United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

IN REPLY REFER TO:

August 27, 2001

District Engineer
Corps of Engineers, Sacramento District
Attn: Chief, Planning Division
1325 J Street
Sacramento, California 95814-2922

Subject: CESAC-American River Watershed Investigation, Long-Term Evaluation, California

Dear Colonel Conrad:

The enclosed Fish and Wildlife Coordination Act (FWCA) report is provided pursuant to the Scope of Work for Fiscal Year 2000. This report describes fish and wildlife resources in the Corps of Engineers' (Corps) proposed American River Watershed Investigation, Long-Term Evaluation project area, and provides impact analyses for project features not included in our 1996 supplemental FWCA report, or those that have been revised since 1996. We have also recommended mitigation measures to avoid or offset these losses. These revised impact analyses and recommendations supersede those presented in our previous reports for the same impact areas. Where no new impact analyses have been completed, our impact assessments and recommendations still apply as described in our 1996 report. The three plans that we are currently analyzing for the Long-Term Evaluation are the Folsom Dam Enlargement Plan, the Stepped Release Plan, and the Ecosystems Restoration Plan.

Unfortunately, time constraints have hindered any attempt to compare the different construction alternatives with one another, to identify a Service-preferred plan, or evaluate combinations of the two alternatives at this time. Our goal, therefore, is to complete that part of the analysis prior to preparing a final FWCA report.

If you have any questions or comments regarding this report, please contact Caroline Prose at (916) 414-6575.

Sincerely,

Dale A. Pierce
Acting Field Supervisor

Enclosure

cc: AES, Region 1, Portland, OR
USACE, Sacramento District, Sacramento, CA (Attn: Patricia Roberson)
CDFG, Director, Sacramento, CA
CDFG, Reg. Mgr., Region II, Rancho Cordova, CA
CDFG, Environmental Services, Sacramento, CA
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SAFCA, Sacramento, CA (Attn: Peter Buck, Karen Hondrick)
JSA, Sacramento, CA (Attn: Brian Higgins, Gregg Roy)

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE COORDINATION ACT REPORT

FOR THE

AMERICAN RIVER WATERSHED INVESTIGATION LONG-TERM EVALUATION

Prepared for:
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA

Prepared by:
SACRAMENTO FISH AND WILDLIFE OFFICE
SACRAMENTO, CALIFORNIA

AUGUST 2001

FISH AND WILDLIFE COORDINATION ACT REPORT

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Prepared for:
U.S. ARMY CORPS OF ENGINEERS
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SACRAMENTO FISH AND WILDLIFE OFFICE
SACRAMENTO, CALIFORNIA

AUGUST 2001

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SUMMARY REPORT

BACKGROUND INFORMATION

In February 1986, major storms in northern California caused record flows in the American River basin. Water releases from Folsom Reservoir, along with high flows in the Sacramento River, caused water levels to rise above the design freeboard of levees protecting the Sacramento area. Emergency repair work was needed along the Garden Highway and in the Pocket area of Sacramento. If these storms lasted much longer, major levee sections would likely have failed, causing probable loss of life and billions of dollars in damages. The results of the February 1986 storms raised concerns over the adequacy of the existing flood control system, which led to a series of investigations for providing additional flood protection to the Sacramento area.

The U.S. Army Corps of Engineers (Corps), The Reclamation Board, and Sacramento Area Flood Control Agency (SAFCA) completed an initial feasibility study in 1991 for the main stem American River and Natomas Basin areas. The scope was to define the flood risks to the Sacramento area, develop flood protection alternatives, and recommend a plan for implementation. Consequently, the December 1991 feasibility report, recommended a flood detention dam just downstream of the confluence of the North and Middle Forks of the American River, and levee improvements in the Natomas area. These plans would result in a 200-year level of protection.

Subsequently, Congress provided guidance relating to the American River study by authorizing the construction of much of the work identified for the Natomas area. It also directed that additional studies be pursued to identify a project for increased flood protection along the American River. In response to congressional direction, the Corps, The Reclamation Board and SAFCA, prepared the 1996 Supplemental Impact Report (SIR) (USACE 1996), which was a comprehensive analysis that reformulated measures and alternatives to increase flood protection to Sacramento. The report proposed three candidate plans: Folsom Modification Plan, Folsom Stepped Release Plan, and the Detention Dam Plan. The Detention Dam Plan was the National Economic Development Plan.

In the Water Resources Development Act (WRDA) of 1996, Congress authorized a portion of the plan recommended in the SIR which included: (1) levee modification along both banks of the lower American River, (2) levee modification along the east bank of the Sacramento River downstream from the Natomas Cross Canal, (3) installation of streamflow gages upstream from Folsom Reservoir and modification to a flood warning system along the lower American River, and (4) continued interim reoperation of Folsom Reservoir for flood control. Construction is presently underway on some of these features.

In 1999, the Corps, SAFCA, and The Reclamation Board prepared an Information Paper that provided information on four new improvement plans that were identified by various interest groups to reduce the flood risks to Sacramento. This Information Paper provided additional information to the March 1996 SIR. These four supplemental improvement plans are the: Folsom Dam Outlet Modification Plan, Folsom Stepped Release Plan, Folsom Dam Enlargement Plan, and Folsom Modification and Upstream Storage Plan. Under section 101 of WRDA 1999, Congress authorized the Folsom Dam Outlet Modification Plan. These modifications are being

refined and designed by the Corps and include: (1) enlargement of existing river outlets, (2) modification of the variable flood control space instituted by Folsom reoperation, and (3) modification to surcharge storage. Construction of these features is expected to be completed in 2007. Construction of the modifications would result in a 1 in 140 chance of flooding in any year. The Sacramento area currently has about a 1 in 85 chance of flooding in any year.

Section 101 of WRDA 1999 also directed that the Folsom Dam Flood Management Plan be updated to take advantage of improved weather forecasting. Studies to update the Flood Management Plan are underway. Section 366 of WRDA 1999 authorized modifications to the Common Features project authorized in WRDA 1996, which primarily consists of additional strengthening and raising levees along the American River and Natomas Cross Canal. Construction of these features is expected to be completed in 2003. Detailed design efforts are underway to implement section 101 and section 366 project features.

The Fish and Wildlife Service (Service) prepared a Fish and Wildlife Coordination Act (FWCA) report for the American River Watershed Investigation (ARWI) in 1991. This analysis was presented in the form of one summary report and three substantiating reports, one report specific to each project area for the Auburn, lower American River, and Natomas areas. Two Planning Aid Reports, for the Deer Creek and Raising Folsom Dam alternatives, were prepared in 1994. We have also prepared a Preliminary Habitat Evaluation Procedures (HEP) report, Preliminary Draft Supplemental FWCA Report, Draft Supplemental FWCA Report, and Revised Draft FWCA Report for this project since January 1995. In 1996, we prepared a supplemental FWCA report.

This draft FWCA report provides analyses and recommendations for the Folsom Stepped Release Plan and Folsom Dam Enlargement Plan, which are described briefly below. In addition, the Corps and SAFCA are considering broad ecosystem restoration alternatives at three high-terrace sites, and one low-terrace site along the lower American River, as well as a water-temperature-specific restoration measure involving modernization of temperature control shutters at Folsom Dam. These are also summarized below.

PROJECT DESCRIPTION

1. No action alternative

Under the no action alternative, the operational modifications (revised flood control release schedule, revised reservoir storage schedule, and a release schedule for Spring refill) to Folsom Reservoir implemented by SAFCA and the U.S. Bureau of Reclamation would continue. Interim reoperation of the Folsom Dam and Reservoir would continue in accordance with the provisions contained in the 1996 WRDA. The no-action alternative also includes an advanced release scenario, which would reduce the risk of flooding from about a 1 in 140 chance to about a 1 in 164 chance in any year. Additionally, the following authorized projects would be implemented: (1) Folsom Dam Outlet Modifications, (2) North Area Local Project, (3) Common Features Project, (4) Sacramento River Bank Protection Project (SRBPP) measures on the American River, and (5) South Sacramento County Stream Group Project. Even with these projects in place, however, Sacramento would still be subject to catastrophic flooding in the event of a levee failure. If levees broke, the extent of flooding would be 86 square miles and cause damage to

over 111,000 structures. The Reclamation Board and SAFCA have indicated that their flood control goal is for Sacramento to have at least a 200-year level of protection. The chance that the current flood control system could pass a 200-year storm without levee failure and major flooding in Sacramento is about 38%.

2. Construction alternatives

a. *Folsom Dam Raising Plan*

The first construction alternative is the Folsom Dam Raising Plan, which would increase the maximum flood pool elevation from 466 feet mean sea level (msl) to a range between 478 and 487 feet msl. The corresponding increase in flood control storage space would range from 47,000 to 155,000 acre-feet, respectively. The Corps is evaluating three raise plans (3.5, 8.5, or 12 feet) as described below.

