

5.7 Monitoring and Research Plan

[Note to Reviewers: The text of this section of Chapter 5, including the approaches to monitoring and research described, is subject to change and revision as the BRCP planning process progresses. This section, however, has been drafted and formatted to appear as it may in a draft HCP/NCCP. Although this section includes declarative statements (e.g., the Implementing Entity will...), it is nonetheless a “working draft” that will undergo further modification based on input from the BRCP Stakeholder Committee and the Permitting Agencies.]

This section describes the elements of the BRCP monitoring and research plan. The monitoring and research plan has been designed to provide a means by which information necessary to implement the BRCP over time will be collected and compiled, and that the adaptive management decision making process described in Section 5.8, *Adaptive Management Plan*, is informed by the best available science. BRCP implementation, monitoring, research, and adaptive management are all part of a feedback loop process that is illustrated in Figure 5.1. The monitoring plan component is consistent with the guidance provided by the U.S. Fish and Wildlife Service’s Five-Point Policy for HCPs (65 FR 106, June 1, 2000) and provisions of the Natural Community Conservation Planning Act (NCCPA) (Fish and Game Code Section 2810(a)(7)). As described in the Five-Point Policy, the monitoring program of a conservation plan should generate information sufficient to guide plan implementation, particularly with respect to the following matters (65 FR 106, June 1, 2000; 35254):

“(1) assess the implementation and effectiveness of the HCP terms and conditions (e.g., financial responsibilities and obligations, management responsibilities, and other aspects of the incidental take permit, HCP, and the IA, if applicable); (2) determine the level of incidental take of the covered species; (3) determine the biological conditions resulting from the operating conservation program (e.g., change in the species’ status or a change in the habitat conditions); and (4) provide any information needed to implement an adaptive management strategy, if utilized. An effective monitoring program is flexible enough to allow modifications, if necessary, to obtain the appropriate information.”

The Implementing Entity may implement research to address specific scientific questions regarding covered species, natural communities, and ecosystem processes to increase the base of knowledge about these resources such that conservation measures can be adaptively implemented to more effectively achieve the biological goals and objectives. While HCPs and NCCPs are not specifically required to include research, the uncertainty regarding the level of anticipated beneficial outcomes for some covered species highlight the need for focused research to better inform BRCP implementation and monitoring. The Implementing Entity may provide funding for research on specific hypotheses important for more effective implementation of the Conservation Strategy.

BRCP monitoring will be conducted primarily to:

- document compliance with terms and conditions of BRCP permits, including limits set by the permits on the incidental take of covered species;

- 1 ▪ collect data necessary to effectively implement conservation measures;
- 2 ▪ document and evaluate the effectiveness of conservation measures in achieving BRCP
- 3 biological goals and objectives;
- 4 ▪ determine the sufficiency of the scientific hypotheses on which the assessment of effects
- 5 and effectiveness are based; and
- 6 ▪ assess progress towards achieving the biological goals and objectives both specific to
- 7 conservation actions and throughout the Plan Area.

8 **5.7.1 Responsibility for the Monitoring and Research Program**

9 The BRCP Implementing Entity is responsible for implementing the monitoring and research
10 plan. However, plan components may be implemented by multiple parties, including staff of the
11 Implementing Entity or, with the oversight of the Implementing Entity, other BRCP participants
12 (e.g., Permit Applicants, Fish and Wildlife Agencies), academic institutions, consulting firms, or
13 other qualified entities. As described under Section 5.7.5, *Integration of Monitoring and*
14 *Research with Other Programs*, monitoring conducted under existing programs implemented by
15 other entities (e.g., Central Valley Regional Water Quality Control Board, Fish and Wildlife
16 Agencies) may also be used by the Implementing Entity to assess the effectiveness of
17 conservation measures in achieving biological goals and objectives. The Implementing Entity,
18 however, is responsible for ensuring that monitoring and research efforts undertaken by others on
19 behalf of the Implementing Entity are sufficient for the purposes of BRCP implementation
20 requirements.

21 **5.7.2 General Requirements for Monitoring and Surveys**

22 The Implementing Entity will conduct several types of monitoring and surveys to ensure the
23 success of the Conservation Strategy. The general types of monitoring and surveys required are
24 described in this section.

25 **5.7.2.1 Pre-Land Acquisition Surveys**

26 As specified in conservation measure LAND CM1 (see Section 5.4, *Conservation Measures*), the
27 Implementing Entity will conduct pre-land acquisition surveys to assess the ecological
28 conditions, potential ecological conditions with implementation of conservation actions,
29 infrastructure and condition, and other attributes of each property considered for acquisition by
30 the Implementing Entity. Survey results will be used by the Implementing Entity to determine
31 the suitability of each surveyed property for achieving BRCP biological goals and objectives and
32 whether or not the property should be acquired. Information collected during pre-land
33 acquisition surveys may also be used to establish baseline ecological conditions on newly
34 acquired conservation lands (see Section 5.7.2.2, *Baseline Ecological Surveys*).

35 **5.7.2.2 Baseline Ecological Surveys**

36 As specified in conservation measure LAND CM5 (see Section 5.4, *Conservation Measures*), the
37 Implementing Entity will conduct surveys of acquired conservation lands within two years of
38 acquisition to collect information necessary to conduct a detailed assessment of baseline
39 ecological conditions. Information developed through this assessment will be used to identify

1 subsequent covered species habitat enhancement and management actions that will be
2 implemented to improve covered species' habitat conditions. The baseline survey information
3 will also provide the basis from which to measure change in ecological conditions following
4 implementation of enhancement and management actions. The degree of change will be
5 analyzed to assess the effectiveness of the actions in achieving their intended biological
6 outcomes (see Section 5.7.5, *Effectiveness Monitoring Requirements*).

