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**The BDCP reflects the culmination of a multiyear, systematic and in-depth evaluation of a wide range of approaches—each with different levels of incidental take on covered species—to achieve the Plan’s goal to provide a comprehensive conservation strategy for the Sacramento-San Joaquin River Delta (Delta) designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. To issue permits, the federal fish and wildlife agencies are required to consider alternatives that would avoid or reduce the “take” of covered species.**

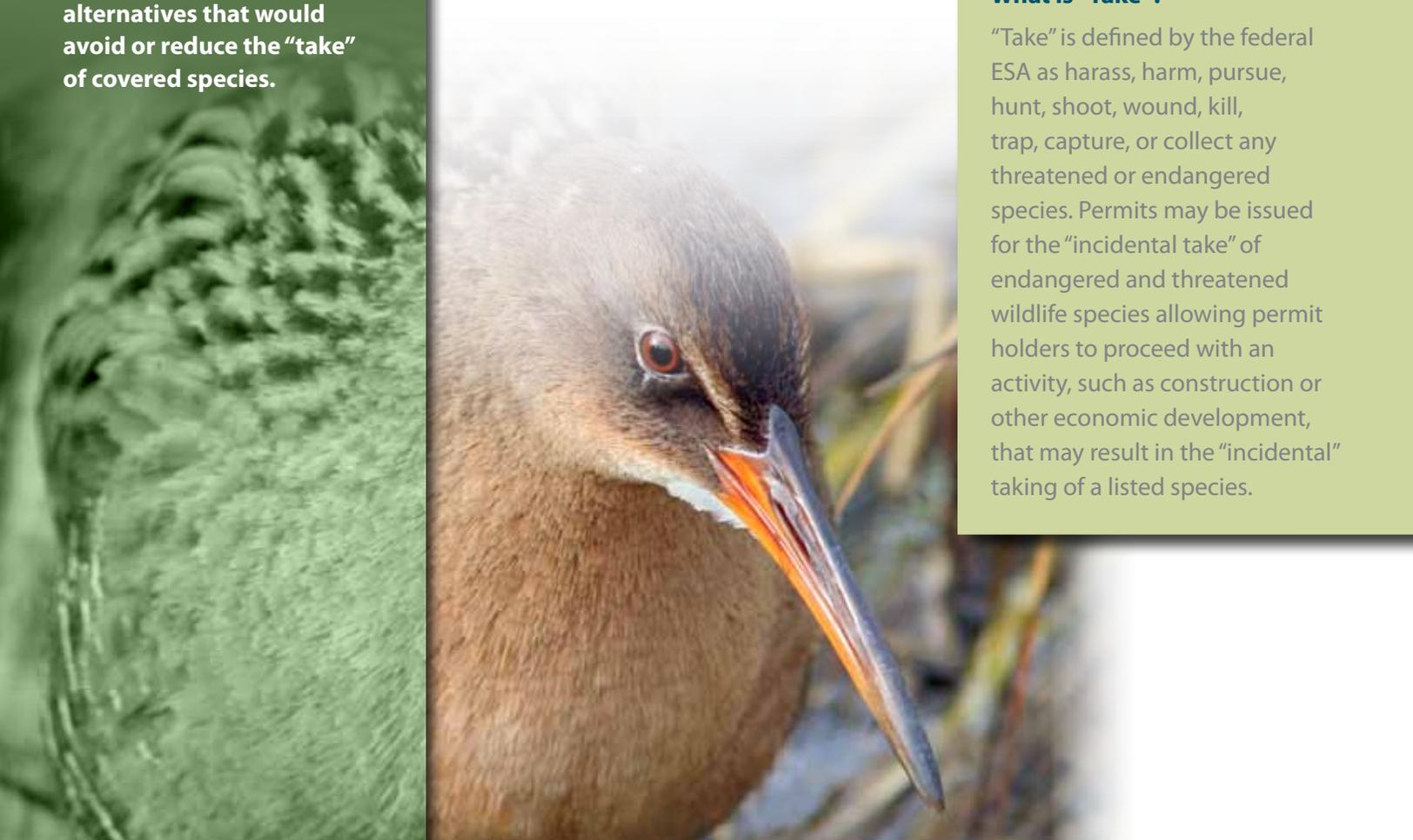
## **BDCP Chapter 9 Alternatives to Take**

