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Fwd: TNC comments on SLWRI DEIS_September 30, 2013

KATRINA CHOW <kchow@usbr.gov> Wed, Oct 23, 2013 at 1:07 PM
To: KATHLEEN DUNCAN <kduncan@usbr.gov>

Sent from my iPhone

Begin forwarded message:

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Date: September 30, 2013, 3:49:35 PM PDT
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Subject: TNC comments on SLWRI DEIS_September 30, 2013

Please find attached comments on the Draft EIS for the SLWRI.

Thank you,

Ryan Luster

The Nature Conservancy

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TNC comments on SLWRI DEIS_Sept 30 2013.pdf
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Katrina Chow
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September 30, 2013

Dear Ms. Chow,

Following are comments from The Nature Conservancy (the Conservancy) on the Draft EIS SLWRI.

In general, our concerns and suggestions center on the impacts the proposed alternatives will have on habitat forming river processes. SLWRI proposes five alternatives (CP1-CP5), all of which will further truncate high flows and/or modify the timing of flows that are required create and maintain habitat for several riverine-dependent species.

Concern 1.
Impact Wild - 24: Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes in CP1-5.

The Bureau states that under the alternatives, river flows would be reduced such that the rate of erosion would be reduced but the length of eroded banks would not change therefore there would be no impacts on bank swallow habitat. See P13-194, lines 21-29 as an example of this recurring statement of Impact Wild-24:

> "Implementing CP4 would cause a small reduction in the magnitude, duration, and frequency of intermediate to large flows in the lower Sacramento River. This reduction also would alter the river's geomorphic processes. The rate of bank erosion would be reduced, but the length of eroding banks would not be substantially altered, and thus, nesting habitat for bank swallows would not decline substantially. High flows during the nesting season that may cause localized bank and nest failure would not increase. The impact on habitat for bank swallow nesting colonies, and therefore bank swallows themselves, would be less than significant."

This, and other similar statements regarding the impacts of reduced erosive flows, suggest that reducing the rate of bank erosion would not have negative impacts on bank swallow habitat. This is contrary to all field based research conducted on bank swallows. There is no analysis in the DEIS to support such claims, the Bureau needs to provide evidence that reducing lateral erosion in bank swallow colonies will not have negative impacts on their habitat.

The Conservancy requests that the Bureau consult and incorporate recommendations from the attached bank swallow conservation strategy [Attachment 1_ Bank Swallow (*Riparia riparia*) Conservation Strategy for the Sacramento River Watershed, California].

Concern 2.
Sections 12.3.4 and 13.3.4 describe Direct and Indirect Effects from the various action and no-action alternatives. Under several of the alternatives, there is a recurring paragraph that refers to Section 12.2. For example:

Page 12-100, lines 14-20:

> "However, under the No-Action Alternative a number of management and restoration plans and programs would be implemented. These actions are described in Section 12.2, "Regulatory Framework," of this DEIS. These actions would cause beneficial effects that would likely be of similar magnitude as the anticipated adverse effects of small changes in flow regime and of continued effects from past actions, and thus would largely offset those adverse effects."

Page 13-91, lines 13-91

> "Impact Wild-18 (No-Action): Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes Future conditions for bank swallows are not expected to differ substantially from existing conditions because of the restoration projects being implemented on the Sacramento River (see Section 12.2, "Regulatory Framework," in Chapter 12, "Botanical Resources and Wetlands"). This impact would be less than significant."

These paragraphs imply that the Bureau is relying on other projects and organizations to offset the potential negative impacts from the proposed SLWRI. The Bureau needs to clarify how they are able to use other projects as mitigation for SLWRI and/or how the Bureau is relying on other agencies' efforts to offset potential impacts from SLWRI.

Suggestion 1. Use the Sacramento River Ecological Tool (SacEFT)
The Conservancy has developed the Sacramento River Ecological Flows Tool (see attachment 2) to evaluate the impacts from proposed water management projects on a suite of Sacramento River and Delta species. We suggest that the Bureau use SacEFT to help better understand the potential impacts, both positive and negative, from implementing each of the SLWRI alternatives.

Please contact me if you have any questions regarding our comments.

Sincerely,

Ryan Luster
Sacramento River Project Director
530-897-6370, ext. 213
rluster@tnc.org

Attachment 1. Bank swallow conservation strategy

Bank Swallow (Riparia riparia) Conservation Strategy for the Sacramento River Watershed, California

Bank Swallow Technical Advisory Committee

June 2013

Cover photo: Bank Swallows perched at the entrance of a nest burrow.

Photo by Dave Bogener, 2013

Bank Swallow (*Riparia riparia*) Conservation Strategy for the Sacramento River Watershed, California

Version 1.0
June 2013

Bank Swallow Technical Advisory Committee

Suggested citation:

Bank Swallow Technical Advisory Committee. 2013. Bank Swallow (*Riparia riparia*) Conservation Strategy for the Sacramento River Watershed, California. Version 1.0. www.sacramentoriver.org/bans/

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EXECUTIVE SUMMARY

The Bank Swallow is a State-listed Threatened Species and is intimately tied to natural river processes; its presence in sustainable numbers is an indicator of a healthy river system on which many of California's species depend. Most Bank Swallows in California nest along the Sacramento River and its tributaries, excavating burrows in vertical banks created by natural river processes. Natural river processes include bank erosion and deposition resulting from lateral migration of rivers within their natural meander belt and floodplain.

The population of Bank Swallows using the Sacramento River system has been estimated by counting burrows and has trended downward from 24,580 burrows in 1986 to 15,000 burrows in 2012. Burrow numbers on the Feather River have also declined, from almost 6,600 in 1987 to 2,320 in 2012. The continued decline of the Bank Swallow population in California coincides with the increase of rock revetment placed on the banks of the Sacramento River between Red Bluff and Colusa, from 50,000 linear feet (10 miles) in 1970 to 275,000 linear feet (52 miles) in 2010; and 64,000 linear feet (12 miles) of revetment on the Feather River. Nesting Bank Swallows have also been affected by alterations to the river's natural hydrology with the installation of water storage and flood control facilities, primarily dams.

The Bank Swallow Technical Advisory Committee (BANS-TAC) is a diverse coalition of State and federal agency and non-governmental organization personnel, created in response to the continued decline of Bank Swallow (*Riparia riparia*) populations on the Sacramento River. The BANS-TAC's mission is to promote collaborative long-term conservation and recovery of the Bank Swallow along the Sacramento River, its tributaries, and other areas throughout California by coordinating and supporting monitoring and research, habitat restoration and management, and outreach and education. To that end, the BANS-TAC has produced a conservation strategy to provide direction to better protect and recover the Bank Swallow in California, as well as benefit the many other species dependent on natural river systems.

To recover the Bank Swallow population in California, natural river processes will have to be restored on a significant portion of the Sacramento River and its tributaries. Many of the current flood management activities will have to be modified and replaced with more sustainable ones, and past habitat modification will have to be reversed. Spring and summer flow regimes that inundate or erode active colonies will have to be modified.

Specifically, the Bank Swallow Conservation Strategy recommends:

1. avoiding new impacts to river processes as well as to existing nesting habitat and colonies using current data; consulting with the California Department of Fish and Wildlife; maintaining appropriate construction buffers; using alternatives to bank stabilization; and maintaining non-impacting flow regimes during the nesting season.

2. protecting suitable habitat by acquiring permanent easements or fee-title to parcels with existing colonies and suitable nesting habitat; and reestablishing and reconnecting river floodplains.

3. restoring nesting habitat and river processes on the Sacramento and Feather Rivers by removing 53 miles of revetment and restoring 12,000 acres of floodplain by 2050; and managing flow regimes to improve floodplain connectivity and reduce inundation impacts to nesting Bank Swallows.

