

3.5 Monitoring and Research Program

[*Note to Reviewers: The text of this section of Chapter 3, including the approaches to monitoring and research described, is subject to change and revision as the BDCP 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 BDCP Steering Committee, state and federal agencies, and the public.*]

This section describes the elements of the BDCP monitoring and research program. The monitoring and research program has been designed to provide a means by which information necessary to implement the BDCP over time will be collected and compiled, and the adaptive management decision making process informed by the best available science. The monitoring program 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 Sections 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 BDCP research program will be implemented 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 advance biological goals and objectives. While HCPs and NCCPs are not specifically required to include research programs, the ecological complexity of the Delta and the high level of uncertainty regarding the level of anticipated beneficial outcomes for covered species resulting from some of the conservation measures highlight the need for focused research to better inform BDCP implementation. Existing research programs (particularly those funded under the Interagency Ecological Program and CALFED Science Program) have produced a broad range of valuable research results and conclusions. The BDCP research program may provide funding for research on specific hypotheses important to more effective implementation of the Conservation Strategy. Many of these hypotheses are stated within the BDCP conservation measures in section 3.4 *Conservation Measures*.

Consistent with regulations and policies, the BDCP monitoring and research program will be conducted primarily to:

- 1 • document compliance with terms and conditions of BDCP permits, including limits set
2 by the permits on the incidental take of covered species;
- 3 • increase and refine scientific understanding of the effects of the covered activities
4 (described in Chapter 4, *Covered Activities*) on covered species and natural communities;
- 5 • collect data necessary to effectively implement conservation measures;
- 6 • document and evaluate the progress toward meeting specifically identified targets
7 established for conservation measures;
- 8 • document and evaluate the effectiveness of conservation measures in achieving BDCP
9 biological goals and objectives;
- 10 • determine the sufficiency of the scientific hypotheses on which the assessment of effects
11 and effectiveness are based; and
- 12 • assess progress towards achieving the biological goals and objectives both specific to
13 conservation actions and Delta-wide.

14 **3.5.1 Responsibility for the Monitoring and Research Program**

15 The BDCP Implementing Entity is responsible for implementing the BDCP monitoring and
16 research program. However, program components will likely be conducted by multiple parties,
17 including staff of the Implementing Entity or, with the oversight of the Implementing Entity,
18 other BDCP participants (e.g., DWR, Reclamation, Fishery Agencies), other entities
19 implementing conservation actions (“supporting entities” such as those tasked to implement
20 some of the other stressor conservation measures), academic institutions, consulting firms, or
21 other qualified entities. As described under Section 3.5.4, monitoring conducted under existing
22 programs implemented by other entities (e.g., CALFED Science Program, Interagency
23 Ecological Program, Central Valley Regional Water Quality Control Board) may also be used by
24 the BDCP Implementing Entity to assess the effectiveness of BDCP conservation measures in
25 achieving biological goals and objectives. The BDCP Implementing Entity, however, is
26 responsible for ensuring that monitoring and research efforts undertaken by others on behalf of
27 the BDCP are sufficient for the purposes of BDCP implementation requirements.

28 **3.5.2 General Requirements for Various Types of Monitoring**

29 The Implementing Entity will conduct several types of monitoring to ensure the success of the
30 Conservation Strategy. The general types of monitoring required are described in this section.

31 ***Preconstruction Surveys***

32 As specified in Section 3.4.4 *Avoidance and Minimization Measures*, preconstruction surveys are
33 required for specifically identified covered species, prior to the implementation of certain
34 covered activities and conservation measures (e.g., tidal habitat restoration actions that would
35 remove existing terrestrial habitat) that may affect covered species or their habitats. The
36 potentially affected area will be surveyed to determine if covered species are present and likely
37 to be affected by the activity. Survey results will be used by the Implementing Entity to
38 determine the need to implement measures described in Section 3.4.4 to avoid and minimize
39 impacts on covered species and natural communities related to the covered activity or
40 conservation measure.