The U.S. Endangered Species Act (ESA) requires analysis of alternatives in a habitat conservation plan that may avoid or reduce the “take” (*see box below for definition of “take”*) of various species covered by the BDCP. Chapter 9 describes these alternatives, called “take alternatives.” These take alternatives were developed based, in part, on the alternatives in the Administrative Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). However, the take alternatives are different from the alternatives to the proposed action in the EIR/EIS because they serve a different purpose. In Chapter 9, the take alternatives are used to evaluate the feasibility of reducing take of the covered species. An important criterion for assessing take alternatives is known as “practicability.” This test involves, among other things, determining whether the project would be economically feasible.

Chapter 9 describes take alternatives considered during the development of the BDCP that may result in less incidental take or more conservation benefit. Chapter 9 fulfills a specific and narrow regulatory purpose under the federal ESA. This chapter should be viewed as a tool to help understand the process for selecting the proposed project.

### **What is “Take”?**

“Take” is defined by the federal ESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species. Permits may be issued for the “incidental take” of endangered and threatened wildlife species allowing permit holders to proceed with an activity, such as construction or other economic development, that may result in the “incidental” taking of a listed species.



## Chapter 9 Fulfills ESA Regulatory Requirement

The federal ESA requires the California Department of Water Resources, as the applicant for an “incidental take” permit, to evaluate in a Habitat Conservation Plan (HCP) what alternative actions to the “take” of federally listed species were considered and why those alternatives were not selected.

### Covered Species

The BDCP covers 57 threatened and endangered species – 11 fish species and 46 plant and wildlife species. BDCP Chapter 9 examines alternatives to “take” of all fish and wildlife species as a result of Plan implementation. Plants are not addressed because the federal ESA does not prohibit take of plants.

#### Fish Species:

- Delta smelt
- Longfin smelt
- Winter-run Chinook salmon
- Spring-run Chinook salmon
- Fall-run and late fall-run Chinook salmon
- Central Valley steelhead
- Green sturgeon
- White sturgeon
- Sacramento splittail
- River lamprey
- Pacific lamprey



*Photo courtesy of CDFW*

*Chinook salmon*



*Delta smelt*

*Photo courtesy of DWR*



## Wildlife Species:

### Mammals

- San Joaquin kit fox
- Riparian woodrat
- Salt marsh harvest mouse
- Riparian brush rabbit
- Suisun shrew

### Reptiles

- Giant garter snake
- Western pond turtle

### Invertebrates

- Vernal pool tadpole shrimp
- Conservancy fairy shrimp
- Longhorn fairy shrimp
- Vernal pool fairy shrimp
- Midvalley fairy shrimp

### Amphibians

- California red-legged frog
- California tiger salamander

### Birds

- Tricolored blackbird
- Suisun song sparrow
- Yellow-breasted chat
- Least Bell's vireo
- Western burrowing owl
- Western yellow-billed cuckoo
- California least tern
- Greater sandhill crane
- Valley elderberry longhorn beetle
- California black rail
- California clapper rail
- Swainson's hawk
- White-tailed kite



*Photo courtesy of USEWS*

*San Joaquin kit fox family*



*Swainson's hawk*



*Giant garter snake*

# Summary of Take Alternatives Evaluated

**Scenario 6:** State and federal regulatory agencies developed Scenario 6 to identify alternative operating criteria to address Sacramento River flows downstream of the intakes, San Joaquin River migratory fish survival, April–May Old and Middle River flows, Spring Delta outflow for longfin smelt, and Fall X2. More information on Scenario 6 can be found in Appendix 5.J of the Administrative Draft BDCP, available online at [www.baydeltaconservationplan.com](http://www.baydeltaconservationplan.com).