7 **5.7.2.3 Preconstruction Surveys**

8 As specified in Section 5.5, *Avoidance and Minimization Measures*, preconstruction surveys are
9 required for specifically identified covered species and habitats, prior to the implementation of
10 certain covered activities and conservation measures (e.g., construction of new developments,
11 restoration or creation of new habitat) that may affect covered species or their habitats. The
12 potentially affected area will be surveyed to determine if covered species are present and likely
13 to be affected by the activity. Survey results will be used by the Implementing Entity and entities
14 implementing covered activities to determine the need to implement measures described in
15 Section 5.5 to avoid and minimize impacts on covered species and natural communities related
16 to the covered activity or conservation measure.

17 **5.7.2.4 Construction Monitoring**

18 Monitoring of ground disturbing activities and implementation of avoidance and minimization
19 measures will be conducted at the time specific covered activities are implemented.
20 Construction monitoring is required to ensure that avoidance and minimization measures are
21 properly implemented where specific sensitive occurrences of covered species (e.g., an active
22 nesting site for a covered bird species or a population of a highly restricted covered plant
23 species) have been identified at or adjacent to a construction site. The Implementing Entity will:
24 1) monitor implementation of covered activities to ensure that any applicable avoidance and/or
25 minimization measure is properly and effectively implemented, and 2) ensure that conservation
26 measures are implemented in accordance with specifications and plans.

27 **5.7.2.5 Compliance Monitoring**

28 The purpose of compliance monitoring is to: 1) track progress of BRCP implementation in
29 accordance with the implementation schedule (see Chapter 6, *Plan Implementation*) and 2) to
30 demonstrate compliance with terms and conditions of the BRCP and its associated permits.
31 Compliance monitoring will be undertaken for all covered activities, whether implemented
32 directly by the Implementing Entity or by other supporting entities through contracts,
33 memoranda of agreement, or other agreements with the Implementing Entity. An important
34 element of compliance monitoring will include documenting the extent of covered species'
35 habitats removed as a result of implementing the covered activities. Results of compliance and
36 other monitoring will be used by the Implementing Entity to determine if BRCP implementation
37 should be adjusted under the BRCP adaptive management plan (see Section 5.8, *Adaptive*
38 *Management Program*) to ensure that compliance with permit terms is achieved.

5.7.2.6 Effectiveness Monitoring

Effectiveness monitoring is conducted for three purposes: 1) to assess the effectiveness of habitat restoration and enhancement techniques in achieving the desired habitat conditions for covered and other native species, 2) to assess covered species responses to the implementation of conservation measures, and 3) to document progress made toward achieving biological goals and objectives. Effectiveness monitoring is informed by compliance and system monitoring (see below) in addition to any relevant research undertaken by the Implementing Entity or others. Effectiveness monitoring will be undertaken for habitat restoration, enhancement, and management activities.

To assess effectiveness of BRCP conservation actions, covered species will be monitored to assess individual and population responses to conservation measures that have been implemented (see Section 5.7.6, *Effectiveness Monitoring Requirements*). Effectiveness monitoring will also be used to determine whether any undesirable consequences may be associated with the implementation of specific conservation measures (e.g., establishment and spread of noxious weeds onto lands adjacent to BRCP conservation lands). Results of effectiveness monitoring will inform the Implementing Entity as it considers adjustments to implementation through the adaptive management plan (see Section 5.8, *Adaptive Management Plan*).

The effectiveness monitoring requirements for specific conservation actions will be determined by the Implementing Entity prior to implementing the actions and will be designed to collect information necessary to improve their effectiveness over time and to resolve the uncertainties. It is anticipated that the extent of effectiveness monitoring will be reduced over time as causal relationships between the implementation of conservation actions and the responses of covered species and ecosystems to those measures are better understood. For example, if relationships between a specific habitat enhancement action and the response of a particular covered species to the action are established through monitoring, then effectiveness monitoring for assessing the species response to the same action in another location may be reduced or no longer required.

5.7.2.7 System Monitoring

System monitoring is intended to complement effectiveness monitoring by helping determine causality when examining a biological response – or lack thereof – to a conservation measure. It is also designed to provide a means to assess biological changes above and beyond those related to individual conservation measures. Information within the scope of system monitoring includes the overall status, distribution, and trends related to selected covered species populations and the status of the natural communities, including the ecological functions they provide for covered and other native species over the term of the BRCP. Results of system monitoring will help the Implementing Entity to discriminate whether any observed response to a conservation action can be attributed to the implementation of the BRCP or if the lack of response indicates failure of that particular conservation measure. System monitoring will be important in particular for covered wildlife species that are migratory, nomadic, or otherwise highly mobile (i.e., dispersing readily in and out of the BRCP Plan Area). For these species, factors external to the Plan Area can readily obscure the type and extent of response to the implementation of the conservation measures. For example, it may be that a conservation measure intended to restore habitat for a covered species is not followed by use of that habitat by the species. The apparent lack of response, however, may be due to a population decline of the covered species caused by reduced

1 production or increased mortality outside the BRCP Plan Area. Thus, system monitoring is
2 important to provide context for interpretation of results of effectiveness monitoring and other
3 monitoring and research. It also provides the Implementing Entity with information necessary to
4 make implementation adjustments through the adaptive management process in advance of large-
5 scale changes in the ecological conditions of the Plan Area that appear forthcoming.

6 **5.7.3 Development of Specific Monitoring and Survey Plans**

7 The Implementing Entity will prepare detailed monitoring and survey plans for implementing the
8 all of the types of monitoring and surveys described in Section 5.7.2, *General Requirements for*
9 *Monitoring and Surveys*, except for construction monitoring (see Section 5.7.4, *Development of*
10 *Construction Monitoring Plans*). These monitoring plans will be developed prior to
11 implementation of the applicable conservation measures. The plans will include monitoring and
12 survey protocols for efforts related to preconstruction, construction, compliance, effectiveness,
13 and system monitoring. In most instances, existing and generally accepted monitoring protocols
14 (e.g., USFWS survey protocols for listed species, protocols for monitoring status and trends in
15 abundance and distribution of covered fish species) will be adopted by the Implementing Entity,
16 as appropriate. In some cases, however, the Implementing Entity will need to develop specific
17 monitoring protocols to assess the effectiveness of conservation measures.