1 **Construction Monitoring**

2 Monitoring of construction activities will be conducted during the construction of various
3 proposed facilities (both covered activities and conservation measures), including habitat
4 restoration projects. Construction monitoring is required to ensure that avoidance and
5 minimization measures are properly carried out where specific sensitive occurrences covered
6 species (e.g., an active nesting site for a covered bird species or a population of a highly
7 restricted covered plant species) have been identified at or adjacent to a construction site. The
8 Implementing Entity will: (1) monitor implementation of covered activities to ensure that any
9 applicable avoidance and/or minimization measure is properly and effectively implemented, and
10 (2) ensure that conservation measures are implemented in accordance with specifications and
11 plans.

12 **Compliance Monitoring**

13 The purpose of compliance monitoring is to: (1) track progress of BDCP implementation in
14 accordance with established timetables, and (2) ensure compliance with terms and conditions of
15 the BDCP and its associated permits. Compliance monitoring will be undertaken for all
16 conservation measures, whether implemented directly by the BDCP Implementing Entity or by
17 other supporting entities through contracts, memoranda of agreement, or other agreements with
18 the BDCP Implementing Entity. Compliance monitoring will be conducted to ensure that
19 conservation measures are meeting specified permit terms. These permit terms are characterized
20 as specific values for metrics assessed in compliance monitoring (permit terms for conservation
21 measures are identified in Table 3.13).

22 The Implementing Entity will conduct monitoring for: (1) water operations conservation
23 measures to assess compliance with permit terms for flow and salinity conditions and screen
24 performance, (2) physical habitat restoration conservation measures to assess progress toward
25 meeting plan requirements (e.g., vegetation composition and structure, ecological functions), and
26 (3) for other stressors conservation measures to assess the success in meeting permit terms for
27 the particular metrics used to addressing the stressor (e.g., effectiveness of submerged and
28 floating aquatic vegetation control methods in reducing the extent of submerged and floating
29 aquatic vegetation in specified locations). Results of compliance monitoring will also be used by
30 the Implementing Entity to evaluate the relative success of different implementation methods to
31 improve the effectiveness of future conservation actions.

32 Results of compliance monitoring would be used by the Implementing Entity to determine if
33 BDCP implementation should be adjusted under the BDCP adaptive management program (see
34 Section 3.6, *Adaptive Management Program*) to ensure that compliance with permit terms is
35 achieved.

36 The BDCP Implementing Entity will also establish quantifiable thresholds to serve as adaptive
37 management triggers for some conservation measures (see Table 3.13). These adaptive
38 management triggers would serve to signal the need to improve the performance of conservation
39 measures and allow for adjustments to be made through the adaptive management program.
40 Adaptive management triggers, and other indicators and targets, may be modified during the
41 course of plan implementation through the adaptive management process described in Section
42 3.6, *Adaptive Management Program*, as new information becomes available.

Effectiveness Monitoring

Effectiveness monitoring assesses ecosystem and covered species responses to the implementation of conservation measures and monitor progress made toward achieving biological goals and objectives (metrics and targets for biological goals are identified in Table 3.12). This effectiveness monitoring will be undertaken for water operations, physical habitat restoration, and other stressors conservation measures implemented by the BDCP Implementing Entity and for conservation measures that may be implemented by supporting entities. Results of effectiveness monitoring will inform the Implementing Entity as it considers adjustments to implementation through the adaptive management program (see Section 3.6, *Adaptive Management Program*). For some conservation measures specific adaptive management triggers are included that identify conditions under which targets are not likely to be achieved and adaptive changes must be considered (see Table 3.13). The effectiveness monitoring requirements for specific conservation measures are designed to collect information necessary to improve their effectiveness over time and to resolve the uncertainties and address the potential risks identified through the DRERIP evaluation of draft conservation measures (see Appendix X, *DRERIP Evaluations*).