4. mitigating unavoidable impacts to Bank Swallow habitat and river processes by removing revetment from potential nesting habitat at a 2:1 ratio, and conserving existing nesting habitat at a 1:1 ratio for impacts to suitable nesting habitat; removing revetment from potential nesting habitat at a 1:1 ratio, and conserving existing nesting habitat at a 1:1 ratio for impacts to nesting habitat that is not currently suitable; and mitigating for flows that inundate Bank Swallow nests during the nesting season.

In addition to improving conditions for Bank Swallows, these actions will protect and restore natural river processes that contribute to the ecosystem services that our rivers provide: nutrient transport, fish and wildlife habitat, water quality, and flood protection. Stewardship of the Bank Swallow is one step toward managing our floodplains and rivers in a way that provides benefits for people and wildlife.

INTRODUCTION

Bank Swallows nest on vertical, or near-vertical, banks and bluffs in areas along rivers, lakes, and oceans (Fig. 1). Although comprehensive surveys are lacking, available information suggests that 70 - 90% of the current known Bank Swallow population in California nests in colonies along the Sacramento and Feather Rivers (Laymon et al., 1988; BANS-TAC, unpublished data). Because most colonies are located on eroding river banks, presence of this species in sustainable numbers is an indicator of the healthy riparian ecosystem that results from a river's lateral migration within its floodplain. The combination of hydrology, erosion, sediment deposition, river migration, and ecological disturbance and succession result in the physical and biological environment that provides essential habitat for the Bank Swallow and many other plants and animals along California's rivers.

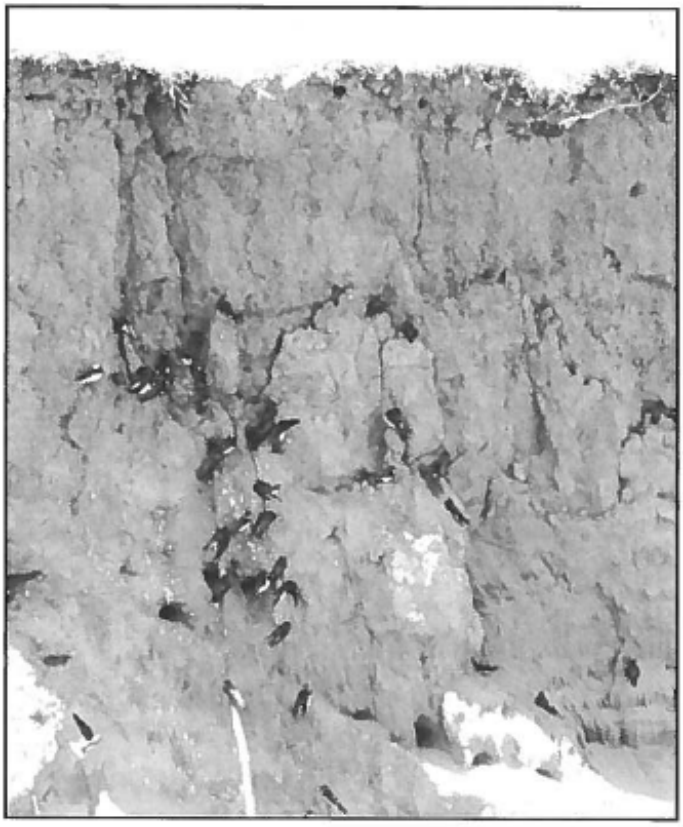

Figure 1: Bank Swallow colony. Photo by Danika Tsao (CDWR) 2011

In 1989 the Bank Swallow (*Riparia riparia*) was State-listed as Threatened. Despite the listing and subsequent adoption of the Recovery Plan (CDFG,1992), which afforded the species additional legal protections, the Bank Swallow population on the Sacramento River has continued to decline and remains vulnerable to ongoing bank stabilization and flood control projects. This vulnerability was illustrated in 2007 when State and federal flood control agencies placed rock revetment on nearly a mile of eroding bank on the Sacramento River. This project covered a Bank Swallow colony site with eight years of surveyed nesting activity and over 4000 burrows, one of the largest in California.

The Bank Swallow Technical Advisory Committee was formed in response to this event. The BANS-TAC is a diverse coalition of State and federal agency, non-governmental organizations, and university personnel dedicated to the conservation of Bank Swallow

populations in California. The BANS-TAC's mission is to promote collaborative long-term conservation and recovery of the Bank Swallow along the Sacramento River, its tributaries, and other areas throughout California by coordinating and supporting monitoring and research, habitat restoration and management, and outreach and education. To that end, the BANS-TAC has produced a conservation strategy to provide direction to better protect and recover the Bank Swallow in California, as well as benefit the many other species dependant on natural river systems (www.sacramentoriver.org/bans).

This conservation strategy is based on the species needs and is intended to guide the preservation, protection, and restoration of habitat and natural river processes that support Bank Swallow populations in California.

Specifically, the strategy is intended to provide flood management and regulatory agencies, conservation organizations, and private landowners with measurable conservation objectives for the species. Focusing on the Sacramento River and its tributaries, this strategy describes:

1. the natural history and ecology of Bank Swallows
2. the status and trends of Bank Swallow populations
3. threats to Bank Swallow populations
4. recommendations for conservation actions to help the population recover

Natural River Processes

Natural water flows, or hydrographs, are highly seasonal and influenced by storm events in the Sacramento Valley and snow melt in the surrounding mountains. Historically, Sacramento River flows were naturally low in the fall, and increased in the winter due to precipitation. Spring and summer snowmelt resulted in a spring peak and long tapering decline in flows into the summer, the amount and duration depending on snowpack.

Alluvial rivers naturally move, or migrate, due to erosion on the outside banks of channel bends and sediment deposition on the inside of the bends creating point bars (Fig. 2). As a result of these dynamic river processes, meander bends move through time, both downstream and cross-stream. The lateral extent of the river's migration is

called the meander belt. Movement of the river channel within the meander belt is driven by high flow events that cause the collapse and resurfacing of banks.

Flooding and bank erosion are vital processes of the river ecosystem for Bank Swallows. Bank erosion creates the near-vertical banks the swallows rely on for nesting. In the absence of bank erosion, over-steep banks collapse and become covered with vegetation, making them unsuitable for Bank Swallow nesting (Garrison, 1999). These river processes and the riparian (river-associated) ecosystem are also important to many other species (Golet et al, 2003; Stillwater Sciences, 2007).