18 The contents of each specific monitoring plan may vary depending on its purpose. The
19 monitoring plans, however, will generally include the following types of information:

- 20 ▪ description of the purpose and objectives of the monitoring (e.g., assessing progress
21 towards achieving a biological objective);
- 22 ▪ description of monitoring protocols, including sampling design and justification
23 supporting the validity of monitoring methods and sampling design;
- 24 ▪ analytical methods for assessing monitoring results;
- 25 ▪ procedures for validating monitoring data and methods;
- 26 ▪ monitoring schedule, duration, and rationale;
- 27 ▪ content requirements and submission schedule for monitoring reports;
- 28 ▪ monitoring data storage procedures;
- 29 ▪ analytical methods for the assessment data and presentation of results
- 30 ▪ references, including printed references and personal communications;
- 31 ▪ provisions for documenting subsequent revisions to the monitoring plan; and
- 32 ▪ other information pertinent to specific monitoring plans.

33 Because monitoring results are a primary source of information to allow for adaptations to BRCP
34 implementation to occur over time and to measure progress toward achieving the BRCP
35 biological goals and objectives, monitoring plans must be based on the best available information
36 and subject to rigorous standards, including statistically sound sampling designs. To ensure
37 defensibility of the BRCP monitoring plans, protocols, and sampling designs, the Implementing
38 Entity will provide for internal science-based review of these monitoring elements as a routine

1 matter; and it will provide for external science review as necessary and appropriate (see Section
2 5.8, *Adaptive Management Plan*).

3 **5.7.4 Development of Construction Monitoring Plans**

4 The Implementing Entity will develop construction monitoring plans for habitat
5 restoration/creation projects prior to initiating restoration/creation projects. Construction
6 monitoring plans will be developed based on results of preconstruction surveys of each project
7 site. The contents of each specific construction monitoring plan will vary, depending on the
8 avoidance and minimization measures applicable to the specific project. Construction
9 monitoring plans, however, will generally include the following types of information:

- 10 ▪ A description of the project-specific avoidance and minimization measures;
- 11 ▪ A construction schedule indicating which avoidance and minimization measures are
12 applicable to each habitat restoration/creation activity;
- 13 ▪ A description of the process that will be used to notify the Implementing Entity if
14 avoidance and minimization measures cannot be or are not implemented as intended by
15 the restoration contractor; and
- 16 ▪ A description of the process for documenting the implementation avoidance and
17 minimization measures.

18 The Implementing Entity will also coordinate with the Permit Applicants to develop construction
19 monitoring plan requirements for implementation of each entities' covered activities.

20 **5.7.5 Integration of Monitoring and Research with Other Programs**

21 [Text to come.]

22 [*Note to Reviewers: This section will describe current relevant monitoring and research that is*
23 *being undertaken by other programs (e.g., water quality monitoring by the Regional Water*
24 *Quality Control Board) that may be used by the Implementing Entity in assessing the Plan Area-*
25 *wide status of natural communities and covered species habitats.]*

26 **5.7.6 Effectiveness Monitoring Requirements**

27 **5.7.6.1 Restored and Created Habitats**

28 Vernal pools, emergent wetlands, and riparian habitats will be restored or created over the term
29 of the BRCP. Prior to implementing habitat restoration/creation actions, the Implementing
30 Entity will develop and implement monitoring plans and schedules for each type of habitat
31 restoration/creation action and/or habitat restoration/creation site (see Section 5.7.3,
32 *Development of Specific Monitoring and Survey Plans*). The duration and frequency of
33 monitoring of each habitat restoration/creation site will be determined by the time required for
34 covered species habitat functions to fully develop (e.g., riparian forest habitat may require the
35 entire term of the BRCP to fully develop habitat functions for covered species that use mature
36 forest) and annual variability in environmental conditions that affect habitat functions (e.g., to
37 assess the full habitat functions of restored/created vernal pools may require monitoring over the

1 course of several wet water years). The monitoring plans will describe the environmental
2 variables to be monitored (e.g., percent vegetation cover and composition and hydrology over
3 time) and variable targets that, when achieved, indicate that ecological objectives of the
4 restored/created habitat have been achieved. The selected environmental variables should be
5 those that represent measures of habitat function for associated covered and other native species
6 and that can be practicably measured. Environmental variables that should be considered for
7 each restored habitat type are described below.

8 **Restored/Created Vernal Pools**

- 9 ▪ Extent of wetted area and swales
- 10 ▪ Vernal pool inundation depth, duration, and extent
- 11 ▪ Water chemistry
- 12 ▪ Establishment and abundance of covered vernal pool shrimp and plant species
- 13 ▪ Extent and type of habitat use by vernal pool associated covered and other
14 wildlife species
- 15 ▪ Vegetation cover and composition adjacent to and within the immediate
16 watershed of the restored/created vernal pools
- 17 ▪ Site specific factors that may affect development of environmental variables
18 (e.g., establishment and abundance of invasive plant species, grasshopper
19 infestations)

20 **Restored/Created Freshwater Emergent Wetlands**

- 21 ▪ Extent of created/restored wetland
- 22 ▪ Site hydrology (e.g., duration, season, and extent of surface ponding)
- 23 ▪ Percent emergent vegetation cover, patchiness, and composition
- 24 ▪ Percent open water habitat area
- 25 ▪ Invertebrate production
- 26 ▪ Adjacent upland vegetation cover and composition
- 27 ▪ Extent and type of habitat use by marsh-associated covered and other wildlife
28 species
- 29 ▪ Site specific factors that may affect development of environmental variables
30 (e.g., establishment and abundance of invasive plant species, effects of offsite
31 management on site hydrology)