BDCP covered species will be monitored to assess individual and population responses to conservation measures that have been implemented. Specific attributes of the aquatic ecosystem that are necessary for the survival and recovery of covered fish species will also be monitored to determine if conservation measures are effectively improving critical physical and biological conditions of the Delta and Suisun Bay. Effectiveness monitoring will also be used to determine whether any undesirable consequences may be associated with the implementation of specific conservation measures.

Effectiveness monitoring will be closely coordinated with the BDCP research program and adaptive management program. It is anticipated that the extent of effectiveness monitoring will be reduced over time as causal relationships between the implementation of conservation measures and the responses of covered species and ecosystems to those measures are better understood (as a result of knowledge gained under the BDCP monitoring and research program and other research programs). For example, if relationships between restoration of tidal marsh and zooplankton production are established through monitoring and research on initially restored tidal marshes, then effectiveness monitoring for assessing the production of zooplankton associated with subsequent restoration of tidal marsh may be reduced or no longer required.

System Monitoring

System monitoring is conducted to assess the overall status, trends, and distribution of selected covered species populations; the responses of aquatic ecosystem processes that support covered fish species; and the status of covered natural communities, including the ecological functions they provide covered species over the term of the BDCP. System monitoring will also be conducted to assess the status and trends of important aquatic ecosystem functions that support covered species and natural communities. System monitoring is important to provide context for interpretation of results of effectiveness monitoring and other monitoring and research. It also provides the BDCP Implementing Entity with information necessary to make implementation adjustments through the BDCP adaptive management process in advance of large-scale changes that appear forthcoming.

1 **Covered Fish Species.** The status and distribution of, and trends related to, covered fish species
2 will be monitored within the BDCP Planning Area and Suisun Marsh over the term of the BDCP.
3 System monitoring for covered fish species will provide the BDCP Implementing Entity with
4 information sufficient to track long-term changes attributable to any of a number of factors (e.g.,
5 covered activities, climate change, activities of others) that may affect the status, trends, and
6 distribution of covered fish species. The results of these monitoring efforts will also provide
7 documentation of the contribution of the BDCP toward the conservation of covered fish species
8 and inform system-level assessments of status, trends, and distribution.

9 As part of system monitoring, the BDCP Implementing Entity will review relevant scientific data
10 collected for covered fish species whose range and life stage distribution extends beyond the
11 BDCP Planning Area as it becomes available. Review of information gathered outside of the
12 BDCP Planning Area will be sought to further inform assessments of the status and trends
13 relating to covered fish species within the BDCP Planning Area and for making adjustments to
14 BDCP implementation through the adaptive management process.

15 Initially, system monitoring will be conducted annually during periods associated with the life
16 stages of covered species. If populations of covered species reach levels established by the
17 BDCP biological goals and objectives, and strong relationships between the response of covered
18 fish species and conservation measures have been established, the frequency of system
19 monitoring for those covered fish species may be modified by the BDCP Implementing Entity.
20 System monitoring for covered fish species, however, will be conducted at intervals of no less
21 than every █ years over the term of the BDCP. It is anticipated that most system monitoring for
22 covered fish species will be conducted through ongoing monitoring programs implemented by
23 other entities (see Section 3.5.4).

24 **Covered Wildlife and Plant Species.** [To come.]

25 **Covered Natural Communities.** The BDCP Implementing Entity will monitor the range and
26 distribution of natural communities within the BDCP Planning Area at █-year intervals over the
27 term of the BDCP. System monitoring of covered natural communities will provide the BDCP
28 Implementing Entity with information sufficient to track long-term changes in the distribution
29 and extent of covered natural communities attributable to any of a number of factors that may
30 affect the communities (e.g., covered activities, climate change, activities of others). The results
31 of these monitoring efforts will also provide documentation of the contribution of the BDCP
32 towards maintaining and improving the extent, distribution, and continuity of covered natural
33 communities. The baseline conditions from which changes in the range and distribution of
34 natural communities will be assessed are the conditions described in Chapter 2, *Existing*
35 *Ecological Conditions*.