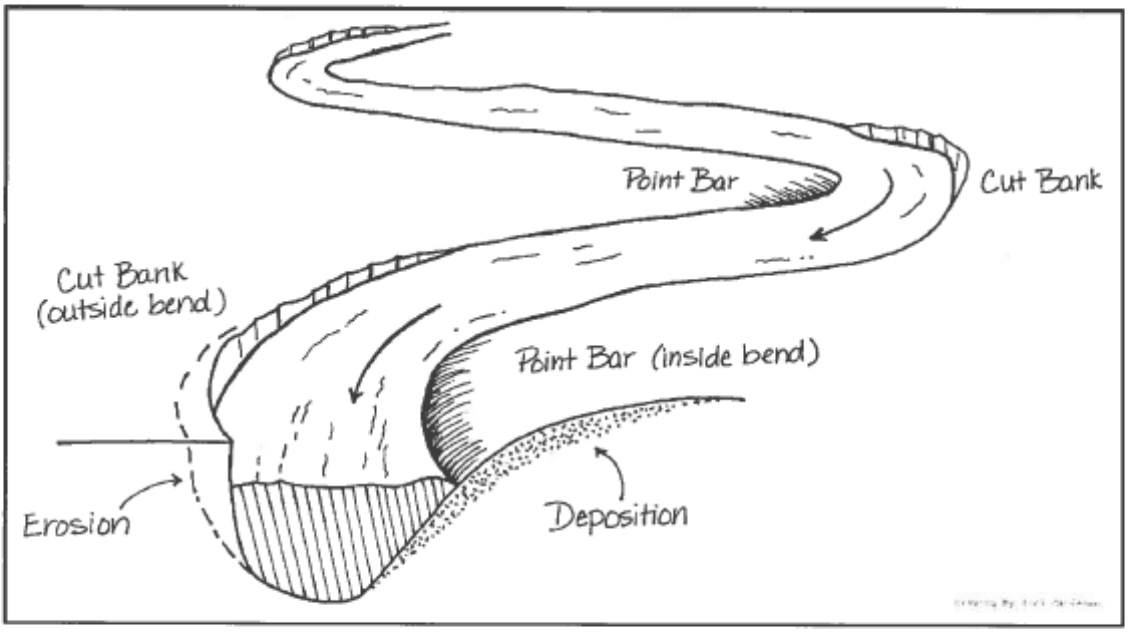

Figure 2: Typical bend on a meandering river (Toni Cardenas, SRCAF Handbook, 2003)

GLOSSARY

Adjacent levee - levee constructed on the landward side of an existing levee. The existing levee is allowed to erode and fail over time, resulting in the river eventually re-occupying a portion of its floodplain.

Bank protection - material (usually rock revetment) is placed on a river bank to prevent erosion on adjacent land. Also **bank stabilization, revetment, rock revetment, rip-rap.**

Brood - number of young produced from a clutch per adult Bank Swallow pair.

Burrow occupancy rate - a constant applied to burrow count numbers to account for the fact that not all burrows are occupied by nesting Bank Swallows. Published rates differ and the rate may change during a season.

Colony - a group of birds nesting together in close association. A Bank Swallow colony is identified as a cluster of burrows in bare or nearly bare cut banks.

Colony persistence - length of time a Bank Swallow colony is in use.

Conservation easement- Legally binding restrictions voluntarily placed on property by the owner that constrains the rights of present and future owners; these restrictions limit certain rights and uses of the property for conservation, preservation, or restoration purposes (California Civil Code Section 815)

Clutch size - the number of eggs laid by a female bird in one nesting attempt. The average Bank Swallow clutch is 3 to 5 eggs.

Cut bank - a steep, bare slope formed by erosion on the outside of a stream bend due to lateral migration, or meander, of a stream. Also **vertical bank**, **natural bank.**

Double-clutching - nesting pair produces two or more sets of eggs, which may result in the production of multiple sets of young, although all sets of eggs may fail.

Floodplain - the relatively flat area adjacent to a river that experiences flooding during periods of high discharge. Also **connected floodplain.**

Geologic control - various substrates that are resistant to erosion; natural hard points that stop lateral migration of the river.

Habitat - refers to the vertical, or near-vertical, river banks with friable soils formed by erosion preferred by Bank Swallows for burrow excavation. Nesting habitat is created and maintained by erosion and sediment deposition, river migration, and ecological disturbance and succession. **Suitable habitat** or **potential habitat** includes sites that

have the proper physical features (mixed alluvium within the meander belt) but may not be currently occupied by a Bank Swallow colony.

Hard point - a structure located adjacent to a river that changes the direction or rate of channel migration by interfering with the rivers movement. Examples include buildings, bridges, and levees. A **natural hard point** may be formed in areas with erosion resistant soils, or geologic control.

Hydrograph - a graph showing discharge (rate of flow) over time at specific place on a river. Historically, Sacramento River flows were low in the fall and increased in the winter due to precipitation. Spring and summer snowmelt resulted in a spring peak and long tapering decline in flows into the summer, the amount and duration depending on snowpack.

Lateral migration - the lateral movement of a river channel as it adjusts to balance erosion with deposition. Also **channel migration**.

Levee - a natural or constructed ridge or wall which regulates water levels. Artificial levees are designed to prevent flooding of the surrounding land and slow natural course changes of a waterway.

Meander - the bend or curve in a river or stream channel. Also refers to the migration of the river or stream channel.

Meander belt - the average meander width of a river measured from outer bend to outer bend; the lateral extent of a river's migration on its floodplain. For the Sacramento River, the historic meander belt is often referred to as where the river has been since 1896, the first available maps of the channel. Also **one-hundred-year meander belt.**

Meander potential - the potential for a channel to migrate laterally, based on suitable soils.

Mitigation - an action designed to avoid, minimize, reduce, or compensate for a significant impact to the environment. Acceptable mitigation for impacts to Bank Swallow habitat or potential habitat, such as placement of rock revetment or sloping a cut bank, includes removal of rock from suitable habitat elsewhere on the river.

Restoration - the return of an altered ecological system to a stable, healthy, sustainable approximation of its former unimpaired condition.

Revetment - a sloping surface of stone, concrete, or other material placed on a river bank in such a way as to absorb the energy of incoming water, thereby protecting the bank from erosion. Also **bank stabilization**, **bank protection**, **rock revetment, rip-rap.**

Revetment removal - the removal of rock or other bank stabilization material from a river bank to restore natural river processes. Also **rock removal**.

Riparian - living or located on the banks of a stream or river, such as riparian woodland or riparian vegetation. Also **riverine.**

Rip-rap alternative - bank stabilization alternatives that do not include using rock. Examples may include bioengineering (planting vegetation and natural features to reduce bank erosion) or set-back levees.

River mile - the distance in miles along a river measured from its confluence with the San Joaquin River. This conservation strategy references river miles on the Sacramento River as published in the U.S. Army Corps of Engineers' "Sacramento River, Sloughs, and Tributaries, California 1991 Aerial Atlas, Collinsville to Shasta Dam." These river miles may no longer be on the main channel due to **meander**.

River processes - the processes associated with rivers and streams include erosion, transportation, and deposition of sediment. Rivers naturally move, or migrate, due to erosion on the outside banks of channel bends and sediment deposition on the inside of the bends, creating point bars. As a result, meander bends of a river are not static but move through time, both downstream and cross-stream. Also **dynamic river processes**, **natural river processes**, **geomorphic processes**, **fluvial processes**.

Setback levees - levees constructed at some distance from the river channel in order to allow the river to occupy a portion of its floodplain; these levees are usually smaller in size than levees placed immediately adjacent to the river channel.

Sustainable population size - the minimum population size that allows a species to persist in the face of environmental uncertainty. For Bank Swallows that live in ephemeral habitats, a minimum number of 25000 breeding pairs guards against events such as breeding failure due to bank collapse, and stochastic events.

Take - to hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill. (FGC §86). Take is regulated by agencies such as California Department of Fish and Wildlife and U.S. Fish and Wildlife Service.

BANK SWALLOW NATURAL HISTORY AND ECOLOGY

Species Description

The Bank Swallow (Fig. 3) is the smallest North American swallow with a weight of about 13.5 grams. They are approximately 13 centimeters in length, with a wing span of 33 centimeters (Brinkley, 2007). The sexes appear similar and are distinguished only by the presence of a brood patch or cloacal protuberance (Garrison, 1999). Adult Bank Swallows have a grayish brown mantle, rump and wing coverts, and a brown tail. They have a distinct brown breast band contrasting with the white chin and belly (Garrison, 1999).

Figure 3: Adult Bank Swallow pair. Photo by Jim Dunn, 2009.