3.5-foot raise with a 478-foot pool elevation

The probability of flooding in Sacramento from levee failure would be reduced from 1 chance in 164 in any one year (with moderate advanced release), to 1 chance in 189. This alternative would include several actions: (a) replacement of the eight existing spillway gates; (b) lowering of the spillway 6 feet and modification of the bridge piers to anchor the new gates; (c) replacement of the existing eight-span spillway bridge; (d) raising the concrete dam 3.5 feet with parapet walls; (e) raising embankment dams and dikes with a 3.5-foot-high concrete wall and extension of the existing slurry walls in Mormon Island Dam and Dikes 5 and 7; (f) construct a 7-foot-high parapet wall around the Newcastle Powerhouse; (g) construction of a temporary Folsom Dam operation and maintenance bridge (about ¼-mile in length); (h) modifying the existing elevator tower; (i) purchasing flowage easements from seven or eight landowners; (j) enlarging the L. L. Anderson Dam (French Meadows Reservoir) spillway so that the dam can safely pass the probable maximum flood; and (k) some additional structural work on Folsom Dam (such as replacement of the gantry crane, modification of the penstock wheel gates, hydraulic control units, etc). This alternative would increase the storage capacity by 47,000 acre-feet and revise the dam reoperation variable flood control space to a total range of 447,00-647,000 acre-feet. About 778 additional acres would be flooded in the reservoir at the new maximum flood pool.

Borrow areas for the embankment materials have been identified at the peninsula between the north and south forks of the American River at Folsom Lake. The peninsula material (10,000 cubic yards; 90 acres) would be barged across Folsom Lake, then trucked to the construction site. Staging areas have been selected immediately adjacent to the construction sites and located to minimize vegetation disturbance.

8.5-foot raise with a 482-foot pool elevation

The probability of flooding in Sacramento from levee failure would be reduced from 1 chance in 164 to 1 chance in 213 in any one year with moderate advanced release. This plan is similar to the above plan except that: (a) the raise would be accomplished by raising the concrete monolith and embankments and adding a 3.5 foot parapet wall; (b) the spillway would not have to be lowered; (c) the floodwall constructed at the Newcastle Powerhouse would be about 12 feet high; (d) about 1/3-mile of the Folsom Dam Road southeast of the left wing dam would be raised to

avoid inundation; (e) about 90 acres (75,000 cubic yards) of the Peninsula borrow site, and 140 acres (675,000 cubic yards) of the Mississippi Bar site would be used for construction material, and (f) flowage easements would be purchased on 13-14 properties. The top of flood pool elevation is limited to 482 feet as this is the maximum normal operation that meets dam stability criteria. This alternative would increase the reservoir storage capacity by 95,000 acre-feet and would revise the dam reoperation variable flood space to a total range of 495,000-695,000 acre-feet. About 1,004 additional acres would be flooded in the reservoir at the new maximum flood pool.

12-foot raise with a 487-foot pool elevation

The probability of flooding in Sacramento from levee failure would be reduced to 1 chance in 233 in any one year with moderate advanced release. This plan is the same as the 8.5-foot raise plan above, plus: (a) new high-strength post-tensioned steel cables would be cored and grouted into the pier/dam section to provide for trunnion anchorage when replacing the spillway gates; (b) piers would be raised and extended downstream to anchor the new larger radial gates when modifying the spillway bridge piers; (c) the concrete dam would be raised 12 feet; (d) post-tensioned tendons would be used to anchor the dam's concrete mass to the bedrock; (e) the floodwall at the Newcastle Powerhouse would be about 16 feet high; (f) about 90 acres (150,000 cubic yards) of the Peninsula borrow site, and 140 acres (1,350,000 cubic yards) of the Mississippi Bar site would be used for construction material; and (g) flowage easements would be purchased on 14-15 properties, and one residence in Granite Bay would be purchased in fee title. This alternative would increase the storage capacity by 157,000 acre-feet. It also represents the maximum feasible amount of dam raise possible before a higher level of extensive modifications of the structure would be required, including foundation work that would require dewatering the reservoir. The dam's reoperation variable flood space would have a total range of 557,000-757,000 acre-feet. About 1,305 additional acres would be flooded in the reservoir at the new maximum flood pool.

b. *Folsom Stepped Release Plan*

The second construction alternative is the Stepped Release Plan which consists of two plans: (1) a Stepped Release Plan to 160,000 cubic feet per second (cfs) and (2) a Stepped Release Plan to 180,000 cfs.

Folsom Stepped Release Plan to 160,000 cfs

The Folsom Stepped Release Plan to 160,000 cfs would allow increased objective flow releases down the lower American River; peak flow releases would increase from the existing 115,000 cfs to 145,000 cfs for the more frequent floods, then to 160,000 cfs for the rarer flood events. The with-project flood risk for the 160,000 cfs plan would reduce the probability of flooding from 1 chance in 164 to 1 chance in 185 in any year. The major features of this plan are the following: (a) modifying levees along the Natomas East Main Drainage Canal (NEMDC); (b) modifying local utilities and drainages, and (c) modifying levees in the Yolo Bypass, Yolo Bypass associated sloughs and Sacramento/San Joaquin Delta (Delta) Sloughs.

Folsom Stepped Release Plan to 180,000 cfs

The Folsom Stepped Release Plan to 180,000 cfs would allow increased objective flow releases down the lower American River; peak flow releases would increase from the existing 115,000

cfs to 145,000 cfs, then to 180,000 cfs for the rarer, larger flood events. It is estimated that this plan would reduce the probability of flooding from about 1 chance in 164 to about 1 chance in 196 in any 1 year. The major features of this plan are the following: (a) modifying selected levees along the Lower American River; (b) raising Howe Avenue and Guy West bridges; (c) raising the Union Pacific railroad trestle; (d) modifying local utilities and drainages, and (e) modifying levees in the Yolo Bypass, Yolo Bypass associated sloughs, and Delta Sloughs.

3. Ecosystems Restoration alternatives

The Ecosystems Restoration Plan would consist of various restoration measures at four sites along the lower American River: Woodlake, Arden Bar, Urrutia and Bushy Lake. If pursued, the Ecosystems Restoration Plan would not be part of any mitigation need for the Long-Term Evaluation project, nor would it serve as any kind of mitigation bank. Its sole purpose would be to restore and enhance the four proposed sites. In addition, a water-temperature-specific restoration measure involving modernization of temperature control shutters at Folsom Dam, is also being considered.

a. *Woodlake Site*

Two preliminary concept design restoration alternatives, designed and mapped by Jones & Stokes Associates (JSA), were evaluated. The two alternatives would target a similar amount of the site's existing acreage–192.7 acres (Alternative 1) versus 189.2 acres (Alternative 2). However, in Alternative 1, the focus would be on creation of forest types (114.3 acres) followed by grassland creation (62.6 acres), whereas Alternative 2 would focus more on grassland (93.2 acres) and less on various forest types (73.0 acres). Alternative 1 would also focus much more than Alternative 2 on the goal of restoration of ecosystem *processes* and *function*, via a combined riparian forest (27.8 acres)-seasonal wetland (3.3 acres)-shallow aquatic (1.1 acres) area that would be created in the southwest corner of the site. In each alternative, most of the "new" habitat area would be derived from existing ruderal area, although a number of small conversions of other habitats would also be necessary. Also, under each alternative, the two existing hydrologic connections between the two existing stranding pits and the river would be improved. In addition, under Alternative 1, a third (new) hydrologic connection would be created from the river.

b. *Urrutia Site*

Just as for the Woodlake site, JSA developed two concept design restoration alternatives for this site. Alternative 1 would be the more conservative and less costly approach involving 95.4 acres. It would entail (1) restoring barren and ruderal areas to (mainly) riparian forest, riparian oak woodland, and grassland; and (2) establishing a 25-foot-wide band of emergent wetland around the entire perimeter of the open water pit. In the process, the open water pit would be reduced slightly in size from 62.4 to 59.2 acres.

Alternative 2 would be the more aggressive and costly action, involving changes on 121.5 acres. It would result in (1) larger restored acreages of (mostly) riparian forest, riparian oak woodland, and grassland; (2) slightly less emergent wetland located in three small "patches" around the pit perimeter, instead of contiguously around the entire perimeter; and (3) a seasonal wetland/ shallow aquatic habitat complex which would be hydrologically connected to the river. These features would result in the open water area of the pit being reduced from 62.4 to 34.1 acres.

Both alternatives would also include significant changes to the 2.2-acre strip of riparian forest/shrub and its associated 0.8-acre strip of adjacent Shaded Riverine Aquatic (SRA) Cover along the waterside border of the south side of the site. Presently, this habitat is relatively steep, sparsely vegetated, and lacking in woody species reproduction. It has also been significantly degraded by the placement of broken concrete slabs and waste material along the bank for bank protection. In both concept design alternatives, a portion of the existing shoreline and upper bank length along the river would be cleared, reshaped, and regraded to restore a more natural riparian hydrologic regime. This would result in the appropriate hydrology for planting and establishing (at decreasing elevations) new, high-value, self-sustaining riparian forest, shallow aquatic and seasonal wetland cover-types.

c. *Bushy Lake Site*

Just as for the other sites, JSA developed two concept design restoration alternatives for this site. The two concept alternatives for Bushy Lake are more alike than the two alternatives at either the Woodlake or Urrutia site.

Key features of Alternative 1 would be restoration of mainly wooded savannah area to riparian forest (33.2 acres), oak savannah (89.2 acres), and oak woodland (2.8 acres). Also, a narrow (150-300-foot-wide) channel which extends upstream from near Capital City Freeway for about 1,500 feet (0.9 acre) into the 66.0-acre seasonal floodplain zone along the river would be improved by grading and channeling to create better flow-through hydrology. This would reduce or eliminate fish stranding potential and provide a small permanently flooded backwater area upstream of the highway. In addition, a 0.4-acre area in the northwestern corner of the Bushy Lake site, known as Sump Pump No. 152, would be converted from existing riparian forest/scrub-shrub/permanent wetland to emergent marsh area, mainly to improve (utilizing wetlands "filtration" benefits) water quality in the vicinity of the pump and in nearby Bushy Lake.