32 **Restored/Created Riparian Habitats**

- 33 ▪ Extent of created/restored riparian habitat

- 1 ▪ Seasonal site hydrology (e.g., depth to ground water)
- 2 ▪ Percent overstory vegetation cover and composition
- 3 ▪ Percent midstory vegetation cover and composition
- 4 ▪ Percent understory vegetation cover and composition
- 5 ▪ Density of elderberry shrubs
- 6 ▪ Invertebrate production
- 7 ▪ Extent and type of habitat use by riparian-associated covered and other wildlife
- 8 species
- 9 ▪ Adjacent upland vegetation cover and composition
- 10 ▪ Site specific factors that may affect development of environmental variables
- 11 (e.g., establishment and abundance of invasive plant species, establishment and
- 12 abundances of non-native predators, effects of rodents on riparian plant
- 13 establishment)

14 **Restored/Created Covered Fish Species Spawning and Rearing Habitat**

- 15 ▪ Extent of created/restored spawning habitat for each covered fish species
- 16 ▪ Extent of created/restored rearing habitat for each covered fish species
- 17 ▪ Extent and type of habitat use of restored/created habitat by covered fish species
- 18 and life stage
- 19 ▪ Spawning success in restored/created spawning habitat
- 20 ▪ Site specific factors that may affect development of environmental variables
- 21 (e.g., extreme flood events that remove or alter restored/created habitats)

22 Failure to achieve or trend towards achieving the variable targets will trigger an adaptive
23 management review by the Implementing Entity to determine if 1) remedial actions should be
24 implemented to improve the likelihood for achieving the variable targets, 2) the variable targets
25 are inappropriate based on site capability and need to be modified, and/or 3) designs of
26 subsequent restored/created habitats need to be adjusted to improve development of the desired
27 ecological conditions.

28 Habitat restoration/creation sites will also be monitored to determine their use by associated
29 covered species over time. Use of restored/created habitats by associated covered and other
30 native species is a strong indicator that the restored/created habitat has successfully developed
31 the desired habitat functions for covered and other associated native species. Failure of
32 restored/created habitat to be used by covered and other native species, however, does not
33 necessarily indicate that the restored/created habitat has failed to develop the desired habitat
34 functions. For example, if the availability of habitat is not limiting the abundance and
35 distribution of a species, that species may not use the restored/created habitat. Evaluation of

1 system monitoring data is intended to provide the Implementing Entity with additional
2 information regarding the regional status, distribution, and trends of associated covered species
3 that will help evaluate the success of restored/created habitats (see Section 5.7.7, *System*
4 *Monitoring Requirements*).

5 The intensity of monitoring required for restoration/creation of specific habitat types is expected
6 to change over the BRCP implementation period as more is learned about how restored/created
7 habitats develop under various designs. For example, initial riparian habitat restoration projects
8 will be intensively monitored until there is a clear cause and effect understanding between
9 restoration actions and the development of riparian habitat attributes. As these relationships are
10 established, the monitoring intensity of subsequent riparian habitat projects would be expected to
11 be reduced.

12 **5.7.6.2 Habitat Enhancement and Management Actions**

13 As described in Section 5.4, *Conservation Measures*, the BRCP includes actions to enhance and
14 manage protected and restored habitats to maintain and increase their functions as habitat for
15 covered and other native species over time. Prior to implementing habitat enhancement and
16 management actions, the Implementing Entity will develop and implement monitoring plans and
17 schedules for each type of habitat enhancement and management action and/or each specific site
18 to be enhanced and managed (see Section 5.7.3, *Development of Specific Monitoring and Survey*
19 *Plans*). The monitoring plans will describe the environmental variables to be monitored (e.g.,
20 percent vegetation cover and composition and hydrology over time) and variable targets that,
21 when achieved, indicate that ecological objectives of the restored/created habitat have been
22 achieved. Baseline conditions will be determined through results of baseline surveys conducted
23 for each parcel as described in Section 5.7.2.2, *Baseline Ecological Surveys*. Additional baseline
24 surveys may be required if the necessary baseline variable conditions were not addressed in
25 baseline surveys. Depending on the type of habitat enhancement and management actions to be
26 undertaken, the Implementing Entity may also need to collect information necessary to evaluate
27 the likely effects of historical land use practices (e.g., grazing regimes) on historical and current
28 site conditions. Environmental variables that may be appropriate for the types of habitat
29 enhancement and management actions contemplated in the conservation measures for each of the
30 natural communities are described below for each natural community.

31 **Oak Woodland and Savanna Natural Community**

- 32 ▪ Extent and composition of invasive grassland species
- 33 ▪ Extent of herbivory on oak tree seedlings/saplings
- 34 ▪ Density of oak tree seedlings/saplings
- 35 ▪ Density of oak tree snags and downed wood
- 36 ▪ Persistence of suitable indicator species, such as perennial bunchgrasses,
37 summer flowering native annuals, geophytes and other native herbaceous
38 perennials
- 39 ▪ Density and composition of shrubs

- 1 ▪ Small mammal abundance
- 2 ▪ Density of ground squirrel and other burrows
- 3 ▪ Extent and type of habitat use by oak woodland and savanna-associated covered
- 4 and other wildlife species