Distribution

Bank Swallows are migratory birds that breed in North America, Europe, and Asia, and winter in Central and South America and Africa (Garrison, 1999). The California populations winter in Central and South America, and currently breed in the northern and central regions of the state (Fig. 4). Despite their extensive range, Bank Swallow

breeding colonies are patchy, occurring only in areas where appropriate habitat exists (Grinnell and Miller, 1944). As a result, although there are nesting colonies scattered across Northern California, 70 - 90% of the California Bank Swallow population occurs along the Sacramento River and its tributaries (Humphrey and Garrison, 1986; Garrison et al, 1987; CDFG, 1992;).

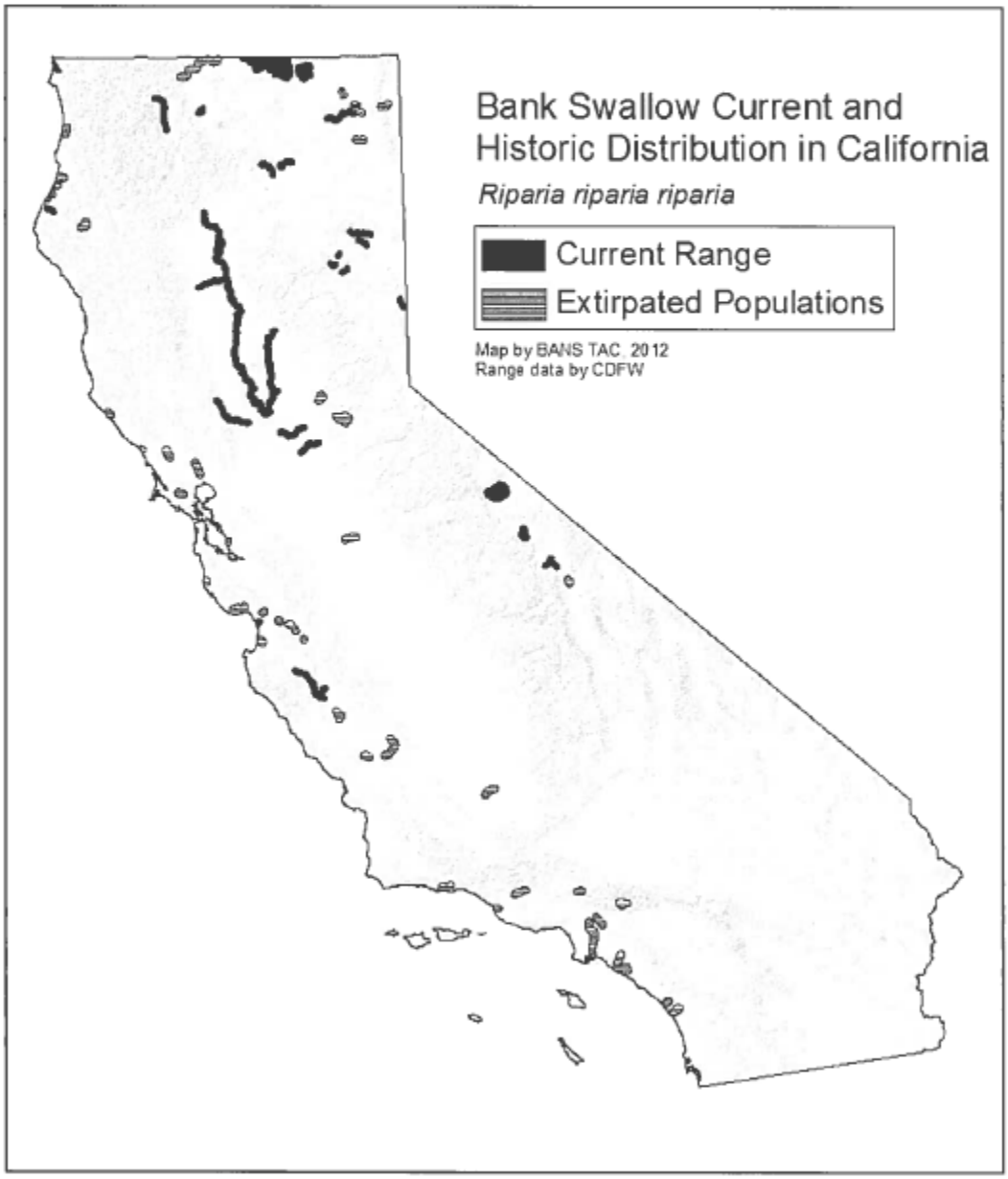

Figure 4. Current Bank Swallow Breeding Distribution and Extirpated Populations in California.

Reproduction

Bank Swallows arrive in California each spring as early as March to nest; they seek suitable colony locations, excavate burrows, and form pairs. Males excavate burrows prior to pairing, and nests are built in the burrows using materials gathered from the ground, and pieces of roots from exposed banks (Fig. 5).

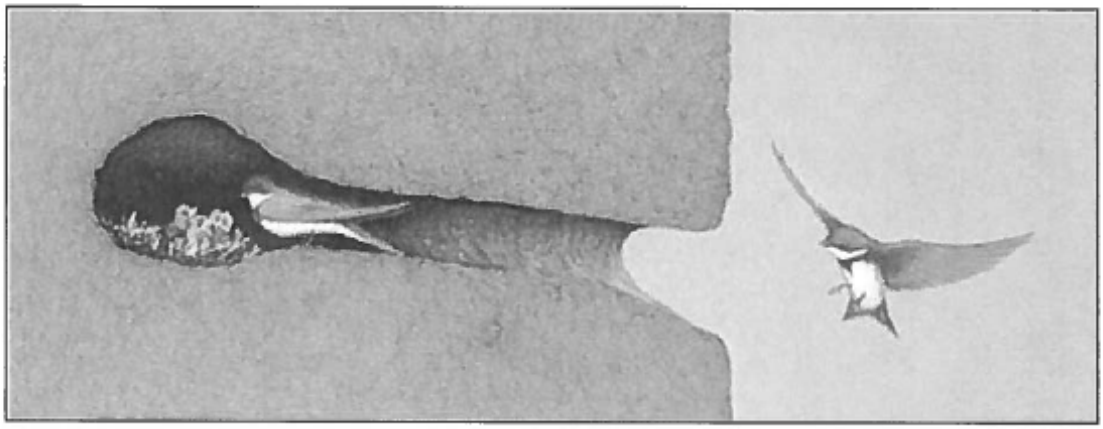

Figure 5: Artist rendition of Bank Swallow burrow and nest structure. Typical burrows can be as much as 3 feet deep. Figure by permission from Tim Gunther, www.gunthergraphics.biz.

Bank Swallows typically lay 3 to 5 eggs, with peak egg-laying occurring between mid-April and mid-May. Most juveniles (Fig. 6) fledge by mid-July. Bank Swallows are thought to produce only one brood per season in California (Garrison, 1999), although some studies suggest Bank Swallows may have two broods in a given season (Stoner, 1925; Wright, 2011). Mortality and survivorship of young have not been extensively studied in North America, but average mortality of hatch-year Sand Martins (Bank Swallows) in Great Britain based on mark-recapture studies was 77–80% (Hardwood and Harrison, 1977; Cowley, 1979).

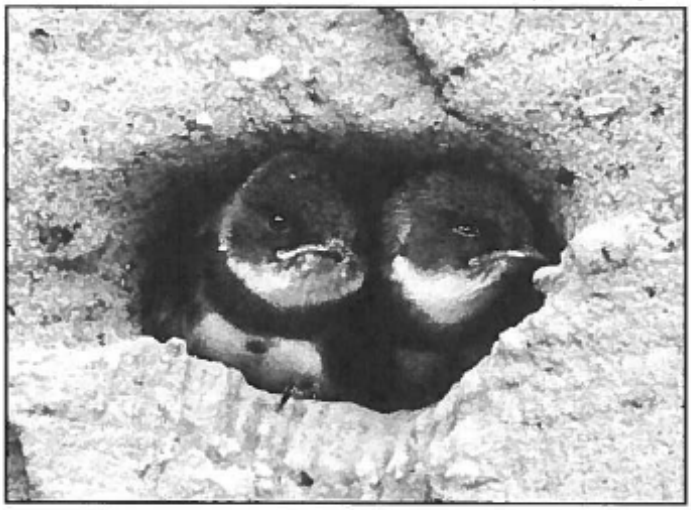

Figure 6. Juvenile Bank Swallows in Burrow. Note the brown chest band. Photo by Ryan Martin (CDWR), 2009

Nesting Colonies and Habitat

Bank Swallows in California nest in colonies ranging in size from 3 to over 3,000 nest burrows. On the Sacramento River, 70% of colonies consist of 10 to 340 burrows (Schlorff, 1997; Garcia, 2009).