Alternative 2 would be similar to Alternative 1, involving creation of riparian forest (20.2 acres), oak savannah (80.4 acres), and oak woodland (2.6 acres)–all mostly from the existing savannah area. Neither the 0.9-acre seasonal floodplain improvement nor the 0.4-acre conversion to emergent marsh at Pump No.152 would occur. However, 30.8 acres of grassland area would be established in the existing savannah area–a feature that Alternative 1 would lack.

In addition, within both alternatives, there would be the same major restoration actions (measures 13 and 15 - *see Section III of attached report*) implemented along the site's existing SRA Cover. The upstream 1,000 feet of this SRA Cover would be completely removed, and the steep, eroding bank would be graded gradually back towards the Chicken and Strong Ranch slough's channel entrance. This would create 4.2 acres of new floodplain area and establish the appropriate hydrology for creation of (in ascending elevation zones) shallow aquatic, seasonal wetland, and riparian forest. The same kind of habitat conversion would occur to the downstream 1,500 feet of SRA cover along the site; however, this would involve grading back about a relatively narrow 150-200-foot-wide swath along the bank and establishing the three new cover-type (on the ascending elevation zones).

d. *Arden Bar Site*

Just as for the three other sites, JSA developed two concept design alternatives for the restoration of this site. Both alternatives assume that the levee around the training facility parcel would be removed (either as part of the restoration, or by other entities) allowing for about 10-11 acres to be restored to fish and wildlife habitat, and leaving about 22-23 acres which could be added to the adjacent park (by Sacramento County or other entities).

Alternative 1 would modify 68.4 acres of the site. The centerpiece feature would be a 6.9-acre high-flow channel running roughly from northeast to southwest across the site and through the southern half of Arden Pond. This channel would essentially be a cobble-lined, auxiliary river bed connecting two points on the river and designed to function at high flows. An inflow control structure at the upstream entry point would regulate and stabilize such flows. Dense vegetation would need to be avoided within the channel itself, but the banks of the channel would be lined with 4.5 acres of willow scrub (necessitating additional filling of the pond). The other elements of the alternative would be: six patches of riparian forest totaling 26.6 acres; three patches of oak woodland savannah totaling 28.8 acres; 0.5 acre of shallow aquatic habitat; and 1.2 acres of emergent wetland in six small patches around the periphery of Arden Pond. About 10 acres of the southeast corner of the training facility would be involved in the above conversions to oak.

All of the proposed new riparian forest patches under both alternatives would necessitate first grading the sites to create appropriate hydrology. That would mean that in some instances significant amounts of riparian forest and/or scrub-shrub would have to be removed.

e. *Folsom Dam Temperature Control Shutter Modernization*

Alternative 1, the preferred alternative selected by JSA, is to modify the shutter housings to allow each shutter to be raised and lowered individually. One exception is that, because of flow limitations into the penstocks, each of the bottom two shutters would be operated as a single unit. The resulting new shutter configuration would thus be 1-1-1-1-1-1-1-2, or 7(1)-2, compared to the current 3-2-4 configuration. The new configuration would provide the greatest possible operational flexibility using the existing shutters, allowing the reservoir withdrawals to occur at 13-foot intervals. This would create essentially the same operational flexibility as a truly unlimited shutter positioning and control scheme.

The 7(1)-2 project could be built for either manual (Alternative 1A) or automated (Alternative 1B) shutter change operation. Although the automated system would have higher construction cost, annual operation cost would be substantially lower than for manual operation.

Alternative 2 evaluated here would involve the same kind of shutter housing modifications, except that a less flexible 1-1-2-2-3 configuration would be created. The 1-1-2-2-3 configuration has been proposed as mitigation for the reoperation of Folsom Reservoir for Sacramento area flood control by SAFCA. This configuration would allow for selection of six different release elevations instead of the present four. However, shutter changes would still be accomplished manually, as now. While greater temperature management flexibility would be achieved with the 1-1-2-2-3 shutter configuration than with existing shutter facilities, the 1-1-2-2-3 system would have considerably less temperature management flexibility and benefits than the proposed Alternatives 1A or 1B systems.

IMPACT ANALYSIS AND COMPENSATION NEEDS

We analyzed the Folsom Dam Raising Plan, Stepped Release Plan, and Ecosystems Restoration Plan separately (*see Sections I, II, and III of the attached report respectively*); each consists of various levels of evaluation, dependent on the information we have received to date. Time constraints hindered the Service's attempt to compare the different construction-related alternatives with one another, to identify a Service-preferred plan, or evaluate combinations of the two alternatives at this time. That part of the analysis is expected to be completed concurrent with compliance with section 7 of the Endangered Species Act and prior to preparing a final FWCA report. Construction-related impacts for various features of each plan were analyzed using the HEP found in the appendices to each plan's section. Operational impacts were quantitatively analyzed for both the Folsom Dam Raising Plan and the Stepped Release Plan and are discussed briefly below. At this time, the Folsom Dam Raising Plan is preferred to the Stepped Release Plan. For the Ecosystems Restoration Plan, the Service recommends that the temperature control shutter modernization option be given the highest priority for implementation of the five ecosystem restoration options that we analyzed.

1. Folsom Dam Raising Plan

a. *3.5-foot raise with a 478-foot pool elevation, 8.5-foot raise with a 482-foot pool elevation, and 12-foot raise with a 487-foot pool elevation*

Folsom Dam and auxiliary dams and dikes

At the Folsom Dam and its auxiliary dams and dikes, six cover-types would be permanently impacted. The footprint of these enlarged structures for any of the raise plans are essentially the same. Impacts would be to: 3.8 acres of blue oak - gray pine woodland, 21.4 acres of oak woodland, 9.0 acres of riparian woodland, 0.3 acre of seasonal wetlands, 80.0 acres of annual grassland, and 152.2 acres of "other" lands (roads, parking lots, structures, riprap, bare ground, gravel bars, etc.). To compensate for these losses, planting of 10.5 acres of blue oak - gray pine woodland, 59.41 acres of oak woodland, 9.00 acres of riparian woodland, and 0.3 acre of seasonal wetland at appropriate compensation sites would offset these losses. The candidate sites included lands near Mississippi Bar adjacent Lake Natoma, downstream of Folsom Dam; lands adjacent and within the Mormon Island Preserve wetlands near Mormon Island Dam; and lands around Folsom Lake within the existing State and Federal property boundaries. Annual grassland should be replaced by reseeding with a native grass seed mix. Impacts to "other" lands do not need to be compensated, although disturbed areas capable of supporting annual grasses should be seeded.

Folsom Reservoir (inundation zone)

At the Folsom Reservoir, seven cover-types would potentially be impacted with all three dam raise plans by being subject to infrequent inundation in the enlarged flood pool. Potential impacts are shown in Table 1. The HEP Team looked at impacts in two ways. The first assumed a worst-case scenario, and the second involved developing a monitoring plan for future impacts. The vegetation types exposed to flooding are not, in general, highly tolerant of prolonged flooding. With the exception of riparian and riverine habitats, natural flooding does not occur in the areas which would be flooded by raising Folsom Dam. Studies of the effects of inundation on blue oaks have found that blue oaks can survive some flooding, but may be sensitive to

periods of inundation of as little as 7 days. It is not clear from these studies, however, at what time of year flooding occurred, and the ability of vegetation to tolerate inundation depends on the time of year. For example, deciduous trees, such as oaks, tend to be much more sensitive to flooding during their period of active growth (i.e., in the spring), while winter-dormant plants appear to be more tolerant of flooding. Folsom Reservoir can be expected to fill during a spring flood event, when oaks are actively growing. The absence of blue oaks within the inundation zone of Folsom Reservoir and other foothill impoundments indicates that blue oaks cannot tolerate the flooding regime currently existing there. Further, evergreen species, including gray pines and live oaks, occur commonly around the reservoir, and tend to be more sensitive to inundation than deciduous trees such as blue oaks.

The Corps developed preliminary data (most recent version is dated March 9, 2001) on water surface elevation and computed probability and duration (hours or days) for 10 alternative floods ranging from a 50 to the 500-year event. This information (days and hours version) is found in the HEP report (Section I, Appendix A, Tables 6 and 7). A worst case scenario for vegetation in the new storage area is a reservoir at maximum flood pool (487 elevation) for 1 day (13 hours) and 3 days (65 hours) at an elevation just above existing conditions during a 500-year flood event. This is 13 and 39 hours above the baseline condition, respectively. During a 200-year event, water would not reach elevation 487 and the lower zone would again be inundated for a maximum of 3 days (66 hours), or 46 hours over the baseline condition.

Table 1. Summary of cover-types and their acreage which would be inundated at Folsom Reservoir at full flood pool if Folsom Dam were raised 3.5, 8.5, or 12-feet as part of the American River Watershed Investigation, California.

PROJECT FEATURE	COVER-TYPE	ACREAGE		
		3.5-foot raise 478 Pool	8.5-foot raise 482 Pool	12-foot raise 487 Pool
Folsom Reservoir (operations)	Blue oak - gray pine	283.7 (784)[1]	367.3 (1,015)	469.7 (1,298)
	Oak woodland	205.2 (570)	264.2 (733)	350.0 (927)
	Chaparral	20.1 (20)[2]	28.7 (29)	38.7 (39)
	Annual grassland	80.5 replant	106.5 replant	172.7 replant
	SUBTOTAL	589.5 (1,374)	766.7 (1,777)	1,031.1 (2,264)

[1]These numbers represent the compensation acreage that would be needed to offset impacts, assuming a worst-case scenario of all habitat values lost in the reservoir area during the life of the project.
[2]This assumes a 1:1 replacement ratio as the HEP for this cover-type was not completed.