Chapter 9 of the BDCP studies these alternatives to take:

Take Alternative	Take Alternative Description	Operational Criteria <sup>1</sup>	Average Annual Water Deliveries <sup>2</sup>	Primary Differences between Take Alternative and BDCP Proposed Action
BDCP Proposed Action	Dual conveyance with Intakes 2, 3, and 5, and up to 9,000 cfs diversion capacity	Decision tree for Fall X2 and enhanced spring outflow, Scenario 6 OMR, without San Joaquin River I/E ratio	4.71–5.59 MAF <sup>3</sup> North Delta: 49% South Delta: 51%	N/A
A: West Canal 15,000 cfs	Dual conveyance with west canal alignment, Intakes W1 through W5, and up to 15,000 cfs diversion capacity	Enhanced spring outflow, Fall X2, OMR criteria same as BiOp RPAs, without San Joaquin River I/E ratio	5.01 MAF North Delta: 52% South Delta: 48%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Location and type of primary conveyance facility</li> <li>• Location of intakes and associated intake facilities</li> <li>• Number of pumping plants</li> <li>• Number of forebays</li> <li>• Water facility components</li> </ul>
B: Tunnels 6,000 cfs	Dual conveyance with Intakes 1 and 2 and up to 6,000 cfs north Delta diversion capacity	Enhanced spring outflow, Fall X2, Scenario 6 OMR criteria, without San Joaquin River I/E ratio	4.49 MAF North Delta: 41% South Delta: 59%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Number and location of intakes and associated intake facilities</li> <li>• Number of pumping plants</li> <li>• Location of conveyances pipelines and initial tunnel between intake pumping plants and intermediate forebay</li> <li>• North Delta diversion capacity</li> <li>• South Delta diversions</li> </ul>
C: Tunnels 15,000 cfs	Dual conveyance with tunnel/pipeline, five intakes, and up to 15,000 cfs diversion capacity	Same as Take Alternative A	5.01 MAF North Delta: 52% South Delta: 48%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Number and location of intakes and associated intake facilities</li> <li>• Number of pumping plants</li> <li>• Location of conveyances pipelines and initial tunnel between intake pumping plants and intermediate forebay</li> <li>• North Delta diversion capacity</li> <li>• South Delta diversions</li> </ul>
D: Tunnels 3,000 cfs	Dual conveyance with Intake 1 with up to 3,000 cfs north Delta diversion capacity; reduce tidal natural communities restoration to 40,000 acres	Enhanced spring outflow, Fall X2, Scenario 6 OMR criteria, with San Joaquin River I/E ratio	4.19 MAF North Delta: 28% South Delta: 72%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Number and location of intakes and associated intake facilities</li> <li>• Number of pumping plants</li> <li>• Location of conveyances pipelines and initial tunnel between intake pumping plants and intermediate forebay</li> <li>• North Delta diversion capacity</li> <li>• South Delta diversions</li> </ul> <b>CM4 Components</b> <ul style="list-style-type: none"> <li>• Amount/location of tidal natural communities restored</li> </ul>
E: Isolated 15,000 cfs	Isolated conveyance with pipeline and five intakes, with up to 15,000 cfs north Delta diversion capacity	Enhanced spring outflow and Fall X2; no south Delta criteria because south Delta diversion is not operating	3.40 MAF North Delta: 100% South Delta: 0%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Operation of existing SWP and CVP south Delta export facilities for Clifton Court Forebay and Jones Pumping Plant</li> </ul>
F: Through-Delta	Through-Delta conveyance with Delta channel modifications and different intake locations	Enhanced spring outflow and Fall X2, OMR criteria same as BiOp RPAs, without San Joaquin River I/E ratio except when flows at Vernalis are greater than 10,000 cfs	4.17 MAF North Delta: 0% South Delta: 100%	<b>CM1 components:</b> <ul style="list-style-type: none"> <li>• Location and type of primary conveyance facility</li> <li>• Number of intake pumping plants</li> <li>• Number of diversion pumping plants</li> <li>• Number of intermediate pumping plants</li> <li>• Number of forebays</li> </ul>
G: Less Tidal Restoration	Reduce tidal natural communities restoration to 50,000 acres <sup>3</sup>	Same as BDCP Proposed Action	4.71–5.59 MAF <sup>3</sup> North Delta: 49% South Delta: 51%	<b>CM4 components:</b> <ul style="list-style-type: none"> <li>• Amount/location of tidal natural communities restoration</li> </ul>
H: More Restoration	Increase tidal natural communities restoration to 75,000 acres, seasonally inundated floodplain restoration to 20,000 acres, and channel margin enhancement to 40 linear miles <sup>3</sup>	Same as BDCP Proposed Action	4.71–5.59 MAF <sup>3</sup> North Delta: 49% South Delta: 51%	<b>CM4 components:</b> <ul style="list-style-type: none"> <li>• Amount/location of tidal natural communities restoration</li> </ul> <b>CM5 components:</b> <ul style="list-style-type: none"> <li>• Amount/location of seasonally inundated floodplain restoration</li> </ul> <b>CM6 components:</b> <ul style="list-style-type: none"> <li>• Amount/location of channel margin enhancement</li> </ul>
I: More Spring Outflow	Increase spring outflow to 44,500 cfs	Same as BDCP Proposed Action but higher spring outflow criteria (44,500 cfs instead of 35,000 cfs)	4.34 MAF North Delta: 51% South Delta: 49%	<b>CM1 component:</b> <ul style="list-style-type: none"> <li>• Rate of flow for spring outflow operating criteria</li> </ul>