36 **Aquatic Ecosystem Functions and Attributes.** Within the BDCP Planning Area, the
37 Implementing Entity will monitor functions and attributes of the aquatic ecosystem that are
38 important to the viability of covered fish species and aquatic natural communities. System
39 monitoring of aquatic ecosystem conditions will provide the BDCP Implementing Entity with
40 information necessary to track long-term changes in important functions and attributes of the
41 aquatic ecosystem attributable to all factors affecting the aquatic ecosystem (e.g., covered
42 activities, climate change, activities of others) and to document the contribution of the BDCP
43 toward maintaining and improving aquatic ecosystem functions in support of the covered fish
44 species.

1 The BDCP Implementing Entity will use the best available information and data regarding the
2 Delta aquatic ecosystem to establish markers from which to assess future changes in ecosystem
3 functions and attributes. Depending on the type and extent of data gaps, the BDCP
4 Implementing Entity may, at the outset of plan implementation, collect additional information to
5 better understand existing conditions. Initially, system monitoring will be conducted annually to
6 detect responses in the aquatic ecosystem as covered activities and conservation measures are
7 implemented. If strong relationships between the response of specific ecosystem functions and
8 attributes and conservation measures are established, the frequency of system monitoring for
9 those monitoring elements of the plan may be modified by the BDCP Implementing Entity in
10 future years through the adaptive management process. System monitoring for aquatic
11 ecosystem functions and attributes, however, will be conducted at intervals of no less than █
12 years. It is anticipated that most aquatic ecosystem system monitoring will be conducted through
13 ongoing monitoring programs implemented by other entities (see Section 3.5.4).

14 **3.5.3 Development of Specific Monitoring Plans**

15 The BDCP Implementing Entity will prepare detailed monitoring plans tailored to specific
16 conservation measures and based on the monitoring requirements, metrics, and targets identified
17 in Table 3.13. These monitoring plans will be developed prior to implementation of the
18 applicable conservation measures. The plans will include survey protocols for monitoring efforts
19 related to preconstruction, construction, compliance, and effectiveness. In most instances,
20 existing and generally accepted monitoring protocols (e.g., USFWS survey protocols for listed
21 species, protocols for monitoring status and trends in abundance and distribution of covered fish
22 species) will be adopted by the BDCP Implementing Entity, as appropriate. In some cases,
23 however, the Implementing Entity will need to develop specific monitoring protocols to assess a
24 conservation measures.

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

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

1 Because monitoring results are a primary source of information to allow for adaptations to occur
 2 over the course of plan implementation and to measure progress toward achieving the BDCP
 3 biological goals and objectives, monitoring plans must be based on the best available information
 4 and subject to rigorous standards, including statistically sound sampling designs. To ensure
 5 defensibility of the BDCP monitoring plans, protocols, and sampling designs, the Implementing
 6 Entity will provide for internal science-based review of these monitoring elements as a routine
 7 matter, and provide for external science review, as necessary and appropriate.

8 **3.5.4 Integration of Monitoring and Research with Other Programs**

9 Monitoring of covered species and ecosystem conditions that are relevant to BDCP
 10 implementation is currently undertaken by a number of entities, including DFG, DWR, USFWS,
 11 Reclamation, and UC Davis (see Table 3.11). These monitoring efforts are being implemented
 12 either as conditions of existing regulatory authorizations or as part of programs to study and
 13 analyze the Bay-Delta ecosystem and fisheries (e.g., Interagency Ecological Program, CALFED
 14 Science Program). The Implementing Entity will coordinate with entities implementing these
 15 monitoring programs and will use data collected through these programs, as appropriate, to
 16 evaluate the effectiveness of the BDCP Conservation Strategy in achieving biological goals and
 17 objectives and to assess the long-term status and trends of covered fish species populations and
 18 ecosystem conditions (see Section 3.5.5.4, *System Monitoring* below).