The other factor which could affect vegetation is erosion (slippage) of the saturated soil in the new inundation area during a flood event as the water is drawn down or from wind driven wave wash during a major storm event. Slopes in the Folsom Reservoir area are generally between 5 and 25%. Slopes in the Mooney Ridge area in the northwestern corner of the reservoir and the shoreline just west of the South Fork of the American River exceed 30%. It is likely that during a major flood event some, or all, of the soil on steep slopes would experience some erosion. However, the extent of erosion and its effect on vegetation would be difficult to predict.

Assuming a worst case scenario that over the life of the project all of the existing vegetation (except riparian woodland and seasonal wetlands which would probably not be affected by inundation) in the inundation zone would be lost, a compensation need was developed for each

remaining cover-type using the HEP results. These numbers (rounded to a whole acre) appear in parentheses next to the acreage impacted in Table 1. Statistically, there is a relatively small chance of complete inundation coupled with total loss of vegetation. However, it is reasonable to expect some impacts, especially at the lower zones due to the potential for more frequent inundation, over the life of the project.

Given the uncertainties on effects of inundation on vegetation and soil erosion, the HEP Team decided, in lieu of compensation recommendations, to recommend that a monitoring and adaptive management program be developed to monitor vegetation around the reservoir over the life of the project. Baseline conditions would be managed and updated at 10-year, or some other predetermined interval. After major flood events (those which encroach above the existing maximum flood pool elevation), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using best management practices at the time (replanting on site would be the first priority).

Lastly, preliminary work conducted by the Corps indicates that one or more bridges or culvert crossings and/or their approaches may be inundated for short periods of time along Salmon Falls Road to accommodate the maximum flood pool with the 12-foot dam raise (pool elevation 487). No impacts to fish and wildlife resources were identified for this potential short duration flooding.

Newcastle Powerhouse

At Newcastle Powerhouse, only the "other" cover-type would be impacted. In this case, the entire impact area is an existing parking lot which provides no habitat value for wildlife. Therefore, provided no construction activities occur outside of the parking lot, no compensation measures are recommended.

Folsom Dam Operations and Maintenance (O&M) Bridge

At the temporary Folsom Dam O&M Bridge, five cover-types would be impacted. Impacts would be to: 2.9 acres of blue oak - gray pine woodland, 1.7 acres of oak woodland, 1.3 acres of riparian woodland, 0.5 acre of annual grassland, and 4.6 acres of "other" lands. To compensate for these losses, planting of 8.01 acres of blue oak - gray pine woodland, 4.72 acres of oak woodland, and 1.30 acres of riparian woodland would offset losses. Again, the candidate sites include lands near Mississippi Bar; lands adjacent and within the Mormon Island Preserve wetlands; and lands around Folsom Lake. Annual grassland should be replaced by reseeding with a native grass seed mix. Impacts to "other" lands do not need to be compensated, although disturbed areas capable of supporting annual grasses should be seeded.

2. Folsom Stepped Release Plan

a. *Folsom Stepped Release Plan to 160,000 cfs*

Hydraulic mitigation area

With the project, eight cover-types would be impacted, including at borrow and staging areas. Impacts would be to: 16.4 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of seasonal freshwater emergent marsh (small irrigation ditches), 11.3 acres of open water (larger irrigation ditches), 12.5 acres of agricultural lands (rice), 91.7 acres of agricultural lands (non-

rice), 61.8 acres of "other" lands (developed lands, orchards, and vineyards), 418.7 acres of upland herbaceous habitat, and 4 individual trees. To compensate for these losses, 18.0 acres of riparian woodland, 17.7 acres of oak woodland, and 20 individual trees would need to be planted at appropriate compensation sites still to be determined. During section 7 consultation, the Biological Opinion will address compensation for the giant garter snake due to seasonal freshwater emergent marsh, open water, and rice field impacts, and the Sacramento splittail and delta smelt due to seasonal freshwater emergent marsh and open water impacts. Upland herbaceous habitat should be reseeded with a native grass seed mix. Impacts to "other" land do not need to be compensated, although disturbed areas capable of supporting annual grasses should be seeded.

NEMDC area

With the project, four cover-types would be impacted. Impacts would be to: 5.7 acres of riparian woodland, 1.5 acres of oak woodland, 18.3 acres of "other" lands (developed land and barren habitat), and 3.8 acres of upland herbaceous habitat. To compensate for these losses, 5.7 acres of riparian woodland and 5.4 acres of oak woodland would need to be planted at an appropriate compensation site, currently identified at the Mississippi Bar and Rossmoor Bar sites respectively. Upland herbaceous habitat should be reseeded with a native grass seed mix. "Other" lands would require no compensation.

Local drainage and utilities modifications sites

With the project, four cover-types would be impacted. Impacts would be to: 0.6 acre of riparian woodland, 0.1 acre of "other" lands (developed land), 0.3 acre of upland herbaceous habitat, and 1 shrub. To compensate for these losses, 0.6 acre of riparian woodland would need to be planted at an appropriate compensation site, currently identified at the Mississippi Bar site. Upland herbaceous habitat should be reseeded with a native grass seed mix. "Other" lands would require no compensation. Three shrubs should be replanted to replace the one shrub to be removed; this could be done also at the Mississippi Bar site.

b. *Folsom Stepped Release Plan to 180,000 cfs*

Levee modifications

With the project, five cover-types would be impacted, including at borrow and staging areas. Impacts would be to: 25.0 acres of riparian woodland, 20.1 acres of oak woodland, 57 acres of agricultural lands (non-rice), 70.2 acres of "other" habitat (developed lands, barren ground, and orchards), and 92.3 acres of upland herbaceous habitat. To compensate for these losses, 25.0 acres of riparian woodland and 70.9 acres of oak woodland would need to be planted at an appropriate compensation site, currently identified at the Mississippi Bar and Rossmoor Bar sites respectively. Upland herbaceous habitat and agricultural lands should be reseeded with a native grass seed mix. Impacts to "other" lands do not need to be compensated, although disturbed areas capable of supporting annual grasses should be seeded.

Howe Avenue Bridge raising site

With the project, four cover-types would be impacted. Impacts would be to: 6.1 acres of riparian woodland, 0.3 acre of SRA Cover, 3.9 acres of "other" lands (developed lands and barren ground), and 2.8 acres of upland herbaceous habitat. To compensate for these losses, 6.1 acres of riparian woodland should be planted at the Mississippi Bar site, and areas where upland

herbaceous habitat would be impacted should be reseeded with a native grass seed mix. A minimum of 0.3 acre of SRA Cover should be planted on-site, and possibly more, pending the section 7 consultation for the Sacramento splittail.

Guy West Bridge raising site
With the project, two cover-types would be impacted. Impacts would be to: 0.1 acre of riparian woodland (native and non-native species) and 0.04 acre of "other" lands (developed lands and barren ground). To compensate for these losses, 0.1 acre of riparian woodland should be planted at the Mississippi Bar site. "Other" lands would require no compensation.

Hydraulic mitigation area
Same as for the 160,000 cfs Stepped Release Plan.

Local drainage and utilities modifications sites
Same as for the 160,000 cfs Stepped Release Plan.

3. Folsom Dam Raising Plan and Stepped Release Plan - operational-related impacts
a. *Cumulative impacts*
Although the Stepped Release Plan may not affect total outflows by itself, it may have an additional effect in combination with modification of the interim 400/670 thousand acre-feet (TAF) operation to some other form (e.g., 400/600 TAF). Such a reoperation would have a wide range of effects, including benefits such as increased coldwater reserves in the reservoir, as well as impacts such as reduced outflow to the Delta or compensatory releases from other reservoirs. The additional carryover could be especially beneficial if available for fishery purposes.

Another cumulative impact would be construction of additional, or alternative structures that would result in increased water development. For example, if the 12-foot dam raise were constructed, some form of the Stepped Release Plan might be constructed to "free up" the flood control space for use in water supply. This might require additional stability structures for longer retention. Such a project could cause or increase the risk of further habitat losses in the reservoir and upper river fork habitats, including oak, willow riparian, elderberry, and chaparral. Even in the absence of a separate water supply project, additional flood protection could affect the way the dam is operated on a routine basis. For example, it may make encroachment a more likely (and frequent) operation than under baseline conditions during average storm events. Additional water supply could have benefits to fisheries through improved coldwater reserves, and/or if some of the supply were dedicated to augment fishery flows. Impacts of increased water conservation, whether due to additional project structures or encroachment, are that it affects outflow-related benefits such as salmonid smolt survival, the health of the Delta (including populations of the listed delta smelt and Sacramento splittail), and the extent and duration of shallow water habitat in the lower American River, Yolo Bypass, and elsewhere.

b. *Discussion and conclusions*
From the standpoint of operational impacts on the lower American River, it is clear that the dam raise plan (*see Section I of attached report*) is superior to the Stepped Release Plans (*see Section II of attached report*). Currently, there is a without-project risk that operation of the baseline facilities could result in additional disturbance or loss of both spawning gravels and SRA Cover

during a flood larger than the 140-year event. The Dam Raise Plan would alleviate that risk by managing outflows to 115,000 cfs. Conversely, the Stepped Release Plan would involve relatively frequent peak outflows of 145,000 cfs or more every 10 years, much more than the existing condition. Although only a small, ½-mile-long portion of the spawning bed downstream of Nimbus Dam is fully armored by large cobbles, a larger section below it is "in the green" (i.e., in motion) at 115,000 cfs. Because of this condition, we speculate that the larger and more frequent outflows associated with the Stepped Release Plan could cause more substantial armoring, extensive gravel loss, and significant grade loss. We further expect there to be additional impacts of these stepped flows to SRA Cover and riparian resources in specific areas already identified at risk of erosion by Ayres Associates. Although some of these have since been variously treated by berms and rock toe due to high bank work indices, others with intermediate indices (or new sites) might be significantly impacted by the 145,000-180,000 cfs flows associated with stepped release. The baseline risk, the frequent high outflows of the Stepped Release Plan, and the physical impacts related to hydraulic mitigation associated with the Stepped Release Plan, clearly indicate that some form of the dam raise plan would be preferable.