**Notes:**

- <sup>1</sup> Reverse flow criteria improved from NMFS 2009 BiOp reasonable and prudent alternative.
  - <sup>2</sup> Values are for the early long-term (2025). Entries with ranges represent take alternatives with the decision tree. Proportions associated with north Delta and south Delta represent the average fraction of water deliveries from each point of diversion based on the historic frequency of water year types.
  - <sup>3</sup> Take Alternatives G and H include the same CM1 operating criteria as is included in the BDCP Proposed Action. Take Alternatives G and H include different restoration configurations for CM4, 5, and 6 than the BDCP Proposed Action. These differences in tidal wetland restoration may affect the outflow requirements and, therefore, may result in different water supply than that shown in this table. No information exists to more specifically estimate water supply for these take alternatives. Therefore, the water supply shown in this table is a reasonable estimate.
- BiOp = biological opinion  
cfs = cubic feet per second  
CVP = Central Valley Project  
I/E ratio = inflow/export ratio  
MAF = million acre-feet  
NMFS = National Marine Fisheries Service  
OMR = Old and Middle River  
RPA = reasonable and prudent alternative  
SWP = State Water Project

### How Are Take Alternatives Different?

The take alternatives vary in as few components as possible to allow comparisons. They vary along three basic dimensions: (1) the location, type, and scale of the water conveyance facility, (2) the amount of natural community restoration, and (3) water operations.

### Why Are the Take Alternatives Different from the EIR/EIS Alternatives?

Alternatives to reduce or avoid the take of covered species are often distinct from the alternatives developed to satisfy California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) regulatory requirements. Alternatives to satisfy NEPA and CEQA must avoid or substantially lessen impacts to the human environment on a wide variety of issue areas. In contrast, alternative actions evaluated in an HCP are only required to avoid or lessen impacts to covered fish and wildlife species.

# How Take Alternatives Compare

Four primary criteria were applied to BDCP take alternatives in Chapter 9 to assess how take alternatives compare to the BDCP proposed actions:

## 1. Incidental take relative to the BDCP proposed actions

A comparison of the likely effects of take alternatives on covered species, including levels of incidental take and conservation benefits during construction, operation, and maintenance.

## 2. Consistency with BDCP goals

An evaluation of whether alternatives to take are consistent, or inconsistent, with the overall goal of the BDCP.

## 3. Practicability of Take Alternatives

An analysis of the cost, logistics, and technology of each take alternative:

- a. For a take alternative to pass the cost practicability test, it must be economically feasible, generating economic benefits to the funding entities that are larger than its costs.
- b. Logistical considerations include accessibility and availability of resources and sufficient suitable lands necessary for construction, operation, and maintenance of conveyance facilities and habitat restoration.
- c. Technology considerations rendered take alternatives impracticable in cases when the alternative would require the use of untested or unproven technology.

## 4. Additional adverse and unavoidable effects

Identification of resource areas where significant and unavoidable adverse effects would result from a take alternative, such as air quality, water quality, land use, and effect, on other species.

