loss of potential valley elderberry longhorn beetle habitat. As a result, Stillwater Plains will be responsible for implementing the monitoring requirements described below.

Monitoring

To meet USFWS–required performance standards described below, evidence of valley elderberry longhorn beetle occurrence in the mitigation site, the condition of the elderberry shrubs in the mitigation area, and the general condition of the valley elderberry longhorn beetle mitigation site itself shall be monitored for 10 consecutive years, beginning after the first elderberry shrub has been relocated and ending 10 years after the last elderberry shrub has been relocated. Results of the monitoring program will be furnished to USFWS annually in written reports (See Reporting, below). As specified by the valley elderberry longhorn beetle conservation guidelines (U.S. Fish and Wildlife Service 1999), the annual report will include information on timing and rate of irrigation, growth rates, and survival rates and mortality.

Because elderberry shrubs are deciduous plants, it may be difficult to judge the health of the plants in the fall. For this reason, annual reports will be based on surveys in spring (February 14–June 30), when the plants normally leaf out.

A minimum of two surveys will be conducted each spring by a qualified monitor designated by Reclamation to evaluate the condition of the plants and the mitigation site. The surveys will obtain the monitoring data described below.

- A census of any adult beetles present, including the number of beetles observed and their condition, behavior, and precise locations. Visual counts will be used. No methods involving harassment will be used.
- A census of beetle emergence holes in all elderberry stems, including their precise locations and estimated ages.
- An evaluation of the elderberry shrubs (transplants and seedlings) and native overstory plantings on the mitigation site, including the number, size, and condition of plants.
- An evaluation of the adequacy of signs, weed control measures, and irrigation at the mitigation site.
- A general assessment of the habitat, including any actual or potential threats to valley elderberry longhorn beetle and its host species, such as erosion, fire, vandalism, or excessive weed growth, and invasion of nonnative plant and animal species.

Performance Standards

Pursuant to the USFWS conservation guidelines (U.S. Fish and Wildlife Service 1999), a minimum survival rate of 60% of the replacement plantings and native overstory plantings must be maintained through the 10-year maintenance period. Within 1 year of discovering that the survival rate has dropped below 60%, for either or both elderberry seedlings and native seedlings, the applicant must replace failed plantings and raise the survival rate above this level.

Reporting

An annual monitoring report describing monitoring activities and results will be submitted to USFWS and DFG. Copies of the annual monitoring report will be submitted by February 15 of the year following the year to which the report applies.

The report will explicitly describe the status and progress of the transplanted and planted elderberry shrubs, elderberry seedlings, and native seedlings, as well as any failings of the mitigation plan and the steps taken to correct them. Any observations of beetles or fresh emergence holes will be noted. Copies of the original field notes, raw data, and photographs of the mitigation site will be included in the report. Also included will be a map of the site vicinity and maps showing where individual adult beetles, if any, and emergence holes were observed. Actual and likely future threats will be addressed along with suggested remedies (e.g., limiting access, more frequent removal of invasive nonnative vegetation, etc.).

Monitoring for Compensation Measures ANFPE2, ANSWE2, and AMORI2

The following sections describe monitoring requirements for compensation for the loss of nontidal freshwater permanent emergent habitat, natural seasonal wetland habitat, and montane riparian habitat.

On-Site Monitoring

A qualified biologist designated by Reclamation in consultation with DFG and/or USFWS will monitor on-site restoration efforts for wetland and woody riparian habitat. Monitoring of on-site wetland and woody riparian restoration sites will be conducted for a 5-year period for herbaceous wetlands and a 10-year period for habitats dominated by trees and shrubs, commencing with completion of mitigation construction. These monitoring periods assume that the mitigation habitats have survived without human intervention (e.g., irrigation and weeding) for at least 3 years for woody riparian sites and at least 2 years for wetland sites.

If the performance standards for wetland sites are not met within 5 years, performance monitoring will continue until the standards have been met without human intervention for 2 years. If the performance standards for woody riparian sites are not met within 10 years, performance monitoring will continue until the standards have been met without human intervention for 3 years.