The Corps should provide additional information on whether combinations of the dam raise alternatives, pre-release, Stepped Release Plan, and/or changing the variable flood control space could enable increased water supply. It is conceivable that if a dam raise were adopted, another entity may propose other operations or facilities in order to free up some of the flood control space for water supply - while maintaining the desired 200-year level of flood protection. Preliminary discussions with the Corps suggest that the stability improvements indicated for the dam raise would not be sufficient for longer term retention; however, this is not confirmed and in any case does not eliminate potential temporary encroachments. The Corps should also disclose whether modifications (e.g., dam, dikes) would be necessary to safely impound water for extended periods if such a project were to be pursued in the future.

One manner in which enhanced water supply may come into being without any further modification of the dam or dikes is through adoption of a reduced variable flood control space - from the current 400/670 thousand acre-feet (TAF) to 400/600 TAF in combination with pre-release. The 400/670 operation regime has been under recent study by the local sponsor but, apparently, is not assumed as a baseline condition for either the outlet/surcharge project or this Long-Term Evaluation. Another way would be to adopt the Stepped Release Plan after the dam raise is completed. The quantitative effect of such "free space" is uncertain, and would depend on the frequency of its use – if restricted to relatively wet years – the effect on the fisheries would be neutral (or possibly beneficial); but if it resulted in reduced outflows in normal-below normal years, the effect would be negative. Although the Service did issue a Biological Opinion for the outlet/surcharge structures in the absence of analysis of permanent reoperation/revision of the water control plan, we noted that additional consultation would be needed for this to occur and is anticipated prior to completion of the physical structures. For this Long-Term Evaluation, a detailed analysis of operations that considers both the effect on water supply and on duration of inundation in the flood control space created, under all possible permutations of reoperation, raise options, and advanced release, should be completed.

It is difficult to evaluate the pre-release option separately, but the risks already identified by the Corps in its preliminary Environmental Impact Statement (EIS) raise similar concerns about the effects on habitat and fisheries, namely: the risk of non-refill, and the inability to make early releases if the reservoir is too low or the channel is already at capacity. Non-refilling could affect the ability to make fishery releases in the spring to supply the Delta, or to maintain temperature in the spring and early summer for salmon.

In deciding which plan to recommend, it is important to integrate the anticipated physical impacts of the dam raise alternatives, the potential cumulative impacts, and the effect that implementation of advanced release would have on the level of flood protection. Information is not presently sufficient to make this determination beyond the general recommendation that the dam raise is preferred to the Stepped Release Plan at this time.

ECOSYSTEMS RESTORATION PLAN ANALYSIS

1. Woodlake Site

The HEP accounting quantified the considerable gains in habitat value that would accrue under each of the concept design alternatives. Using the *unadjusted* (by RVIs) (Relative Value Indices) accounting results, Alternatives 1 and 2 would create 549 and 535 average annual habitat units (AAHUs) (*see HEP Reports in Sections I or II for definition of AAHUs)*, respectively, compared to 411 AAHUs under the baseline (no action) condition. However, using more directly comparable AAHUs results, Alternative 1 would accrue 0.67 *adjusted* average annual habitat units (AAAHUs)/acre (*see Appendix A of Section III for definition of AAAHUs)* versus 0.36/acre under the baseline for a net gain of 0.31/acre; Alternative 2 would generate 0.57/acre versus 0.34 under the baseline for a net gain of 0.23/acre. Thus, overall, concept Alternative 1 would clearly be superior to concept Alternative 2.

Examining the AAHU/acre results by measure and individual polygon yields several other findings as well: (1) the largest gains per acre would be derived by the relatively simple measure of improving the hydrologic connections of the two stranding pits to the river; (2) the next largest gains would accrue from creating new riparian forest habitat; (3) intermediate gains in value would occur from creating riparian oak woodland and oak woodland/savannah; and (4) the lowest gains per acre would result from conversion of existing ruderal area to grasslands.

In addition, within several of the measures, there would be differences in the gains per acre for different polygons of the same cover-type. Generally, the polygons with highest values would be those with improved hydrologic connections to the river or minimal amounts of existing high-value area that would have to be destroyed as part the cover-type re-creations.

There are several restoration constraints not factored into the HEP analysis for this site. First, any alternative ultimately recommended for implementation should have at least the 63 acres of grassland designed into concept Alternative 1. We believe this is the minimum necessary to ensure adequate foraging area for the raptors which currently use the site, plus the expected *increase* of raptors using the site following restoration. This is a critical need, because the nearest alternate foraging areas for raptors are at least several miles away. Without ensuring adequate on-site foraging area, habitat value gains that would otherwise accrue to raptors in response to forest and wetlands re-creation might not be achieved. And thus some of the HEP

accounting findings and conclusions would be invalidated. Another constraint relates to the relatively low unit-value gain of 0.15 AAAHUs/acre that would be associated with converting existing ruderal area to grassland. An important constraint could not be factored into the HEP accounting, which is that it has been shown that yellow starthistle infestations can reduce wildlife habitat and forage, displace native plants, and decrease native plant and animal diversity. Dense infestations such as presently occur at the Woodlake site also threaten natural ecosystems and nature reserves by fragmenting sensitive plant and animal habitats. Thus, decisions as to whether to vigorously pursue conversions of the starthistle-dominated ruderal land to grassland at the site must consider these ecosystem-related constraints in addition to projected habitat-value gains and monetary costs.

A final constraint involves the need for diversity and functioning improvements achieved through cover-type mixing to ensure a complex mosaic pattern of habitat. This is yet another ecosystem-related issue that the HEP accounting addressed in only a limited manner through the species models that were selected. Our position is that any alternative recommended for implementation should involve re-creation of the same general type of cover-type mix as was included and evaluated in the two preliminary concept design alternatives. Biodiversity and ecosystem-functioning improvements can best be assured with such a mix. The primary focus of the restoration of this site is, and should remain, the re-creation of various floodplain and riparian forest habitats.

2. <u>Urrutia Site</u>

Preliminary results were derived from AAHUs across all cover-types and polygons. As expected, results showed that despite the very similar measures and alternatives at the Woodlake and Urrutia sites, considerably more habitat value gains per unit area could be derived at the latter site. In particular, Alternative 1 at the Urrutia site would accrue 0.69 AAHUs/acre compared to 0.17/acre for the baseline (no action) condition, for a net gain of 0.52/acre. Alternative 2 would be very similar, accruing 0.68 AAAHUs/acre compared to 0.16/acre for baseline, also for a gain of 0.52/acre. Thus, unlike the Woodlake site, neither one of the preliminary action alternatives at Urrutia would be clearly superior over the other in terms of habitat value gain/acre.

Under concept design Alternative 1, the three highest-gaining combinations of measure, cover-type, and polygon (in descending order) would be: 1. 7-riparian forest-RFO1 (1.19/acre); 2. 15-riparian forest-RFO3 (0.69/acre); and 3. 15-shallow aquatic-NA (0.68/acre). These same combinations would accrue essentially the same values under Alternative 2. In addition, in concept Alternative 2, the shallow aquatic (SAQ1) and seasonal wetland (SW1) areas that would be created under measure 13 would create relatively high gains of 1.10 and 0.83 AAAHUs/acre, respectively. In contrast, the lowest-gaining measures (in ascending order) would be the habitat conversions in both alternatives to grasslands (measure 10), riparian oak woodland (measure 8), and emergent wetland (measure 17).

Just as for the Woodlake analysis, these preliminary values give no consideration to costs. Another constraint is that in each of JSA's two concept design alternatives, the proposed acreage that would remain "open"–as either ruderal or grassland area–is likely insufficient. Total ruderal-grassland area would only be 25.1 or 27.0 acres, respectively, under Alternatives 1 and 2.

Either figure is likely to be an insufficient size of area to support foraging raptors. Applying the same ratio we recommended above for the Woodlake site of at least 63.0 acres (23%) of grassland and/or ruderal for 273.8-acre area, the Urrutia site would need at least 55.6 acres (23% of 241.6 acres) of grassland and/or ruderal area. Moreover, it would be incongruous to expend significant public dollars creating such a massive forest restoration at the Urrutia site, for which one of the primary fish and wildlife beneficiaries would be raptors, without providing adequate foraging area for such species. This is especially true because alternate raptor foraging sites are likely several miles away from the Urrutia site.