## How Cost and Economic Benefit are Determined

As a part of the practicability assessment, Chapter 9 describes the economic benefits to water agencies in three categories: water supply, water quality, and seismic risk reduction. The cost practicability test compares the incremental benefits of an alternative to its incremental costs—from 2015 through 2075\*—to determine whether it is economically feasible.

The cost of the BDCP and each take alternative are also compared to two reasonable scenarios without the BDCP. For example, without the BDCP, the existing water conveyance (i.e., south Delta facilities) would remain in place and continue to operate as a part of the State Water Project (SWP) and Central Valley Project (CVP). Covered fish populations would be expected to continue to decline. To arrest those declines, operational constraints similar to those of BDCP could be imposed on the existing infrastructure. It is also reasonable to assume that some level of habitat restoration would be required without BDCP to comply with the current BiOps.

These scenarios, called the Existing Conveyance High-Outflow Scenario and the Existing Conveyance Low-Outflow Scenario, are used only in Chapter 9 and only to provide a reasonable comparison point for the cost practicability analysis.

*\*2075 was used as the end point of the economic analysis to account for the 50-year life of the water facility. The additional 10 years assumes that a permit extension would be granted to continue operations.*

## Chapter 9 Summary of Conclusions

Years of study and analysis have shown that the actions proposed in the BDCP are those that not only meet the goals of the BDCP, but also do the best at balancing those goals with levels of take for all fish and wildlife species, with economic, technical, and logistical viability, and with other environmental effects. There are alternatives to take that meet some, or even most, of the criteria. However, none of the take alternatives to the proposed BDCP meet all of the criteria required of a successful project.

The table below shows whether the take alternatives meet each of the criteria. A “No” in any criteria eliminates that take alternative from viability. For example, Take Alternative B would convey less water from the north Delta than the proposed actions, provides a similar level of conservation benefit, does not add unavoidable adverse effects, and passes the practicability test. However, it would result in greater take than the proposed action from an operational perspective due to an increased reliance on south Delta intakes, therefore eliminating it as a viable alternative.

Take Alternative <sup>1</sup>	Reduces Take of Some Covered Species Without Increasing Take of Others? <sup>3</sup>	Increases Conservation Benefit to Some Covered Species Without Decreasing Take of Others? <sup>2,3</sup>	Consistent with BDCP Dual Goals?	Practicality Assessment			No Additional Unavoidable Adverse Effects?
				Do Water Contractor Benefits Exceed Costs?	Logistically Feasible?	Technically Feasible?	
BDCP Proposed Action Tunnels 9,000 cfs	-	-	Yes	Yes	Yes	Yes	Yes
A: West Canal, 15,000 cfs	No	N/C	Yes	Yes	Yes	Yes	No
B: Tunnels, 6,000 cfs	No	N/C	Yes	Yes	Yes	Yes	Yes
C: Tunnels, 15,000 cfs	No	N/C	Yes	Yes	Yes	Yes	Yes
D: Tunnels, 3,000 cfs	No	No	No	No	Yes	Yes	Yes
E: Isolated, 15,000 cfs	No	N/C	Yes	No	Yes	Yes	No
F: Through Delta	No	N/C	Yes	Yes	Yes	No	No
G: Less Tidal Restoration	Yes	No	No	Yes	Yes	Yes	No
H: More Restoration	No	Yes	Yes	Yes	No	Yes	No
I: More Spring Outflow	Yes	No	No	No	Yes	Yes	No

<sup>1</sup> Take Alternatives fail if answer is “No” to one or more questions.

<sup>2</sup> In some cases, take alternatives also increase or reduce benefits to some covered species. For example, Take Alternative G reduces benefits to covered fish due to less tidal natural community restoration. Take Alternative H increases benefits to some covered fish due to more restoration of several aquatic natural communities, but increases take on some covered terrestrial species.

<sup>3</sup> Measured against the BDCP.

N/C = no measurable change in benefits compared to the BDCP.

*For more information, or to submit comments,  
visit [www.BayDeltaConservationPlan.com](http://www.BayDeltaConservationPlan.com),  
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