Bank Swallows establish colonies along eroded, vertical banks within river systems with friable alluvial soils (Fig. 7) (Garrison et al., 1987). Dynamic river processes create these conditions as rivers meander and expose fresh soil. In coastal areas and lakes, wave action erodes banks or bluffs to create vertical faces.

Figure 7. Active Bank Swallow Colony on the middle Sacramento River. Photo by Scott McReynolds (CDWR), 2012.

Burrows are often destroyed by erosional processes from year to year, exposing fresh banks that are used by the swallows. Due to the ephemeral nature of their nesting habitat, individual Bank Swallows have relatively low fidelity to a particular nest site (Freer, 1979); however, colonies may persist in a given area for many years, as long as appropriate soil characteristics and vertical bank profile remain available. The regular resurfacing of this habitat may be beneficial to Bank Swallow populations by reducing parasite loads (Garrison and McKernan, 1994; Garrison, 1999; Moffatt et al., 2005), as

ectoparasites may reduce their reproductive success (Szep and Møller, 1999). Such resurfacing may also help reduce nest predation risk since older banks can become too accessible to predators due to minor bank sloughing or vegetation encroachment (Garrison et al, 1989; Garrison, 1998).

Additionally, riparian over-bank vegetation appears to be an important feature for Bank Swallows on the Sacramento River, perhaps for burrowing, foraging, or both. In an analysis of data from a 10 year survey period colonies were more strongly associated with native riparian habitats, including herbaceous cover, scrub, and forest, than with orchard crops (Garcia, 2009).

Bank Swallow nesting colonies are also found in artificial sites, including sand quarries (Fig. 8) and road cuts, where resurfacing occurs during mechanical removal of materials, but these are uncommon (Garrison, 1999). These off-river sites are not well documented although there are California records from Siskiyou, Shasta, Lassen, Plumas, San Joaquin, and Inyo counties (pers. comm. D Garcia, 2008).

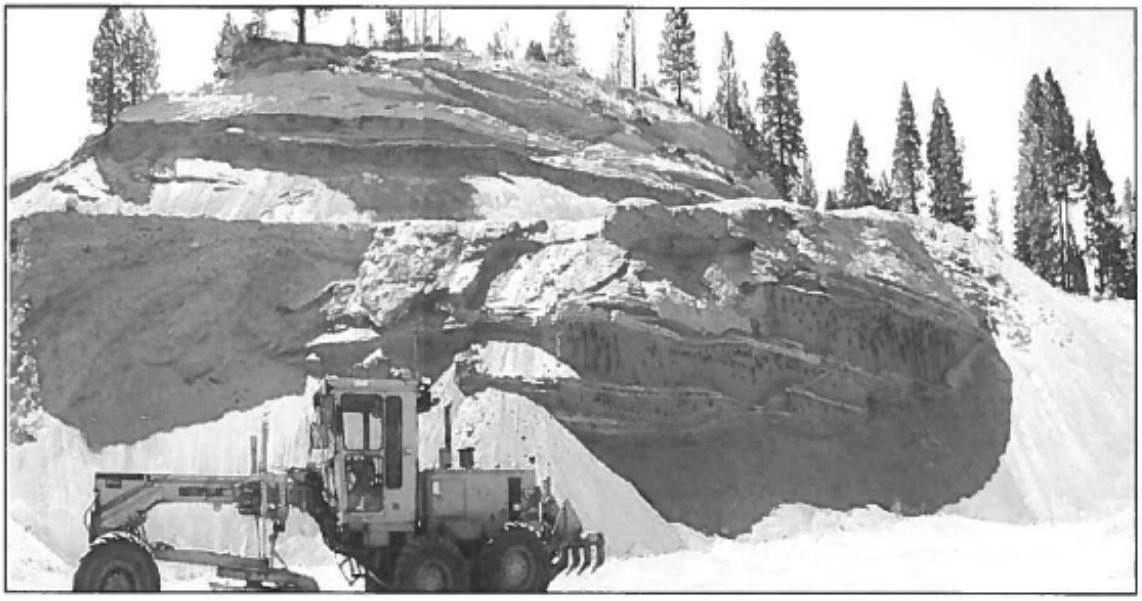

Figure 8. Bank Swallow burrows in sand mine (in shadow, right-center), Shasta County. Photo by Tricia Bratcher (CDFW), 2011.

From 1987 to 1989, eight experimental nesting sites were constructed along the Sacramento River to evaluate the effectiveness and feasibility of created habitat to compensate for losses of natural Bank Swallow nesting habitat (CDFG, 1992; Garrison, 1991). Five of the eight locations were natural river banks "enhanced" by reshaping the bank to expose vertical faces and fresh soils. The other three locations were "artificial"

sites constructed with soil mounds landward of the rip-rap above the bank. Although the enhanced sites were used by Bank Swallows, they required annual maintenance; use by the birds ended once maintenance stopped. The artificial sites lacked the needed characteristics of natural Bank Swallow nest sites and were not well used. Those that were used showed high levels of predation by herons and egrets (Garrison, 1991). Because of these factors, Garrison (1991) recommended that artificial nesting sites not be used to mitigate for losses of natural Bank Swallow nesting habitat.

Relationship of Burrow Numbers to Number of Nesting Pairs

The number of nesting pairs of Bank Swallows is difficult to assess directly. It is not possible to derive the number of nesting pairs by counting active burrows, or by counting the number of burrows used in a season. Not all birds within an active colony nest at the same time, some males construct nest burrows but do not attract a mate and abandon them, and there is evidence that some pairs may produce more than one brood per season. For that reason, raw burrow counts are currently the best index of Bank Swallow numbers and are used in this document for that purpose. During surveys, burrows that have specific characteristics indicative of recent use are counted as surveyors pass in boats.

Occupancy rates, percent of burrows actually used for nesting that season, have been calculated for some raw burrow counts. Under close inspection, burrows that show signs of use, such as eggs, shells, nest material, incubating or brooding swallows, or young are deemed occupied. Calculated occupancy rates have ranged from 31.6 - 63% in studies conducted on the Sacramento River (Garrison et al., 1987; Garrison et al., 1989; Garrison, 1991; Wright et al., 2011). The BANS-TAC compared the studies that include occupancy rates, and has adopted a rate of 50% to convert raw burrow counts to a rough estimate of nesting pairs. Thus, the 15,000 burrows counted on the middle Sacramento River in 2012 would represent 7,500 nesting pairs.

Diet and Foraging Habitat

Bank Swallows usually forage in flight, both individually and in flocks, consuming mainly flying or jumping insects (Beal, 1918; Turner and Rose, 1989; Garrison, 1999). When feeding nestlings, birds are commonly observed foraging within 50-200 meters of nesting colonies (Garrison, 1998). Foraging habitat includes wetlands, open water, grasslands, riparian woodland, orchards, agricultural fields, shrub lands, and upland woodlands (Stoner, 1936; Gross, 1942; Freer, 1977; Turner and Rose, 1989; Garrison, 1999).