A constraint of at least 56 acres of open ruderal and/or grassland foraging area at the Urrutia site may appear counter intuitive given the very low gain–only 0.02 AAAHUs/acre–that the HEP indicated would result from grassland creation. However, part of the reason for such a low gain is that all three of the proposed grassland polygons in the two preliminary action alternatives were located within the existing ruderal area of the Urrutia site. This area already has relatively high values to its associated evaluation species. This is also the main reason that the riparian oak woodland re-creation measure rated rather low (0.10 AAAHUs gain/acre) in both alternatives. Moving these polygons to currently barren areas would be expected to substantially increase the gains of habitat values that could be achieved under such actions. In fact, siting the grasslands in currently barren areas would be expected to generate more than the 0.15/acre gain projected for the Woodlake site's proposed conversions from ruderal to grassland.

3. <u>Bushy Lake Site</u>

Results indicate that overall, similar habitat-value gains would accrue both from the two preliminary alternatives at the Bushy Lake site (0.29 and 0.27 AAAHUs/acre) and the two preliminary alternatives at the Woodlake site (0.31 and 0.23/acre). However, both of these two restoration sites would accrue less than the Urrutia site, where both of the preliminary alternatives have projected gains of 0.52AAAHUs/acre.

The results for measures 15 and 13 warrant further discussion. These are the actions (identical under Alternatives 1 and 2) that would eliminate existing SRA Cover along 2,500 feet of shoreline, slope the bank back for up to 200 feet (more in the proposed upstream "backwater" area), and establish transition zones (proceeding up-slope) of new shallow aquatic, seasonal wetland, and riparian forest habitat. Currently, the SRA Cover at this location has a baseline Habitat Suitability Index (HSI) of 0.53, which means that it is roughly one-half as good as the "best" SRA Cover.

The measure 15 and 13 actions would be relatively robust in terms of the relative average gains of AAAHUs/acre–ranging from 0.50 to 0.77 for measure 13, and from 0.49 to 0.74 for measure 15. Also, there would be 4.21 acres of seasonal floodplain created under measure 13 and 6.70 acres created under measure 15, versus the 0.57-acre of SRA Cover that would be destroyed. Linear feet (LF) of SRA Cover lost would also be reasonably offset or substantially increased, depending on measure. In particular, under measure 15, the downstream 1,500 LF of SRA Cover that presently functions under a relatively restricted flow range (because of the steep, eroding bank) would be replaced by 1,500 LF of gradually-sloped, vegetated floodplain that would function (i.e., with flooded vegetation) over a much broader range of flows. And under measure 13, the greatly increased sinuosity of the new shoreline (associated with the creation of

the backwater area) at various flows would result in up to (depending on flow) 3,500 LF of shoreline with significant soil/water/vegetation interaction versus the 1,000 LF of impacted SRA Cover.

Thus, the analysis supports a finding that measures 13 and 15 would both be desirable actions for inclusion in the restoration of this particular site. Nevertheless, a limiting factor not accounted for in the HEP involves the large number of elderberry shrubs present which would have to be removed along the top of the 2,500 LF of bank. Valley elderberry longhorn beetle (VELB) compensation guidelines would thus be a constraint and would have to be carefully factored into any more detailed analyses and/or decision to implement this restoration feature.

Measure 16, involving improvement of the 1,500-foot-long floodplain channel within the 66.0-acre seasonal floodplain area, would also have a relatively high habitat-value gain of 0.52 AAAHUs/acre. Moreover, this figure was derived without perhaps fully valuing the considerable improvement to ecosystem functioning (from a more frequent and natural flooding regime) that would occur under this measure.

Combined measures 1 and 8, involving creating oak woodland, and measure 9, involving creating oak savannah, would accrue gains of 0.23 and 0.26 AAAHUs/acre, respectively. These figures are similar to values that would accrue for these measures at the Woodlake site, but higher than what would accrue for the oak woodland creation at the Urrutia site.

Creating grassland at the Bushy Lake site would accrue 0.15 AAAHUs/acre gain in value. This is the same as at the Woodlake site, but higher than for the grassland proposed at the Urrutia site. (However, as discussed earlier, the low Urrutia value for grassland and oak woodland are anomalies due largely to poor present siting of the proposed polygons.)

Measure 18, which would create an emergent wetland "filter" in the vicinity of Sump Pump No.152, would result in a *loss* of 0.23 AAAHUs /acre. This is the only option examined using HEP from among the four restoration sites which would have a negative value. This loss would occur mainly because relatively high-value existing riparian forest, scrub-shrub, and permanent wetland habitat would have to be destroyed. There may be overriding arguments to help support the need for and benefits of a wetland filter at this location. However, they have not to date been provided to the Service. In fact, we have received no documentation establishing that a serious water quality problem affecting fish and wildlife values and thus necessitating corrective action exists at the site.

Measure 7, in which riparian forest areas of either 29.8 (Alternative 1) or 20.2 acres (Alternative 2), would be created adjacent to Bushy Lake, would result in relatively low habitat-value gains of 0.29 AAAHUs/acre. In comparison, various combinations of measure 7 options proposed at the Woodlake and Urrutia sites would each accrue from 0.38 to 1.19 of habitat-value gain in AAAHUs/acre. The relatively low benefits of the measure 7 at the Bushy Lake site are due mainly to the relatively high existing values of the savannah area that would be graded towards the lake and converted to riparian forest. In particular, the very large elderberries in this savannah area have some moderate owl cover and reproductive values as well as relatively high owl food values and vole values. This elevated baseline reduces the gain that can be achieved.

Moreover, the HEP does not consider the elderberry compensation plantings that would be required elsewhere on the site if the measure 7 scenario(s) were to be implemented.

Measure 6 involving the riparian forest RFO4 polygon would also be a relatively low-gain (0.20 AAAHUs/acre) restoration feature. This is because the site has relatively high baseline values which would be difficult to increase. However, cost must be considered for this polygon too, since it may require relatively little planting (and associated plant maintenance) to achieve the 0.20/acre figure.

The other measure 6 polygon–RFO3–would have a habitat-value gain rate of 0.34 AAAHUs/ acre. The improved gain is because this polygon has lower existing values and lacks elderberries.

4. <u>Arden Bar Site</u>

Results show that the average habitat-value gain of Alternative 1 (0.35 AAAHUs/acre) would be slightly superior to Alternative 2 (0.31/acre). Thus, overall average gains at Arden Bar would be slightly greater than at either the Woodlake (0.31 [Alt.1] and 0.23/acre [Alt.2]) or Bushy Lake (0.29 [Alt.1] and 0.27/acre [Alt.2]), but well below the values that could be achieved at the Urrutia site (0.52/ace [Alts.1-2]).

Measure 14, the high-flow channel, would accrue 0.45 AAAHUs/acre despite the channel itself not being vegetated. The gain would be mostly in the form of increased habitat values to juvenile salmonids. The associated willow scrub to be established (measure 22) along the high-flow channel banks would accrue from 0.42 to 0.63 AAAHUs/acre, depending on the patch location. However, the shallow aquatic area (SAQ1-measure 23) to be sited at the mouth of the high-flow channel would accrue a value of 0.77 AAAHUs/acre. Thus, overall, the high-flow channel and its associated features would be a moderately beneficial restoration option. However, this considers only habitat values, without any cost data or analysis.

The various riparian forest patches (measure 7, and measures 7 and 24 combined) proposed at the site would accrue widely variable benefits, ranging from 0.27 for patch RFO1 to 0.70 AAAHUs/acre for patch RF03. These differences would be related mainly to the amount and quality of existing forest and scrub-shrub cover at the patch sites that would have to be removed in the grading and replanting processes. However, these particular results must be used with some caution, because the HEP accounting did not factor in benefits that would accrue from removing non-native vegetation and replacing it with native species. Thus, the riparian forest values should all be considered *minimum* habitat-value gain estimates.

The proposed actions creating new areas of oak forest on the site (measure 21; combined measures 7 and 9; and combined measures 9 and 24) would also produce variable benefits from a low of 0.08 for patch OWS3 to 0.55 AAAHUs/acre for OWS1 (Alt.2) and OWS2 (Alt.1). These differences are also related to on-site impacts related to patch existing conditions.

Measure 17, which would entail establishing patches of emergent marsh around the periphery of Arden Pond, would return only a relatively modest habitat-value gain of 0.32 (Alt.2) to 0.33 AAAHUs/acre (Alt.1). However, this might still be a viable option, depending on related costs.

A number of the individual patches of habitat that would be created under several of the measures at Arden Bar could involve significant losses of VELB habitat in the form of the elderberry host plants. While this potential problem is not as great as at the Bushy Lake site, VELB avoidance and compensation, for unavoidable impacts, could nevertheless become important constraint at certain patch locations. Unlike the Bushy Lake site, there were no measure/cover-type combinations at Arden Bar that would create a negative gain of habitat value.

5. Folsom Dam Temperature Control Shutter Modernization

The "best fit" of the word model is that modernization of the shutters into an automatic 7(1)-2 regime (Alternative 1B) would have an associated HSI of 0.7. This would result in 315.7 HUs in any one year and 315.7 AAHUs (451 acres x 0.7 HSI). A net gain of habitat value of 1,105.0 AAAHUs would thus accrue for an average gain of 2.45 AAAHUs/acre.

The 2.45 AAAHUs/acre gain of habitat value of Alternative 1B compares to overall average net habitat-value gains (for the better of the two alternatives) of 0.31/acre at the Woodlake site, 0.52/acre at the Urrutia site, 0.29/acre at the Bushy Lake site, and 0.35/acre at the Arden Bar site. Thus, a conservative estimate (due to the conservative evaluation species adjustment of 3.5 and conservative water surface acreage estimate) is that the shutter modernization option would be about 5-8 times more effective per acre in creating new habitat value than the four terrestrial restoration options.