5 **Grassland Natural Community, Including Vernal Pool and Swale Complex**

6 *Grassland without Vernal Pools and Swale Complex*

- 7 ▪ Extent and composition of invasive grassland species
- 8 ▪ Extent and composition of covered and other native grassland-associated plant
- 9 species
- 10 ▪ Persistence of suitable indicator species, such as perennial bunchgrasses,
- 11 summer flowering native annuals, geophytes and other native herbaceous
- 12 perennials
- 13 ▪ Small mammal abundance
- 14 ▪ Density of ground squirrel and other burrows
- 15 ▪ Extent and type of habitat use by grassland-associated covered and other
- 16 wildlife species

17 *Vernal Pools and Swale Complex*

- 18 ▪ Extent of wetted area and swales
- 19 ▪ Vernal pool inundation depth, duration, and extent
- 20 ▪ Abundance of covered vernal pool shrimp and plant species
- 21 ▪ Extent and type of habitat use by vernal pool associated covered and other
- 22 wildlife species
- 23 ▪ Water chemistry
- 24 ▪ Vegetation cover and composition adjacent to and within the immediate
- 25 watershed of the restored/created vernal pools

26 **Riparian Natural Community**

- 27 ▪ Percent overstory vegetation cover and composition
- 28 ▪ Percent midstory vegetation cover and composition
- 29 ▪ Percent understory vegetation cover and composition
- 30 ▪ Density of elderberry shrubs

- 1 ▪ Density of native woody riparian plant seedlings/saplings
- 2 ▪ Extent and type of habitat use by riparian-associated covered and other wildlife
- 3 species

4 **Wetland Natural Community**

- 5 ▪ Site hydrology (e.g., duration, season, and extent of surface ponding)
- 6 ▪ Percent emergent vegetation cover, patchiness, and composition
- 7 ▪ Percent open water habitat area
- 8 ▪ Extent and type of habitat use by marsh-associated covered and other wildlife
- 9 species

10 **Aquatic Natural Community**

11 *Stream Channels*

- 12 ▪ Covered fish species passage success by life stage
- 13 ▪ Percent instream woody cover
- 14 ▪ Percent shaded riverine aquatic cover

15 *Ponds*

- 16 ▪ Occurrence of non-native aquatic predators
- 17 ▪ Percent emergent vegetation cover
- 18 ▪ Poned area, depth, and duration

19 The effects of enhancement and management actions will be measured as the extent of change in
20 specified environmental variables for each type of enhancement/management action relative to
21 baseline conditions (i.e., pre-action) for each variable.

22 The intensity of monitoring required is expected to change over the BRCP implementation
23 period for the reasons described above for monitoring of restored/created habitats. Monitoring
24 results will be analyzed to evaluate the effectiveness of habitat enhancement/management
25 actions in achieving site-specific objectives and to provide the Implementing Entity with
26 information necessary to make project-level adaptive management adjustments in the
27 implementation of subsequent habitat enhancement and management actions.

28 *Adjustments to Existing Grazing Practices*

29 A potential habitat enhancement action that will be contemplated, where appropriate, by the
30 Implementing Entity is adjusting livestock grazing practices to improve vegetation and other
31 ecological conditions to improve the functions of preserved lands as habitat for covered and
32 other native species. Monitoring designs for sites where grazing practices will be adjusted
33 should consider site specific characteristics, such as the spatial arrangement of natural resources,

1 the spatial arrangement of grazing specific improvements such as water supply points, salt licks,
2 fences, and herd behavior that can affect outcomes of the adjusted grazing regime. In addition to
3 the effects of the consumption of plants, the monitoring should also quantify the effects of
4 trampling on habitat conditions. Study designs should be replicated appropriately to capture
5 seasonal variation, spatial variation across analogous and dissimilar sites, and provide sufficient
6 statistical power to test for treatment effects as well interactions between treatment effects and
7 other sources of variation. Monitoring designs should also capture data on upland indicator
8 species such as perennial bunchgrass persistence and recruitment, summer flowering native
9 annuals, geophytes and other native herbaceous perennials as well as grazing driven shifts in the
10 cover of exotic annual species from more desirable to less desirable species. For some
11 conservation purposes it may be necessary to monitor within season variation in cover and thatch
12 at important times of the year such as September, February-May, and July.

13 **5.7.7 System Monitoring Requirements**

14 **5.7.7.1 Status of Natural Communities within the Plan Area**

15 The Implementing Entity will delineate and determine the distribution and extent of each natural
16 community within the Plan Area at least every 5 years over the term of the BRCP. It is
17 anticipated that the delineations will be performed using aerial imagery taken at each analysis
18 point for this purpose. Natural community mapping results will be used by the Implementing
19 Entity to identify changes in the extent and distribution of natural communities and associated
20 covered species habitats within the Plan Area over time. This information will be used by the
21 Implementing Entity to determine if there is a need to adjust implementation to better address the
22 conservation needs of covered species if substantial and unanticipated changes in the distribution
23 and extent of natural communities and covered species habitats are detected within the Plan
24 Area.

25 **5.7.7.2 Status of Covered Species within the Plan Area**

26 The Implementing Entity will assess the status, distribution, and trends of covered species within
27 the Plan Area at least every 5 years over the term of the BRCP. This assessment will be
28 conducted based on reviews of all previous BRCP monitoring results and results of relevant
29 monitoring and research conducted by others (e.g., Fish and Wildlife Agency survey results and
30 status and trends assessments). System monitoring for covered species will provide the
31 Implementing Entity with information to help track long-term changes attributable to any of a
32 number of factors (e.g., covered activities, climate change, and activities of others) that may
33 affect the status of covered species within the Plan Area. As part of system monitoring, the
34 Implementing Entity will also review relevant scientific data regarding the regional status of
35 covered species whose range and life stage distribution extends beyond the Plan Area as it
36 becomes available. This information will help inform the need for making adjustments to BRCP
37 implementation through the adaptive management process (see Section 5.8, *Adaptive*
38 *Management Plan*). For birds in particular, the Breeding Bird Survey (BBS) and Christmas Bird
39 Count (CBC) programs, in addition to raptor counts along migration routes, provide readily
40 available, continuously updated data on the global and regional status of species.