Performance Standards

Specific performance standards will be defined in the detailed mitigation plan and monitoring program. The standards will be based on the overall characteristics of the wetlands affected by the project to ensure that restored wetlands that have at least the same quality (e.g., plant species richness, percent cover by natives). Depending on the affected habitat, the performance standards are expected to include requirements for the following parameters:

- minimum relative percent cover by hydrophytes;
- minimum number of hydrophytic plant species;
- minimum absolute percent vegetation cover;
- maximum percent cover by invasive and other nonnative species;
- minimum percent survivorship of woody species;
- minimum height or stem diameter of woody species;
- vigor of plantings;
- level of natural recruitment;
- minimum duration of soil saturation or ponding during the growing season; and
- extent (i.e., acreage) of area meeting the performance standards listed above.

Observed use of the restored sites by wildlife will be recorded but is not proposed to be a performance standard. All restored habitats may require removal of invasive species or otherwise nonnative species during the monitoring period to ensure that the performance standards are met. Replanting may also be required.

Reporting

The monitoring contractor will submit an annual monitoring report to the appropriate resource agencies at the end of each monitoring year. The report will summarize monitoring methods, results, progress toward meeting the final performance standards, and corrective actions taken.

In the event that, after approximately 3 years following construction, monitoring reveals that some or all the restored acreage of wetlands will probably never achieve the performance standards, the Restoration Project will propose to the

Corps either (1) alternative on-site or off-site areas in which to implement similar mitigation; or (2) a different form (e.g., out-of-kind mitigation, use of a conservation easement, payment of an in-lieu fee to satisfy Corps requirements).

Conservation Easement Monitoring

The Burton Ranch conservation easement, located in the Battle Creek project area and held by The Nature Conservancy, will be used to compensate for wetland and woody riparian habitat permanently affected by Restoration Project activities. As directed by a CALFED grant agreement, The Nature Conservancy currently monitors the Burton Ranch conservation easement. This ASIP determined that the monitoring and reporting needs for this project are consistent with those required under the CALFED grant agreement. The Nature Conservancy will be responsible for sending annual easement compliance monitoring summaries to CALFED pursuant to The Nature Conservancy's grant agreement. After the grant agreement expires, The Nature Conservancy will provide CALFED with copies of all monitoring reports that The Nature Conservancy has prepared regarding the Burton Ranch easement.

Riparian Monitoring Plan

The Battle Creek Adaptive Management Plan proposes a draft riparian monitoring program to document project-related benefits to riparian habitats hypothesized to result from increased minimum streamflow, a primary component of the Restoration Project. Riparian enhancement expected from increased minimum instream flows may provide additional riparian benefits that could make the Restoration Project partially or fully self-mitigating. For more information on the riparian monitoring plan, see Section VII of the Adaptive Management Plan (Appendix C).

Monitoring

A qualified biologist designated by Reclamation in consultation with DFG and/or USFWS will be responsible for implementing the riparian monitoring plan. The plan will be implemented over a 10-year period to monitor riparian habitat response to increased base flow. The three main components of the riparian monitoring plan are:

- **Repeat aerial photography and vegetation mapping.** The goal of this study component is to quantify the distribution of plant communities as a function of increased streamflow over time.
- **Field-based monitoring.** The goal of this study component is to inventory and characterize riparian community types, document species composition, and monitor for invasion of exotic species.

- **Growth increment coring.** The goal of this study component is to quantify the growth rates of riparian species represented by the width of growth increments.

Performance Standards

Repeat Aerial Photography and Vegetation Mapping

Vegetation community–type patches will be mapped using aerial photography over a total of approximately 42 stream miles that include downstream of North Battle Creek Feeder Diversion Dam and South Diversion Dam on North Fork and South Fork Battle Creek, respectively, and also on the reaches of Ripley and Soap Creeks that will experience increases in streamflow. Vegetation communities will be mapped according to the CNPS classification system described in Sawyer and Keeler-Wolf on ortho-rectified aerial photography at a scale of larger than 1:7800. Aerial photo ortho-rectification and vegetation mapping would then be repeated 5 and 10 years after baseline characterization to detect the hypothesized response.

Field-Based Monitoring

Field-based monitoring will complement the aerial photography analysis by providing data on a finer resolution of changes within the riparian communities. Five indicator sites will be selected as representative of overall system response. Techniques similar to the Wood (2003) study, which applied standard forestry monitoring techniques and statistical analyses to characterize differences between sites, will be used to characterize differences at a site over time. Suggested methods are outlined in Section VII of the Adaptive Management Plan (Appendix C).