In addition, Alternative 1B shutter modernization would provide the largest areal extent of habitat improvement–at least 451 acres of LAR riverine area, versus a maximum (for the larger of the two alternatives) of 68-193 acres of terrestrial habitat improved under the four terrestrial restoration options.

However, as discussed earlier in the terrestrial analyses, a few of the individual restoration measures at the four terrestrial sites would accrue higher habitat-value gains than the averages for the sites considered as a whole. For example, at the Woodlake site, improvements to the two stranding pits would result in gains of 0.90 and 0.86 AAAHUs/acre, respectively. At the Urrutia site, the best overall measure involving riparian forest re-creation would result in a gain of 1.19 AAAHU/acre. At the Bushy Lake site, the best measure, also involving riparian forest re-creation, would produce a gain of 0.77 AAAHUs/acre. And finally, the highest-gaining measure at the Arden Bar site, involving creation of a small shallow aquatic area, would also result in a gain of 0.77 AAAHUs/acre. Compared in this manner, and without consideration of costs, the temperature shutter modernization option Alternative 1B is still clearly and unequivocally the superior restoration approach of the five broad measures being considered. However, just as clearly, some the terrestrial restoration measure components are still highly desirable.

The "best fit" HSIs for Alternative 1A (manual 7[1]-2 system) and Alternative 2 (1-1-2-2-3 manual operation), would be 0.5 and 0.3, respectively. Thus, Alternative 1A would result in 225.5 HUs and AAHUs, an overall gain of 789.25 AAAHUs, and a net gain of 1.75 AAAHUs/acre. The comparable estimates for Alternative 2 would be 135.3 HUs and AAHUs, an overall gain of 473.55 AAAHUs, and a net gain of 1.05 AAAHUs/acre. Thus, both of these

alternatives would be far less effective than Alternative 1B and much more similar to the results that would be obtained via the four terrestrial restoration options.

Alternative 1B shutter modernization would clearly be the superior alternative based on the HEP results. However, decision makers also need to consider a number of other benefits of Alternative 1B shutter modernization not factored into the HEP accounting, which would make its implementation even more desirable:

1. The greatly improved shutter management capability would result in both better water temperature management and cool water savings when river flows must be unexpectedly ramped up to meet Delta water quality needs or for other purposes, since with higher flows, in-river warming is less and cool water release requirements could be proportionally (and much more quickly and efficiently than now) reduced;

2. The antiquated operations and control of LAR water temperatures represent a long-term, severe impact of Folsom Dam that can and should be alleviated using 21st century technology, to allow "real time" temperature monitoring and micro- adjustments based on actual fishery needs and system conditions;

3. Both the Nimbus (salmon and steelhead) and American River (trout) fish hatcheries would likely benefit from reduced mortalities and chronic effects of periodic high water temperatures on their broodstock and offspring;

4. The coldwater fishery of Folsom Reservoir, which includes both rainbow trout and king salmon, could possibly benefit due to warm-seasonal increase in the size of or seasonal duration of cold water pool behind the Folsom Dam (this potential benefit requires further analysis, however);

5. There would be more flexibility to respond to power generation needs without compromising or impacting LAR temperature needs and requirements; and

6. The LAR ecosystem and all or most of the fish and other aquatic organisms it supports would benefit by this significant step towards reestablishing the more favorable water temperature regimes under which they evolved.

Construction methods for shutter modernization have as yet only been cursorily described. The Service assumes that operations of the existing shutters would not be curtailed or otherwise detrimentally impacted during the construction period, and that any construction-related turbidity, blasting, drilling, use of chemicals and abrasives, and other actions during in-or out-of-water work would be appropriately minimized and mitigated. The Service is reserving the right to analyze these aspects of the Alternative 1B shutter modernization option in greater detail after the construction methods and procedures are fully known and described.

RECOMMENDATIONS

Recommendations are included within each section of the report (Folsom Dam Enlargement, Stepped Release and Ecosystems Restoration) and are also listed below.

1. FOLSOM DAM ENLARGEMENT PLAN

The Service recommends the Corps implement the following recommendations if the Folsom Dam Enlargement Plan is pursued. As additional project information is developed, these basic recommendations will be further refined.

a. General recommendations

(1) Select a flood control alternative which, to the extent possible, avoids unmitigable impacts and minimizes other impacts to fish and wildlife resources.

(2) Complete section 7 consultation with the Service pursuant to the Endangered Species Act for potential impacts to listed species.

(3) Complete section 7 consultation with the NMFS pursuant to the Endangered Species Act for potential impacts to listed anadromous fish species

(4) Consult with the Department of Fish and Game regarding potential impacts to State listed threatened and endangered species.

(5) Develop a mitigation monitoring and remediation plan for each of the compensation sites developed for the project.

(6) Avoid impacts to oak woodland, blue oak-gray pine woodland, riparian and seasonal wetlands, Sierran mixed conifer forest, and montane riparian scrub adjacent to, but outside of, construction easement areas with orange construction fencing.

(7) Avoid impacts to woody vegetation at all staging areas, borrow sites, and haul routes by enclosing them with orange construction fencing.

(8) Minimize impacts to annual grassland habitat and other disturbed areas by re-seeding all disturbed areas with appropriate native grass species as construction elements are completed.

b. Specific recommendations

1. *Folsom Dam Enlargement*

Newcastle Powerhouse

(9) Avoid impacts to vegetation at the Newcastle Powerhouse by confining all construction activities to the existing parking lot area.

(10) Avoid impacts to water quality of Folsom Lake by taking appropriate measures to prevent construction materials (e.g., fuels, oil, cement products, lubricants) from spilling into, or otherwise entering, the reservoir.

Folsom Dam Operation and Maintenance Bridge

(11) Select an alignment which avoids woody vegetation to the extent possible.

(12) Minimize impacts to annual grassland by reseeding all disturbed areas when construction is complete.

(13) Compensate for the construction impacts of a temporary Folsom Dam Operation and Maintenance Bridge by acquiring suitable lands to develop 4.72 acres of oak woodland, 8.01 acres of blue oak-gray pine woodland, and 1.30 acres of riparian woodland.

Folsom Dam and Reservoir

(14) Avoid impacts to water quality at Lake Natoma and Folsom Reservoir when loading, unloading, and barging borrow material to be used for dam raising, by taking appropriate measures to prevent soil, fuel, oil, lubricants, etc. from entering into these waters.

(15) Compensate for any vegetation losses associated with developing access to loading and unloading barges to be used for moving borrow material. Specific routes have not been determined.

(16) Compensate for unavoidable impacts to oak woodland habitat by acquiring suitable lands and developing 59.41 acres of oak woodland using the guidelines in contained in Section I, Appendix A.

(17) Compensate for unavoidable impacts to blue oak-gray pine woodland habitat by acquiring suitable lands and developing 10.51 acres of blue oak-gray pine woodland using the guidelines in contained in Section I, Appendix A.

(18) Compensate for unavoidable impacts to riparian habitat by acquiring suitable lands and developing 9.00 acres of riparian habitat using the guidelines in contained in Appendix A.

(19) Compensate for unavoidable impacts to seasonal wetland habitat by acquiring suitable lands and developing 0.3 acre of seasonal wetland habitat using the guidelines in contained in Section I, Appendix A.

(20) Develop a monitoring and adaptive management program to monitor vegetation around the reservoir over the life of the project. Baseline conditions would be established and updated at intervals (10 years). After major flood events (those which encroach above the existing maximum flood pool elevation), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using best management practices at the time (replanting on site would be the first priority).

2. *French Meadows Reservoir*

General

(21) Avoid introduction of materials, such as fuels, hydraulic oils and lubricants, and cement products, into the reservoir or Middle Fork of the American River, by storing/handling these types of material away from water bodies.

Spillway enlargement

(22) Avoid impacts to the Sierran mixed conifer habitat to the extent possible.

(23) Avoid impacts to swallow nesting (cliff and/or barn swallows) on the bridge crossing of the French Meadows spillway by removing old nests prior to March 1 and placing netting material so that they cannot construct new nests during the construction period.

(24) Minimize impacts in all habitats by reseeding all disturbed soil areas with annual grasses after construction is complete (most of the area appears to be underlain with bedrock).

(25) Minimize impact to aquatic resources by taking appropriate steps to prevent sediment from entering the reservoir or river.

(26) Minimize impacts to nesting raptors by conducting this activity outside the breeding period, or determining there are no raptor nests in the vicinity prior to construction..

Escape channel constriction removal

(27) Avoid impacts to vegetation by confining all work activities to existing roads and already disturbed areas.

(28) Minimize impacts of the river crossing by constructing it in a manner which least disturbs the natural channel and streambed.

(29) Minimize impacts to disturbed soil areas by reseeding such areas with annual grass species when construction is complete.

(30) Minimize impacts to the river by constructing sediment barriers to prevent sediments from washing into the river during construction.

Spoil area

(31) Avoid placement of spoil material on vegetated areas.

(32) Minimize potential impacts to the river by constructing sediment barriers to prevent sediments from washing into the river after construction is complete.

2. <u>STEPPED RELEASE PLAN</u>

The Service recommends the Corps implement the following recommendations if the Stepped Release Plan is pursued. As additional project information is developed, these basic recommendations will be further defined.

a. <u>General recommendations</u>

(33) Avoid impacts to all native trees and shrubs and freshwater emergent marsh vegetation during construction activities.

(34) Avoid impacts to woody vegetation at all staging areas, borrow sites, and haul routes by enclosing them with orange construction fencing.