5.7.7.3 Status of Covered Species on BRCP Preserve Lands

In addition to monitoring to assess the response of covered species to habitat restoration/creation, enhancement, and management actions, the Implementing Entity will implement periodic standardized surveys to determine the abundance and use of habitats on preserved lands over the term of the BRCP. The purpose of this monitoring is to provide the Implementing Entity with information necessary to detect unanticipated and undesirable changes in the distribution and abundance of covered species that may warrant adjustments in BRCP implementation to better conserve the covered species. Proposed monitoring requirements for each species are presented in Table 5.1.

5.7.7.4 Preserved Non-Agricultural Habitats

The Implementing Entity will conduct ecological assessments of environmental conditions present on each BRCP non-agricultural preserved parcel at least every 5 years over the term of the BRCP. This assessment will be conducted using the aerial imagery acquired for monitoring natural communities throughout the Plan Area (see Section 5.7.7.1, *Status of Natural Communities within the Plan Area*) in combination with parcel-specific surveys. The frequency of assessments may be adjusted if warranted by overall conditions within the Plan Area. For example, monitoring frequency may be intensified if there has been a major environmental event (e.g., large wild fires) that has substantially altered parcel conditions. The Implementing Entity will develop a preserve-wide monitoring plan for this purpose to provide, but not be limited to, the following types of information:

- Delineation of the extent and distribution of vegetation types within each parcel;
- An assessment of habitat conditions within the parcel (e.g., vegetation composition, cover, and structure);
- An assessment of potential threats to the extent and functions of covered species habitats (e.g., adjacent land uses); and
- Occurrence of covered and other native species.

This monitoring may be satisfied through monitoring conducted to assess the effectiveness of habitat restoration/creation, enhancement, and management actions for preserved lands on which that monitoring is being conducted. Monitoring results will be evaluated to determine changes in habitat conditions from baseline conditions established at the time that each parcel was acquired and any subsequent parcel monitoring results. Results of this evaluation will be used by the Implementing Entity to determine the need for implementation of subsequent habitat enhancement or management actions to improve the habitat functions of the parcel for covered and other native species through the project-level adaptive management process.

5.7.8 Analysis of Monitoring Data

The Implementing Entity will ensure quality control of all monitoring data and will adopt procedures to maintain the highest standards of quality. Steps will be instituted to maintain the accuracy and functionality of any installed monitoring devices, and protocols will be established to govern the collection, transcription, and storage of data. All monitoring data will be entered

Handout #1

1 **Table 5.1. Proposed Monitoring for Covered Species within BRCP Preserves**

Covered Species	Proposed Monitoring ¹
Tricolored blackbird	<ul style="list-style-type: none"> ▪ Annual reconnaissance-level surveys of preserved nesting habitats to locate nesting colonies ▪ Annual surveys of active nesting colonies to estimate colony size and nesting success
Yellow-breasted chat	<ul style="list-style-type: none"> ▪ Protocol-level surveys of habitat at least every 5 years following completion of baseline surveys for each parcel to document occurrence of nesting and abundance of breeding pairs ▪ Annual surveys in parcels where nesting or breeding behavior has been detected in previous surveys for at least 2 years following detection and subsequent monitoring at intervals to be determined by the Implementing Entity
Western burrowing owl, western yellow-billed cuckoo, American peregrine falcon, bald eagle, white-tailed kite, and Swainson's hawk	<ul style="list-style-type: none"> ▪ Protocol-level surveys of habitat at least every 5 years following completion of baseline surveys for each parcel to document occurrence of nesting and nesting success ▪ Annual surveys in parcels where nesting or breeding behavior has been detected in previous surveys for at least 2 years following detection and subsequent monitoring at intervals to be determined by the Implementing Entity
Bank swallow	<ul style="list-style-type: none"> ▪ Review of annual DFG monitoring results for the Plan Area to determine distribution and size of nesting colonies
Greater sandhill crane	<ul style="list-style-type: none"> ▪ Annual monitoring of created roost sites to assess the abundance of cranes using roost sites and habitat functions of roost sites for at least 2 years following detection of use; subsequent annual reconnaissance-level surveys of roost sites to confirm use
California black rail	<ul style="list-style-type: none"> ▪ Protocol-level surveys of habitat at least every 5 years following completion of baseline surveys for each parcel ▪ Annual surveys in parcels where breeding behavior has been detected in previous surveys for at least 2 years following detection and subsequent monitoring at intervals to be determined by the Implementing Entity
Giant garter snake	<ul style="list-style-type: none"> ▪ Protocol-level surveys of habitat for at least 2 years following acquisition of each parcel ▪ Protocol-level surveys of habitat at least every 5 years following completion of initial 2 year survey period
California horned lizard	<ul style="list-style-type: none"> ▪ Protocol-level surveys of habitat following acquisition of each parcel to establish species status ▪ Reconnaissance-level surveys of habitat to document occurrence and habitat conditions at least every 5 years following completion of baseline surveys for each parcel
Western pond turtle	<ul style="list-style-type: none"> ▪ Reconnaissance-level surveys of habitat to document occurrence and habitat conditions at least every 5 years following completion of baseline surveys for each parcel
Foothill yellow-legged frog	<ul style="list-style-type: none"> ▪ Reconnaissance-level surveys of habitat to document occurrence and habitat conditions at least every 5 years