19 *[Note to Reviewers: this table is incomplete and will be expanded in subsequent document versions.]*

Table 3.11. Existing Bay Delta Monitoring Programs Anticipated to Provide Data in Support of the BDCP Monitoring Program

<i>Monitoring Program</i>	<i>Agency</i>	<i>Primary Purpose</i>	<i>Available data for BDCP</i>
Spring Kodiak trawl	DFG	Monitors spawning adult delta smelt distribution, relative abundance, and reproductive status, January-May, 2002-present	Spawning abundance index, distribution, sex ratios, reproductive status (e.g., pre-spawn, mature, or spent)
20 mm townet survey	DFG	Monitors post larval-juvenile delta smelt distribution and relative abundance, March-June, 1995-present	Post larval and juvenile abundance index, distribution, length frequency
Summer townet survey	DFG	Monitors striped bass and delta smelt abundance indices, July-August, 1959-present	Delta smelt: juvenile delta smelt abundance index, distribution, and length frequency. Longfin smelt: post larval juvenile longfin smelt abundance index, distribution, and length frequency. Sacramento splittail: YOY splittail, distribution, and length frequency
Fall midwater trawl	DFG	Monitors striped bass and delta smelt abundance indices, September-December, 1967-present	Delta smelt: Pre-adult delta smelt abundance index. Longfin smelt: Pre-adult longfin smelt abundance index. Sacramento splittail: Abundance of all size classes
Smelt larval study	DFG	Monitors longfin smelt larvae distribution and relative abundance, January 2009-present	Larval abundance index and distribution

Table 3.11. Existing Bay Delta Monitoring Programs Anticipated to Provide Data in Support of the BDCP Monitoring Program

<i>Monitoring Program</i>	<i>Agency</i>	<i>Primary Purpose</i>	<i>Available data for BDCP</i>
Bay Study	DFG	Monitors abundance indices for a variety of species in South San Francisco and Suisun Bays, Year-round, 1980-present	Delta smelt: Juveniles-adult delta smelt abundance index. Longfin smelt: Juveniles-adult longfin smelt abundance index. Sacramento splittail: Young of year and older splittail abundance
Suisun Marsh fisheries monitoring program	UC Davis	Monitors abundance of all fish species in Suisun Marsh, Year-round, 1979-present	Delta smelt: Juveniles-adult delta smelt abundance, distribution within Suisun Marsh. Longfin smelt: Juveniles-adult longfin smelt abundance, distribution within Suisun Marsh. Sacramento splittail: Abundance of all size classes, distribution within Suisun Marsh.
Fish salvage monitoring	DWR, DFG, USBR	Monitors entrainment and salvage of all fish species, Year-round, 1979-present	Delta and longfin smelt: 20 mm post larvae-adult smelt abundance. Sacramento splittail: Abundance of all size classes >20 mm and length frequency. Salmonids: >20 mm larvae-adults abundance. Sturgeon: >20 mm juvenile sturgeon abundance.
Chippis Island, Mossdale, and Sacramento trawls	USFWS	Monitors fish abundance and distribution in mid-channel at surface at Chippis Island, Mossdale (RM 54), and Sacramento (RM 55), and survival through the Delta, targets Chinook salmon, Year-round, 1976-present	Salmonids: juvenile abundance, distribution, length frequency, survival indices (of hatchery tagged fish) to Chippis Island Delta smelt: >25 mm abundance, distribution, and length frequency. Longfin smelt: >25 mm abundance and distribution, and length frequency. Sacramento splittail: >25 mm abundance and distribution, and length frequency.
Beach seines	USFWS	Monitors fish abundance and distribution throughout the Delta, upstream Sacramento River, northern San Francisco and San Pablo Bays, targets Chinook salmon, Year-round, 1976-present	Sacramento splittail: >25 mm young of year splittail abundance, distribution, and size frequency. Salmonids: juvenile salmonids, abundance, distribution, and size frequency.
Chinook salmon escapement estimates (Grandtab database)	DFG, DWR	Grandtab collects all races of Chinook salmon escapement	Salmonids: adult returns to spawning grounds by race and location
Suisun Marsh otter trawl	UC Davis	Monitors abundance of all fish species in Suisun Marsh, Year-round, 1979-present	Chinook salmon: juvenile abundance and distribution within Suisun Marsh
Adult sturgeon tagging study	DFG	Tag-recapture (via creel surveys) of green (prior to being listed) and white sturgeon for abundance and population dynamics	White and green sturgeon: abundance, distribution, population dynamics, length frequency, annual harvest rates, and migration rates.