Wintering Habitat

Little information exists regarding Bank Swallow wintering habitat. Bank Swallows have been recorded in grassland, savanna, open agricultural areas, and freshwater and brackish wetlands in Central and South America (Garrison, 1999).

BANK SWALLOW STATUS

Historic Distribution

Bank Swallows historically bred throughout lowland California (Grinnell and Miller, 1944), including coastal sites from Santa Barbara County south to San Diego County. In 1987, only four colonies were found south of San Francisco Bay (Laymon et al., 1988). At that time, the Sacramento River and Feather River populations were thought to comprise about 64 percent of the colonies and 70 percent of the California population. The remaining population was thought to be concentrated in the Klamath Basin and Modoc County areas of northeastern California.

Legal Status and Recovery Goals

In March 1989, the California Fish and Game Commission listed the Bank Swallow as a Threatened species under the California Endangered Species Act (CESA). CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate mitigation planning to offset project caused losses of listed species populations and their essential habitats.

In 1992, the California Department of Fish and Wildlife (CDFW) (formerly CDFG) published a recovery plan for the species (CDFG 1992: http://www.dfg.ca.gov/wildlife/nongame/publications/bm_research/docs/93_02.pdf). The recovery plan states that "While it is not expected that the Bank Swallow population can be fully restored to its former abundance and distribution, stabilizing the population at a level that ensures long-term viability is a reasonable and achievable goal." The plan did not, however, give a specific population target for recovery.

The Recovery Plan identifies numerous actions needed to protect the Bank Swallow, including avoiding impacts through use of alternatives to bank stabilization and mitigating impacts from bank stabilization projects; preserving major portions of the remaining Bank Swallow habitat in California; identifying and obtaining appropriate preserve lands; and using set-back levees reestablishing river meander-belts. Few of the recommendations included in the Recovery Plan were implemented to a significant degree.

The Bank Swallow is not listed under the federal Endangered Species Act (ESA); however, it is protected by the Migratory Bird Treaty Act, the Fish and Wildlife Coordination Act, and under the California Environmental Quality Act.

The Migratory Bird Treaty Act (MBTA) was implemented in 1918 for the protection of migratory birds between the U.S. and Great Britain (on behalf of Canada). Later amendments implemented treaties between the U.S. and Mexico, Japan, and Russia.

The MBTA makes it illegal to take or possess any migratory bird or parts, nests, or eggs, of such a bird except under the terms of a valid permit issued pursuant to Federal regulations.

The Fish and Wildlife Coordination Act (FWCA) of the United States was enacted in 1934 to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The Act provides the basic authority for involvement of the United States Fish and Wildlife Service (USFWS) in evaluating impacts to fish and wildlife from proposed water resource development projects. The Act's purpose is to recognize the vital contribution of U.S. wildlife resources, and their increasing public interest and significance. FWCA requires that wildlife conservation be given equal consideration to other features of water-resource development programs through planning, development, maintenance and coordination of wildlife conservation and rehabilitation.

The California Environmental Quality Act (CEQA) was passed in 1970 to implement a statewide policy of environmental protection. CEQA applies to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval (California Public Resources Code, Sections 21000 - 21178, and Title 14 CCR, Section 753, and Chapter 3, Sections 15000 - 15387). Under CEQA, analysis of project impacts to all aspects of the environment, including sensitive species and their habitats, is required. Due to their threatened status under CESA and declining population, disturbance to Bank Swallows or their habitat could be a significant impact. Any project with potential impacts to Bank Swallows or their habitat must comply with CEQA to identify and analyze the impacts and propose measures to reduce impacts to below a level of significance.

The National Environmental Policy Act of 1969 (NEPA) (P.L. 91-190; 83 Stat. 852; 42 U.S.C. 4321) was passed in December 1969 and signed into law on January 1, 1970. NEPA expanded environmental reviews and formally established environmental protection as a Federal policy. NEPA requires Federal agencies to consider the potential environmental consequences of their proposed action, and any reasonable alternatives. Major Federal actions significantly affecting the environment require consultation with other Federal agencies having jurisdiction or expertise regarding the environmental effects of proposed actions. Federal agencies are directed to cooperate in fulfilling the requirements of state and local laws and ordinances where those requirements are in addition to, but not in conflict with, Federal requirements.

POPULATION TRENDS SINCE PROTECTION

Sacramento River

Since 1986 the CDFW (in partnership with the USFWS since 1999) has conducted annual surveys along the Sacramento River between Red Bluff and Colusa (middle Sacramento River) (Fig. 9) (Laymon et al., 1988; Schlorff, 1997; Hight, 2000; Garcia et al., 2008; Wright et al., 2011). At the time of CESA listing in 1989, the burrow count based on the 1986 survey was approximately 25,000. Through most of the 1990s burrow counts, and the corresponding estimate of Bank Swallow pairs, consistently declined, reaching a low of 9250 burrows in 1995. Since 1998, the number of burrows has fluctuated between 10,000 and 19,000 (Schlorff, 2000). The most recent estimate (2012) was of 15,000 burrows.

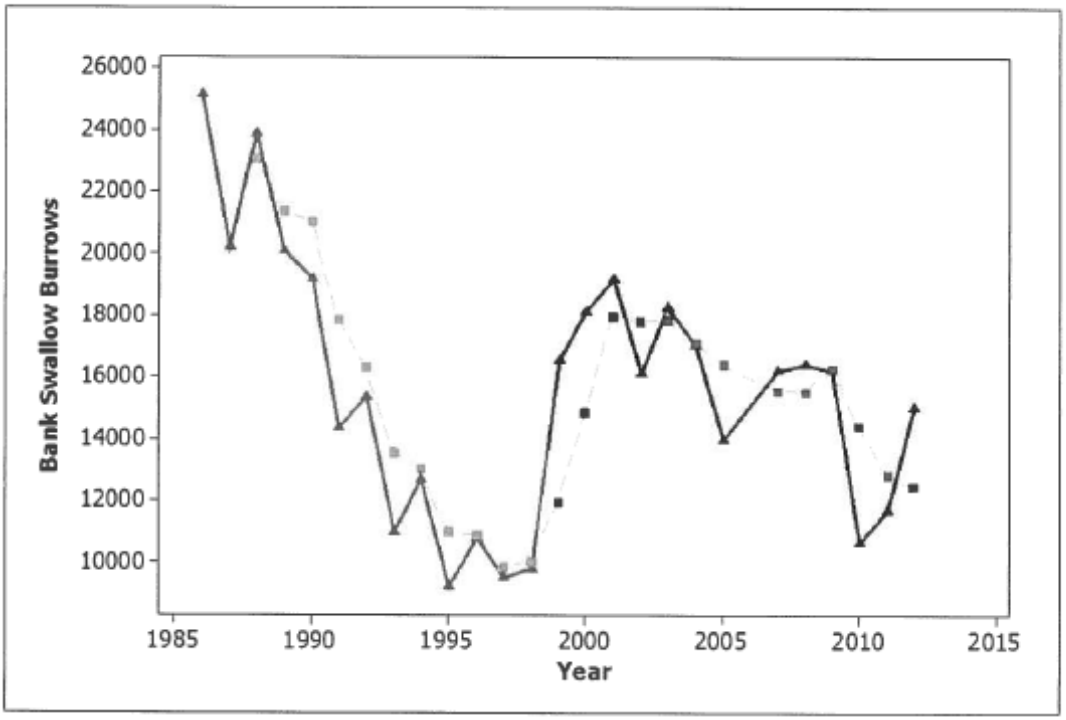

Figure 9. Bank Swallow burrow counts reported for the Sacramento River between Red Bluff and Colusa (100 river miles), from interagency survey efforts (1986-2012). Annual counts are shown in black, 3 year moving average in red. Data within the gray shaded area (1986-1998) were compiled from Hight (2000).