(35) Avoid placement of rock riprap or rock fill where it was not present prior to the 1998 floods, and limit use of rock and other non-soil fill to only those areas and sections of levee slopes where rock was present prior to the 1997/1998 damage.

(36) Minimize adverse impacts by selecting a flood control alternative which avoids unmitigable impacts and minimizes other impacts to fish and wildlife resources.

(37) Develop detailed mitigation, monitoring, and remedial action plans for each mitigation action and site. Coordinate all phases of mitigation plan development and implementation with the Service and CDFG.

(38) Direct staff with biological expertise to monitor construction activities and provide technical assistance to ensure avoidance of additional construction impacts.

(39) Select a flood control alternative which avoids unmitigable impacts and minimizes other impacts to fish and wildlife resources.

(40) Enhance habitat conditions for fish in the lower American River, by working with the Service, CDFG, NMFS, the Bureau of Reclamation and other parties to implement improved flow conditions for anadromous fish, as outlined in the Service's draft report for the CVPIA.

(41) Modify Corps levee maintenance regulations to allow tree growth on existing (and proposed) levees, thereby reducing impacts to riparian woodland and oak woodland habitats.

(42) Complete the appropriate consultation with the Service, as required under the Endangered Species Act, for such potential effects on listed species.

(43) Consult with the CDFG regarding potential impacts to State listed threatened and endangered species.

(44) Complete the appropriate consultation with NMFS, as required under section 7 of the Endangered Species Act, for potential impacts to anadromous fish species.

b. Specific recommendations

1. Stepped Release Plan to 160,000 cfs

Hydraulic Mitigation Area

(45) Reevaluate proposed construction work to ensure that modification features are necessary to meet intended flood control objectives. Deleting project features in these areas would greatly reduce losses and associated mitigation needs for woody riparian, oak woodland vegetation, seasonal freshwater marsh, and open water.

(46) Avoid impacting woody vegetation at all borrow and staging areas.

(47) Mitigate the loss of 16.4 acres of riparian woodland by planting 18.0 acres of riparian woodland at a site(s) still to be determined.

(48) Mitigate the loss of 5.2 acres of oak woodland by planting 17.7 acres of oak woodland at a site(s) still to be determined.

(49) Mitigate the loss of 91.7 acres of agricultural lands by reseeding the site with a non-native grass seed mix.

(50) Mitigate the loss of four individual trees by replanting native trees on-site (e.g, cottonwood, valley oak).

(51) Mitigate loss of 128.2 acres of upland herbaceous habitat at construction sites, and 162.3 acres at staging and borrow sites, by reseeding with a native grass seed mix.

NEMDC Area

(52) Avoid impacting woody vegetation at all borrow and staging areas.

(53) Mitigate the loss of 5.7 acres of riparian woodland impacts by planting 5.7 acres of riparian woodland at an appropriate site, such as Mississippi Bar.

(54) Mitigate the loss of 1.5 acres of oak woodland impacts by planting 5.4 acres of oak woodland at an appropriate site, such as Rossmoor Bar.

(55) Mitigate the loss of 3.8 acres of upland herbaceous habitat by reseeding the site with a native grass seed mix, including staging and borrow sites.

Local drainages, utilities, and water intake structure modifications areas

(56) Avoid impacting woody vegetation at all borrow and staging areas.

(57) Mitigate the loss of 0.6 acre of riparian woodland by replanting 0.6 acre of riparian woodland on-site, if possible.

(58) Mitigate the loss of one shrub by replacing it with three native shrubs on-site, if possible.

(59) Mitigate the loss of 0.3 acre of upland herbaceous habitat by reseeding the site with a native grass seed mix, including staging and borrow sites.

Operational Impacts

(60) Provide further information on flow-related parameters above 115,000 cfs (velocity, depth, critical shear exceedence, tractive force) in order to fully evaluate the operational impacts.

(61) Provide additional information on whether combinations of the dam raise alternatives, pre-release, Stepped Release Plan, and/or changing the variable flood control space could enable increased water supply.

(62) Complete a detailed analysis of operations that considers both the effect on water supply and on duration of inundation in the flood control space created, under all possible permutations of reoperation, raise options, and advanced release.

2. Stepped Release Plan to 180,000 cfs

Levee modifications

(63) Avoid impacting woody vegetation at all borrow and staging areas.

(64) Mitigate the loss of 25.0 acres of riparian woodland by planting 25.0 acres of native woody riparian vegetation at optimum densities at the Mississippi Bar mitigation site in the American River Parkway (pending a suitability analysis).

(65) Mitigate the loss of 20.1 acres of oak woodland by planting 70.9 acres of oak woodland vegetation at optimum densities at the Rossmoor Bar mitigation site in the American River Parkway (pending a suitability analysis).

(66) Mitigate the loss of 57.0 acres of agricultural lands (non-rice) by reseeding the area with a native grass seed mix.

(67) Mitigate losses to 66.7 acres of upland herbaceous habitat by reseeding areas with a native grass seed mix, including staging and borrow sites.

Howe Avenue Bridge Raising Site

(68) Mitigate the loss of 6.1 acres of riparian woodland by planting 6.1 acres of riparian woodland at the Mississippi Bar mitigation site.

(69) Mitigate the loss of 0.3 acre of SRA Cover by planting a minimum of 0.3 acre of SRA Cover on-site, and possibly more, pending completion of section 7 consultation for the Sacramento splittail.

(70) Mitigate the loss of 2.8 acres of upland herbaceous habitat by reseeding areas with a native grass seed mix, including staging and borrow sites.

Guy West Bridge Raising Site

(71) Mitigate for the elimination of 0.1 acre of degraded native and non-native riparian woodland habitat that would result from raising the Guy West Bridge, by planting 0.1 acre of native riparian habitat on-site.

(72) Mitigate the loss of 0.5 acre of upland herbaceous habitat by reseeding areas with a native grass seed mix, including staging and borrow sites.

Hydraulic Mitigation Area

(73) See "Specific recommendations for Stepped Release Plan to 160,000 cfs".

Local drainages, utilities, and water intake structure modifications areas

(74) See "Specific recommendations for Stepped Release Plan to 160,000 cfs".

Operational Impacts

(75) See "Specific recommendations for Stepped Release Plan to 160,000 cfs".

3. ECOSYSTEMS RESTORATION

The following recommendations are preliminary, based on the habitat values and qualitative analyses presented herein, and the identified constraints. There has been not been any consideration of, or adjustments for, the monetary costs that the various actions would involve

per unit area. As costs are factored into the equation, through the Corps' incremental cost analyses and other planning techniques, our recommendations may be subject to some modification. However, in the interim, the Service recommends that the Corps (and its local sponsor, SAFCA):

(76) Vigorously pursue implementation of the Folsom Dam automated 7(1)-2 shutter modernization option in place of the 1-1-2-2-3 manual operation scheme previously proposed as mitigation for Folsom Reservoir reoperation, and consider the 7(1)-2 modernization option as the top priority among the five restoration options evaluated herein.

(77) Also pursue implementation of a restoration alternative at *each* of the four terrestrial sites, focusing on the higher-habitat-value-gaining preliminary conceptual Alternative 1 for each site (except Alternative 3 at Bushy Lake), or any other materially and significantly similar alternative as may be developed by combining the measures and polygons (habitat patches) evaluated herein using the Corps' incremental analysis and/or other planning techniques.

(78) To the extent funding, land acquisition, or other constraints ultimately limit the number of the four terrestrial sites that can be restored, select sites for implementation based on their relative habitat- and ecosystem-value potential rates of gain in order (from highest to lowest priority for restoration) as follows: Urrutia site, Arden Bar site, Woodlake site, and Bushy Lake site.

(79) Ensure that potential impacts to elderberry plants and VELB could and would be fully minimized and appropriately offset using Service compensation guidelines for all terrestrial alternatives, but especially for any proposed at the Bushy Lake and Arden Bar sites.

(80) Include in any restoration alternatives proposed for implementation at the Woodlake, Urrutia, and Bushy Lake sites, not less than 63, 56, and 31 acres, respectively, of grassland restoration.

(81) To the extent that restoration intensity must be curtailed and limited for any reasons at the four terrestrial sites, focus first on the highest habitat-and ecosystem-value gaining options, as follows (and in descending order): Woodlake–measures 16 and then 13; Urrutia–measures 6 + 7 (RFO1), 13, and 15; Bushy Lake–measures 13, 15, 18, and 25 altogether; and Arden Bar–measures 14, 22, and 23 altogether.

(82) To the extent any funding or other constraints limit the number of patches of riparian forest and various kinds of oak woodlands that can be created at any of the four terrestrial sites, select the patches for implementation in descending order of their habitat-value gains as shown in Tables 5, 8, 10-10a, and 12 for the Woodlake, Urrutia, Bushy Lake, and Arden Bar sites, respectively.

(83) For any restoration alternatives proposed for implementation at any of the four terrestrial sites, include as part of the project, detailed long-term monitoring and remediation plans as well as adaptive management guidelines and policies, such as SAFCA currently uses for

monitoring and evaluating mitigation along the lower American River for impacts from recent bank protection completed for flood control. In addition, implement Alternative 3 for the Bushy Lake site only with a staged construction/operation and intensive contaminant monitoring as described above in the Alternative 3 preliminary HEP analysis.

(84) Provide any more detailed (or significantly modified) plans, specifications, and operational criteria as the Corps and SAFCA may develop for these four terrestrial sites and the shutter modernization option to the Service for further analysis and determination of whether our preliminary conclusions and recommendations presented here remain valid and acceptable to us.