1 3.5.5 Specific Monitoring Requirements, Metrics, and Targets

2 *[Note to Reviewers: Compliance and effectiveness monitoring metrics, targets, methods, and*
3 *adaptive management responses and triggers, and specific target values for the metrics that*
4 *constitute achievement of biological objectives are under development.]*

1 **Monitoring Metrics and Targets for Biological Objectives**

2 Each BDCP biological objectives was developed to be measurable using one or more metrics.
3 Monitoring metrics and targets for each BDCP biological objective are provided in Table 3.12.

Table 3.12. Monitoring Requirements, Metrics, and Targets for BDCP Biological Objectives

[Note to Reviewers: Table 3.12 will contain a description of specific monitoring metrics and targets for each BDCP biological objective. This table is under development and will contain a substantial amount of information. The Steering Committee has approved the formation of a group of technical experts to advise on the development of these metrics and targets and this effort will get underway the week of July 20, 2009.]

Monitoring Metric	Description of Monitoring Requirements, Metrics, and Targets.

4 **Monitoring Requirements, Metrics, and Targets for Conservation Measures**

5 Each BDCP conservation measure will be monitored using the various types of monitoring
6 described in section 3.5.2, *General Requirements for Various Types of Monitoring*. Table 3.13
7 provides details of the compliance and effectiveness monitoring requirements, metrics, targets,
8 and adaptive management triggers for each BDCP conservation measure.

Table 3.13. Monitoring Requirements, Metrics, Targets, and Adaptive Management Triggers for BDCP Conservation Measures.

[Note to Reviewers: Table 3.13 will contain a description of specific compliance and effectiveness monitoring requirements, metrics, targets, and adaptive triggers for each conservation measure. This table will contain a substantial amount of information. The Steering Committee has approved the formation of a group of technical experts to advise on the development of these metrics and targets and this effort will get underway the week of July 20, 2009.]

Monitoring Metric	Description of Monitoring Requirements, Metrics, Targets, and Adaptive Management Triggers

9 **3.5.6 Analysis of Compliance, Effectiveness, and System Monitoring Data**

10 The BDCP Implementing Entity will ensure quality control of all monitoring data, and will adopt
11 procedures to maintain the highest standards of quality. Steps will be instituted to maintain the
12 accuracy and functionality of gages, meters, and other devices, and protocols will be established
13 to govern the collection, transcription, and storage of data. All monitoring data will be entered

1 into database software (see Section 3.5.8, *Database Development and Maintenance*) and will be
2 made readily available online once quality control analyses have been conducted.

3 The BDCP Implementing Entity will document all standardized analytical procedures and update
4 procedures as necessary. Particular analyses would be specific to individual monitoring
5 parameters and would consist of classical parametric or non-parametric hypothesis testing and
6 statistical models (e.g., t-tests, ANOVAs, correlations, regressions, etc.) to the extent practicable.
7 If advanced statistical methods are necessary (e.g., multivariate ANOVAs, principle components
8 analysis, Bayesian statistics, etc.), the BDCP Implementing Entity would consult with experts to
9 ensure proper analyses are being conducted. For many parameters, due to high environmental
10 variability, time series analyses will be necessary to assess with confidence whether a trend in a
11 parameter depicts a change that has occurred as a result of a BDCP action. Results of the
12 analysis of monitoring data will feed back into the BDCP adaptive management process to
13 modify and refine conservation measures to maximize benefits to and minimize unanticipated
14 adverse effects on covered species and other components of the aquatic community.