Growth-Increment Coring

A positive correlation between rate of instream flow and rate of tree ring growth has been observed for riparian vegetation in California (Stromberg and Patten 1990, Stromberg and Patten 1991). It is therefore hypothesized that increased base flows on Battle Creek will result in more vigorous riparian vegetation growth rates. The growth rates of riparian trees will be monitored by collecting tree core samples. Suggested methods for collecting core samples are summarized from the Wood (2003) study in Section VII of the Adaptive Management Plan (Appendix C). Data collected from the tree core samples could be used to create approximate age-class structure at Battle Creek sites parallel with growth rate analysis.

Reporting

Data collected from riparian monitoring of baseline conditions, and at 5- and 10-year increments over a period of 10 years, will be reported to the Adaptive Management Technical Team (AMTT) in a timely fashion as determined by the Adaptive Management Policy Team (AMPT). Results from the riparian monitoring study will be included in an adaptive management report, which will

be prepared each year by the AMTT and approved by the AMPT. More information on the reporting process is presented in Section III.D.8.b in the Adaptive Management Plan (Appendix C).

Monitoring for Compensation Measure AVFWF2

The following sections describe monitoring requirements for compensation for the loss of valley/foothill woodland and forest habitat.

On-Site Monitoring

A qualified biologist designated by Reclamation in consultation with DFG and/or USFWS will monitor on-site restoration efforts for valley/foothill woodland and forest habitat. Plantings of oak trees shall be monitored annually by a qualified biologist for 10–15 years after construction is complete. The monitoring methods will be decided by USFWS and DFG and will be described in the Battle Creek Implementation Plan (see Environmental Commitments described in Chapter 2).

During monitoring, the following information will be evaluated: average tree height, diameter at breast height, percentage of tree cover, tree density, percentage of woody shrub cover, seedling recruitment, and invasion by nonnative species. During the revegetation process, tree survival will be maximized by using deer screens or other maintenance measures as recommended by a certified arborist.

Areas that will require vegetative pruning and tree removal will be inspected immediately before construction, immediately after construction, and 1 year following construction to determine the amount of existing vegetative cover, cover that is removed, and cover that resprouts. If these areas have not resprouted sufficiently to return the cover to the level of cover existing prior to project construction, these areas will be replanted with the same species to reestablish the cover to the preproject condition.

Performance Standards

Success will be achieved if there is a minimum survival rate, specified by USFWS, by the end of the fifth year and a stable viable population for the duration of the monitoring period. If the performance standards are not met, remedial measures, such as replanting, will be implemented.

Reporting

An annual monitoring report will be submitted by the monitoring contractor to USFWS and DFG at the end of each monitoring year.

Conservation Easement Monitoring

The Burton Ranch conservation easement, located in the Battle Creek project area and held by The Nature Conservancy, will be used to compensate for valley/foothill woodland and forest habitat permanently affected by Restoration Project activities. As directed by a CALFED grant agreement, The Nature Conservancy currently monitors the Burton Ranch conservation easement. This ASIP determined that the monitoring and reporting needs for this project are consistent with those required under the CALFED grant agreement. The Nature Conservancy will be responsible for sending annual easement compliance monitoring summaries to CALFED pursuant to The Nature Conservancy's grant agreement. After the grant agreement expires, The Nature Conservancy will provide CALFED with copies of all monitoring reports that The Nature Conservancy has prepared regarding the Burton Ranch easement.

Integrating Monitoring Results in the CALFED Monitoring Program

Monitoring of on-site compensation measures, as well as sediment and riparian monitoring for the Restoration Project, will be developed through the coordination of Reclamation, USFWS, NOAA Fisheries, and DFG. Monitoring results will be reported back to the CBDA for use in tracking compliance of CALFED projects with the ESA, CESA, and NCCPA, as specified in the CALFED Bay-Delta Programmatic Record of Decision (2000b)[1]. The Nature Conservancy will be responsible for sending easement compliance monitoring summaries to CALFED. Monitoring results will also provide information to improve habitat restoration methodologies for other CALFED projects.

[1] This text was changed from the original Draft ASIP (April 2004) at the request of DFG on November 18, 2004.