Feather River

In 1987, CDFW conducted a survey of the Feather River and obtained an estimate of 6,590 burrows (Laymon et al., 1988). In 2002 and 2003, the Department of Water Resources (DWR) surveyed the Feather River and obtained burrow estimates of 2,270 and 3,590, respectively. Since 2008, DWR has conducted annual surveys of the Feather River, counting a low of 1,830 burrows in 2010. The most recent estimate (2012) was 2,320 burrows (Fig. 10).

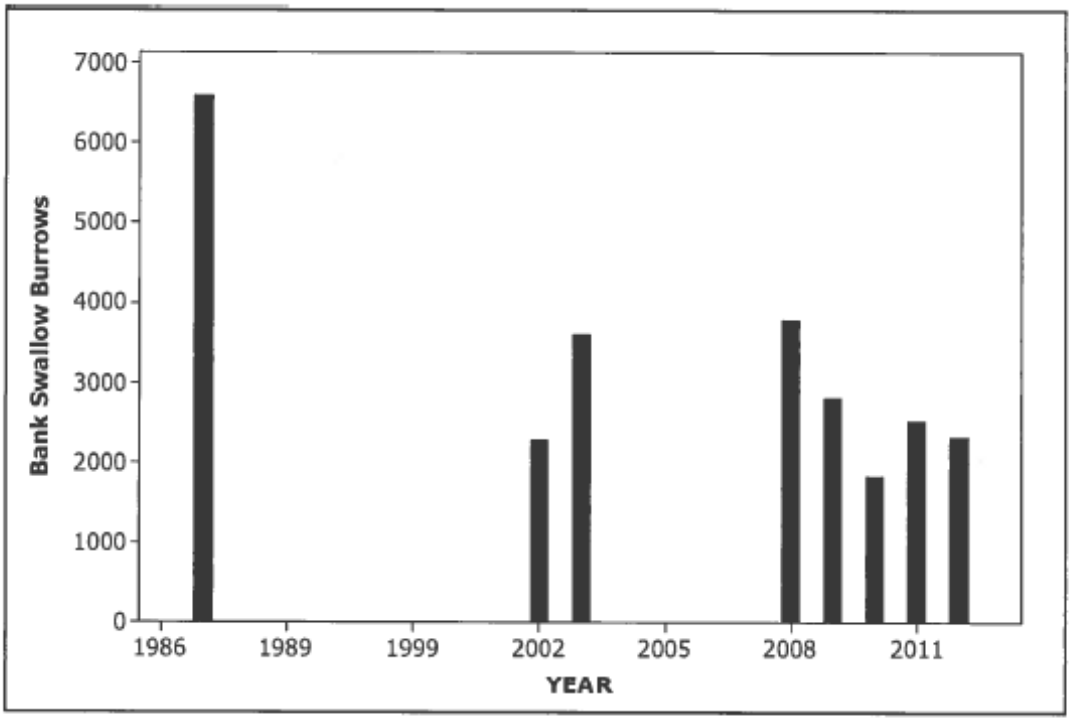

Figure 10. Bank Swallow burrow counts reported for the Feather River between the mouth and Thermolito Afterbay Outlet (59 river miles). DWR Annual surveys began in 2008. Surveys were not conducted in years without bars.

IMPACTS AND THREATS TO BANK SWALLOW POPULATIONS

On the Sacramento River and its tributaries, the most important overall threat to Bank Swallows has been the gradual loss of river processes that provide habitat for Bank Swallows and other wildlife. Bank Swallow populations have been impacted through direct mortality, as well as loss of suitable nesting and foraging habitat resulting from land conversion, bank stabilization, flood management activities, and water supply operations throughout California (Remsen, 1978; Humphrey and Garrison, 1987; CDFG, 1992; Schlorff, 1997).

Bank Stabilization

Projects that prevent lateral migration of the river channel through placement of rock revetment have significantly reduced the amount of available nesting habitat and altered the river processes that renew these habitat features (Garrison et al., 1987; Humphrey and Garrison, 1987; CDFG, 1992; Stillwater Sciences, 2007) (Fig. 11). In addition, erosion control projects constructed at active nesting sites during the breeding season have caused direct mortality to adult and nestling birds (Garrison, 1991; Schlorff, 1995; Garcia et. al., 2008).

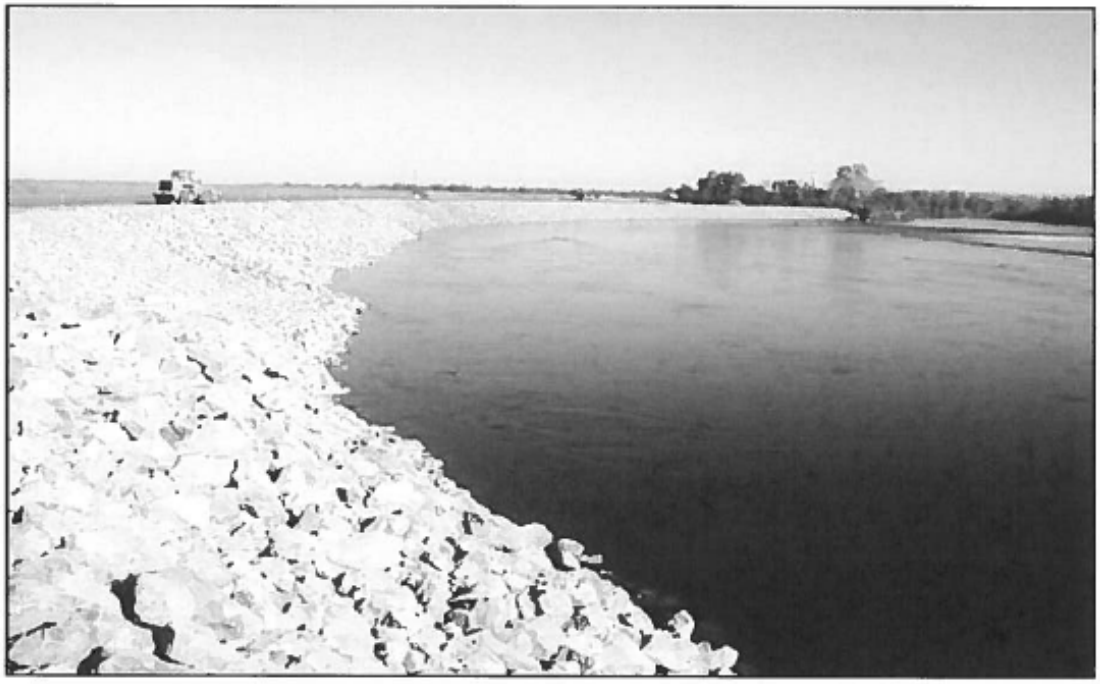

Figure 11. Agency revetment placed on an eroding bank on the middle Sacramento River under Executive Order S-01-06. Photo by Joe Silveira (USFWS), 2007.

The federal Flood Control Act of 1960 authorized the Sacramento River Bank Protection Project (SRBPP) to use bank stabilization actions to protect existing levees and flood control facilities of the Sacramento River Flood Control Project, in a partnership between the U.S. Army Corps of Engineers (USACE) and Central Valley Flood Protection Board (CVFPB). Between 1960 and 2007 the SRBPP was responsible for the installation of 320,000 linear feet (60.6 miles) of rock revetment along natural banks of the Sacramento River between Verona (River Mile 80) and Chico Landing (River Mile 194) (Table 1).

Table 1: Revetment, in linear feet, placed on the banks of the Sacramento River between Verona and Red Bluff, and the Feather River, from 1960 to present.