Handout #1

Covered Species	Proposed Monitoring ¹
	following completion of baseline surveys for each parcel
Valley elderberry longhorn beetle	<ul style="list-style-type: none"> ▪ Documentation of presence of elderberry host shrubs in riparian habitats through implementation of preserved natural community surveys described in Section 5.7.5.4, <i>Non-Agricultural Protected Habitats</i>.
Vernal pool species (<i>western spadefoot toad, vernal pool tadpole shrimp, vernal pool fairy shrimp, conservancy fairy shrimp, Hoover's spurge, Ahart's dwarf rush, hairy orcutt grass, slender orcutt grass, Butte County golden clover, and Greene's tuctoria</i>)	<ul style="list-style-type: none"> ▪ Monitor the presence/absence of vernal pool shrimp species during the first wet year following vernal pool acquisition; if expected shrimp species are present, monitor for their presence/absence every 5 years thereafter over the term of the BRCP; if expected shrimp species are not present, monitor during at least 2 subsequent wet years to confirm presence/absence ▪ Monitor the presence/absence of vernal pool plant species and, if present, the estimated abundance of individual plants, during the first wet year following vernal pool acquisition; if expected plant species are present, monitor for their presence/absence and estimated abundance every 5 years thereafter over the term of the BRCP; if expected plant species are not present, monitor during at least 2 subsequent wet years to confirm presence/absence and estimated abundance ▪ Monitor for the presence/absence of western spadefoot toad eggs in suitable breeding vernal pool habitats during the first wet year following vernal pool acquisition; if toad eggs are located, monitor for the production of juveniles that emerge from the pool and monitor for their presence/absence every 5 years thereafter over the term of the BRCP; if toad eggs are not located, monitor during at least 2 subsequent wet years to confirm presence/absence.
Butte County meadowfoam	[Text to come.]
Ferris' milk vetch, lesser saltscale, Red Bluff dwarf rush, Ahart's paronychia, California beaked rush, Butte County checkerbloom	<ul style="list-style-type: none"> ▪ Conduct baseline surveys to determine current distribution and abundance of individual plants within known extant occurrences on preserve lands and monitor distribution and plant abundance every 5 years thereafter over the term of the BRCP ▪ Monitor for presence of unknown occurrences of these species on preserve lands during baseline surveys and when conducting subsequent 5 year system monitoring of preserve lands; conduct similar monitoring of any new occurrences detected on preserved lands as described above for known extant occurrences.
Veiny monardella	<ul style="list-style-type: none"> ▪ Conduct baseline surveys to determine current distribution and abundance of individual plants within the known extant occurrence and monitor distribution and plant abundance every 5 years thereafter over the term of the BRCP; conduct similar monitoring of any new occurrences detected on preserved lands.
¹ Based on monitoring results, the Implementing Entity may conduct additional monitoring beyond what is indicated in this table that may be necessary to improve its understanding of monitoring results.	

1 into database software (see Section 5.7.10, *Database Development and Maintenance*) and will be
2 made readily available online once quality control analyses have been conducted.

3 The Implementing Entity will document all standardized analytical procedures and update
4 procedures as necessary. Results of the analysis of monitoring data will feed back into the
5 BRCP adaptive management process to modify and refine conservation measures to maximize
6 benefits to and minimize unanticipated adverse effects on covered species and natural
7 communities.

8 **5.7.9 Research**

9 The Implementing Entity may undertake or contract focused research to develop information
10 necessary to better inform BRCP implementation. The types of research that may be conducted
11 include those related to resolving BRCP-specific uncertainties related to:

- 12 ▪ technologies and methods for effectively implementing conservation measures;
- 13 ▪ the ecological requirements of covered species as they relate to effective implementation
14 of conservation measures; and
- 15 ▪ the likely response of covered species to conservation measures.

16 Results of research would also be used to help direct and prioritize subsequent implementation of
17 conservation measures.

18 Potential research needs identified in the course of BRCP development include conducting
19 research necessary to:

- 20 ▪ Develop effective methods for successfully establishing new occurrences of rare covered
21 plant species, including Butte County meadowfoam, veiny monardella, and other covered
22 vernal pool plant species;
- 23 ▪ Develop livestock grazing regimes that promote the establishment and increase the
24 abundance and vigor of existing occurrences of covered plant species; and
- 25 ▪ Develop appropriate waterfowl habitat management practices to maintain and enhance
26 known occurrences of Ferris' milkvetch and lesser saltscale.

27 Additional research needs are expected to be identified by the Implementing Entity over the term
28 of BRCP implementation.

29 **5.7.10 Database Development and Maintenance**

30 The Implementing Entity will develop and maintain a comprehensive spatially-linked database to
31 track implementation of all aspects of the BRCP. The database would be structured to be “user
32 friendly” and to allow for future expansion and integration with external databases if desired
33 (e.g., linkage to Fish and Wildlife Agency databases). The database would be structured to
34 support the following services:

- 35 • data documentation such that future users can determine why, how, and where data were
36 collected (i.e., metadata);

- 1 • quality assurance and control of the data and data entry;
- 2 • access and use the most current information for analysis and decision making; and
- 3 • evaluation of data by all users, as appropriate, and incorporation of corrections and
- 4 improvements in the data.

5 Major types of information expected to be maintained within the database include:

- 6 • monitoring, research, and adaptive management experiment data and results;
- 7 • BRCP funding and expenditures;
- 8 • status of covered activities, including implementation and impacts;
- 9 • implementation status of conservation measures;
- 10 • implementation status of research and adaptive management experiments;
- 11 • adopted changes to BRCP implementation through the adaptive management process; and
- 12 • all reports and documents generated by the Implementing Entity and relevant data and
- 13 reports generated by other entities.

14 The Implementing Entity may choose to develop a web-linked database to facilitate controlled
15 transference of information into and out of the database by other entities. If the BRCP
16 Implementing Entity chooses to allow access to the database by others, the database will
17 incorporate strict controls and monitoring to ensure the integrity of the database is maintained.

18 **5.7.11 Monitoring and Research Schedule**

19 The general schedule for implementing monitoring is presented in Table 5.2 [*to come*].
20 Following authorization of the BRCP, the Implementing Entity will develop detailed monitoring
21 schedules for compliance, effectiveness, and system monitoring. In addition, site-specific
22 monitoring schedules will be developed for each BRCP preserve as they are established.