15 **3.5.7 Research and Analytical Tools Development**

16 [*Note to Reviewers: Areas for potential research and analytical tools development are under*
17 *development and will be revised and expanded as conservation measures are further developed.*]

18 BDCP Implementing Entity may undertake or contract focused research to develop information
19 necessary to better inform BDCP implementation. The types of research that may be conducted
20 include those related to resolving BDCP-specific uncertainties related to:

- 21 • technologies and methods for effectively implementing conservation measures;
- 22 • appropriate indicators, targets, and adaptive management triggers;
- 23 • the ecological requirements of covered species as they relate to effective implementation
24 of conservation measures; and
- 25 • the likely response of covered species to conservation measures.

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

28 The BDCP Implementing Entity may develop or participate in the development of models and
29 other analytical tools to help inform BDCP implementation. These analytical tools include
30 development of relevant deterministic, statistical, and conceptual models and correlations. To
31 develop these tools, the BDCP Implementing Entity may conduct studies to collect information
32 necessary for their development. Additionally, it is anticipated that the BDCP Implementing
33 Entity will also participate in revising existing tools (e.g., hydrodynamic models) as new
34 information becomes available over the term of the BDCP to improve their utility.

35 **3.5.8 Database Development and Maintenance**

36 The BDCP Implementing Entity will develop and maintain a comprehensive spatially-linked
37 database to track implementation of all aspects of the BDCP. The database would be structured
38 to be “user friendly” and to allow for future expansion and integration with external databases
39 (e.g., linkage to CALFED and Fishery Agency databases). The database would be structured to
40 support the following services:

- 1 • data documentation such that future users can determine why, how, and where data were
- 2 collected (i.e., metadata);
- 3 • quality assurance and control of the data and data entry;
- 4 • access and use the most current information for analysis and decision making; and
- 5 • evaluation of data by all users, as appropriate, and incorporation of corrections and
- 6 improvements in the data.

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

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

16 The BDCP Implementing Entity may choose to develop a web-linked database to facilitate

17 controlled transference of information into and out of the database by other entities. If the BDCP

18 Implementing Entity chooses to allow access to the database by others, the database will

19 incorporate strict controls and monitoring to ensure the integrity of the database is maintained.

20 **3.5.9 Monitoring and Research Schedule**

21 The general schedule for implementing monitoring is presented in Table 3.14 [*to come*].

22 Following authorization of the BDCP, the Implementing Entity will develop detailed monitoring

23 schedules for compliance, effectiveness, and system monitoring. In addition, site-specific

24 monitoring schedules will be developed for each BDCP habitat area as they are restored.

Table 3.14. Schedule for Implementing Monitoring

25 [*to come*]

26 **3.5.10 Reporting**

27 The BDCP Implementing Entity will prepare annual implementation reports that describe survey,

28 monitoring, research, and adaptive management experiment activities and results over the term

29 of the BDCP. Annual implementation reports will summarize the previous calendar year's

30 activities and results and will be completed within an established time frame the following year.

31 Reports will be submitted to the BDCP permitting agencies, permit applicants, and participants.

32 The process for distributing implementation reports is described in Chapter 7, *Implementing*

33 *Structure*. The BDCP Implementing Entity may also distribute reports as appropriate to other

34 cooperating entities and entities engaged in Delta ecosystem management and research that could

35 benefit from sharing information. The BDCP Implementing Entity will use results of

36 compliance, effectiveness, and system monitoring, and adaptive management experiments to

1 assess BDCP progress towards achieving the biological goals and objectives and to inform
2 adaptive management decision making over the term of the BDCP.

3 Annual implementation reports, as appropriate to BDCP activities undertaken during the
4 reporting year, should include descriptions of:

- 5 • implemented covered activities;
- 6 • implemented conservation measures;
- 7 • implemented avoidance, minimization, and mitigation measures to address impacts of
8 covered activities and conservation measures on covered species and natural
9 communities;
- 10 • effects monitoring activities and results;
- 11 • compliance monitoring activities, monitoring results, and a description of implemented
12 remedial actions, if any;
- 13 • effectiveness monitoring activities and monitoring results; and
- 14 • research activities and results.

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