23 **5.7.12 Reporting**

24 The Implementing Entity will prepare annual implementation reports that describe survey,
25 monitoring, research, and adaptive management experiment activities and results over the term
26 of the BRCP. Annual implementation reports will summarize the previous calendar year's
27 activities and results and will be completed within an established time frame the following year.
28 Reports will be submitted to the BRCP Permitting Agencies and Permit Applicants. The process
29 for distributing implementation reports is described in Chapter 7, *Implementation Structure*. The
30 Implementing Entity may also distribute reports as appropriate to other cooperating entities and
31 entities engaged in ecosystem management and research that could benefit from sharing
32 information. The Implementing Entity will use results of compliance, effectiveness, and system
33 monitoring, and adaptive management experiments to assess BRCP progress towards achieving
34 the biological goals and objectives and to inform adaptive management decision making over the
35 term of the BRCP.

36 Annual implementation reports, as appropriate to BRCP activities undertaken during the
37 reporting year, should include descriptions of:

- 1 • implemented covered activities;
- 2 • implemented conservation measures;
- 3 • implemented avoidance, minimization, and mitigation measures to address impacts of
- 4 covered activities and conservation measures on covered species and natural
- 5 communities;
- 6 • compliance monitoring activities, monitoring results, and a description of implemented
- 7 remedial actions, if any;
- 8 • effectiveness monitoring activities and monitoring results;
- 9 • system monitoring activities and monitoring results; and
- 10 • research activities and results.

11 Implementation reports will also include year-to-date summaries of the extent to which
12 conservation measures have been implemented and impacts of covered activities and
13 conservation measures on covered species and natural communities.

14

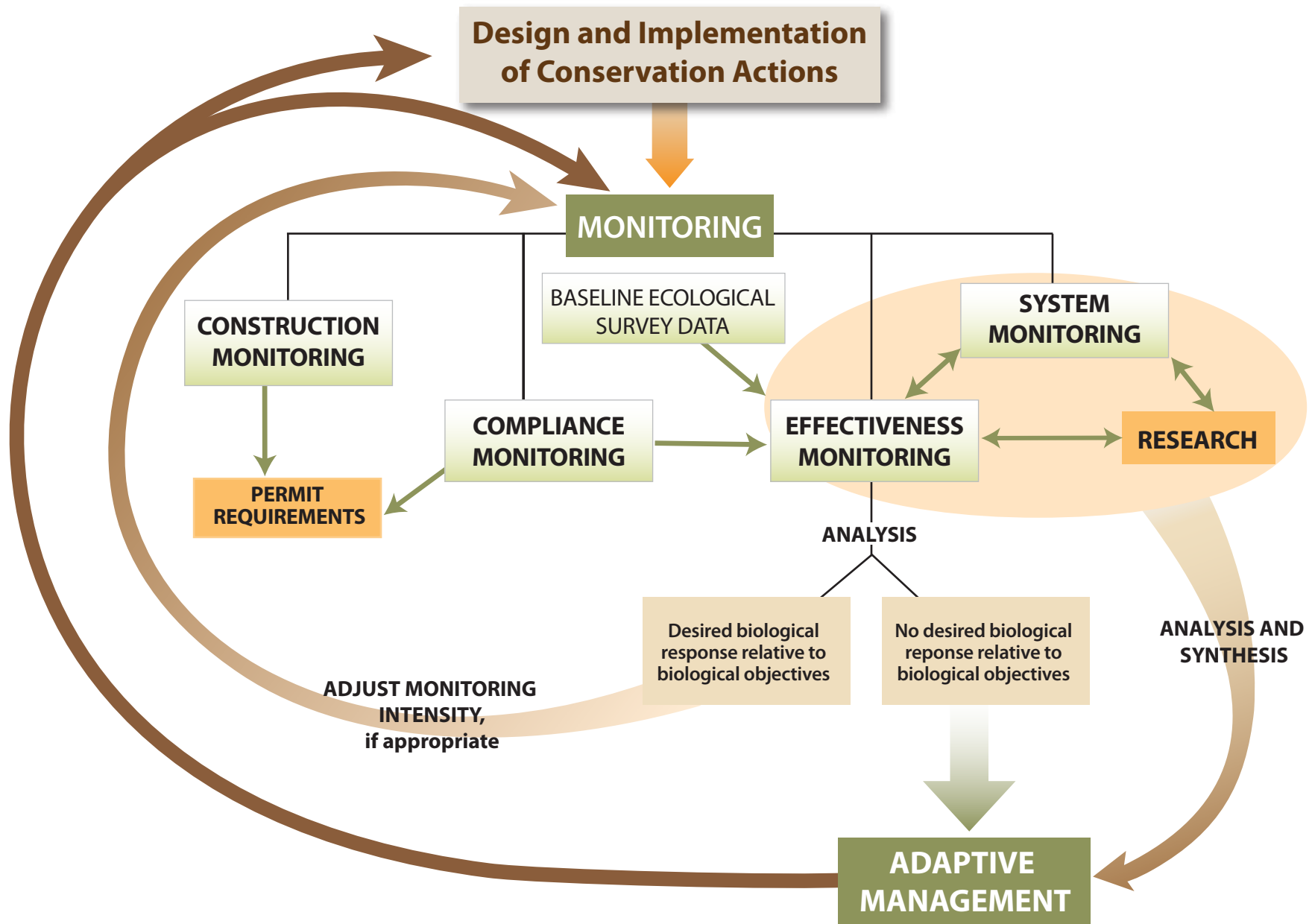


Figure 5.1 BRCP Implementation, Monitoring, Research, and Adaptive Management Feedback Loop 05/26/10