	Sacramento River			Feather River
Project Name	Verona to Colusa	Colusa to Chico Landing	Chico Landing to Red Bluff	
SRBPP, Phase 1	161,900	9,200		14,000
SRBPP, Phase 2	78,650	69,750		9,400
DWR Emergency 2005/06	3,800	6,200		
Chico Landing to Red Bluff			87,915	
Non-federal or State Revetment	**162,660**	**37,700**	**63,685**	**40,600**
Total (Linear Feet)	**407,010**	**122,850**	**151,600**	**64,000**

An additional 10,000 linear feet (1.9 miles) of revetment was placed in 2006, after the Governor's State of Emergency declaration, issuance of Executive Order S-01-06, and passage of AB 142 (Fig. 11). The federal Flood Control Act of 1958 and Water Resources Development Act of 1976 authorized the Sacramento River, Chico Landing to Red Bluff project and placed 88,000 linear feet (16.7 miles) of rock revetment between Chico Landing (River Mile 194) and Red Bluff (River Mile 245) (Table 1).

Installation of non-federal or State revetment by local maintaining agencies and private landowners proves difficult to quantify, but to date, an additional 264,000 linear feet (50 miles) of banks are known to have been impacted along the Sacramento River from Verona to Red Bluff (DWR unpublished data, 2012) (Table 1, Fig. 12).

These actions not only reduce the amount of Bank Swallow nesting habitat (Fig. 13), they also alter sediment transport and deposition, vegetation regeneration, and other natural river processes to the detriment of the entire riparian ecosystem, including special status species such as salmonids (USFWS, 2000; Stillwater Sciences, 2007).

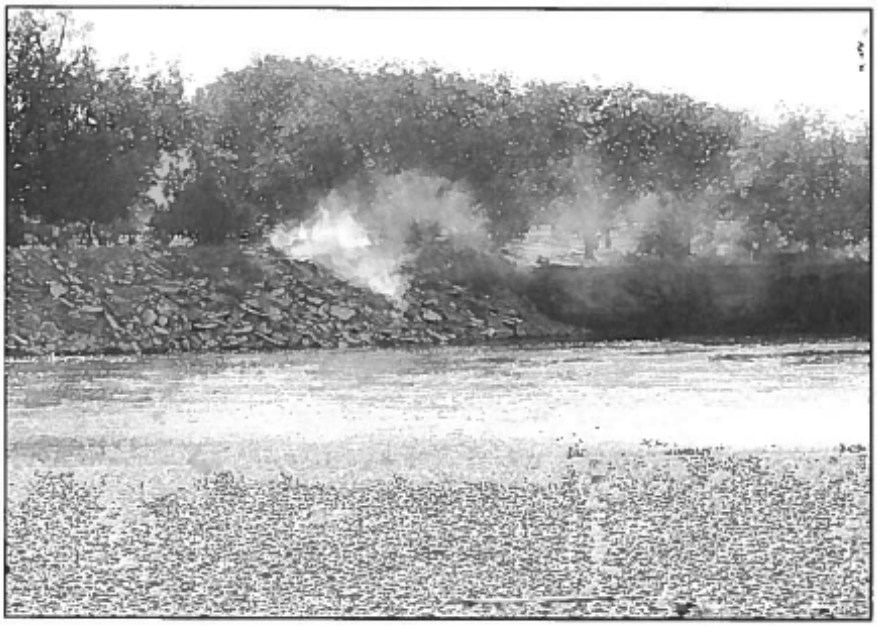

Figure 12. Private revetment being placed on an eroding bank on the middle Sacramento River. Photo by Dave Forwalter (DWR, Northern Region Office), 2007.

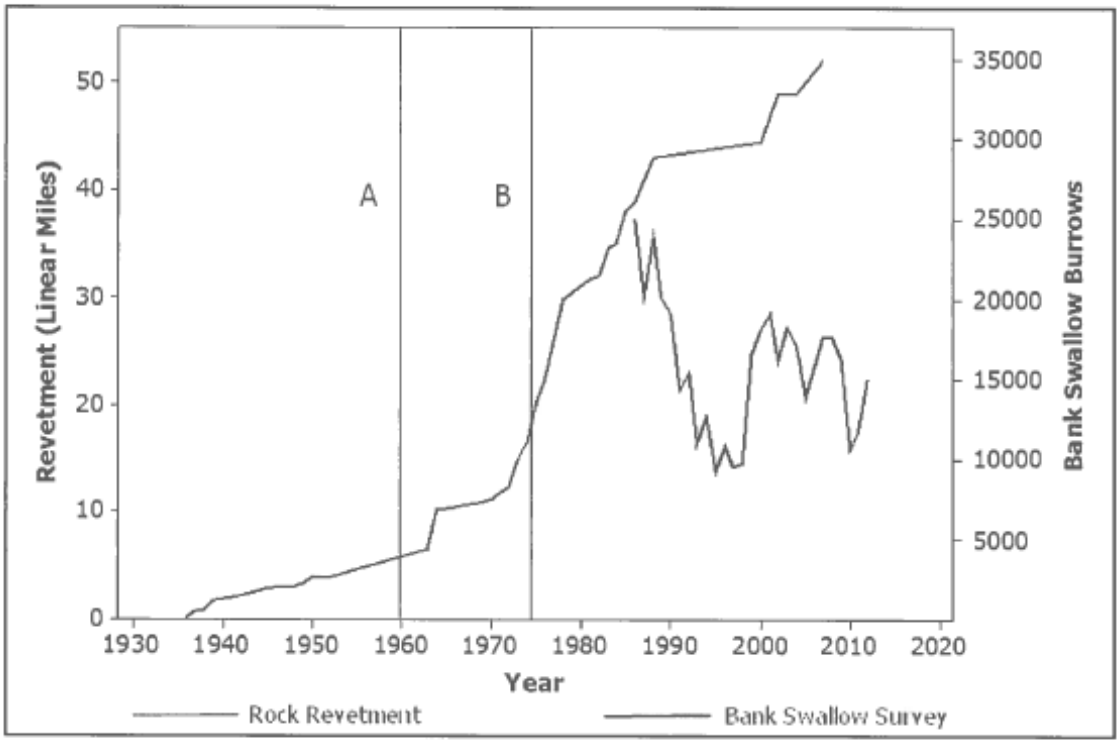

Figure 13. Cumulative length of rock revetment placed on the middle Sacramento River between Red Bluff and Colusa (approximately 100 miles of river) from 1935-present and Bank Swallow burrow counts, beginning in 1986. Vertical line A - Initial authorization of SRBPP, Phase 1, 1960, Vertical line B – Authorization of SRBPP, Phase 2, 1974.

The findings of Girvetz (2010) indicate that river process restoration through removal of bank stabilization on the Sacramento River has the potential to significantly benefit Bank Swallow population viability.

Changes in River Flows

As described earlier ("*Natural River Processes*", Page 4), Bank Swallows rely on ephemeral nesting habitat created and maintained by dynamic river processes. Progressive channel migration and associated bank erosion during winter and early spring high flow events renews nesting habitat and is beneficial to Bank Swallows. In general, bankfull flows are necessary to promote more natural levels of channel migration and bank erosion, although lower flows can also contribute to maintaining these beneficial natural river processes. However, high flows during the late spring and summer nesting season may be detrimental to Bank Swallows due to direct inundation of burrows or loss of nests caused by localized bank sloughing. Burrows have been documented near the water line during the breeding season and are frequently found 3.3 feet above the waterline on the Sacramento River and 1.6 feet above the water line on the Feather River (BANS-TAC, unpublished data).

Dam operations have greatly altered the timing, magnitude, duration, and frequency of winter high flow events on the Sacramento River (Fig. 14), and the Feather River. Since

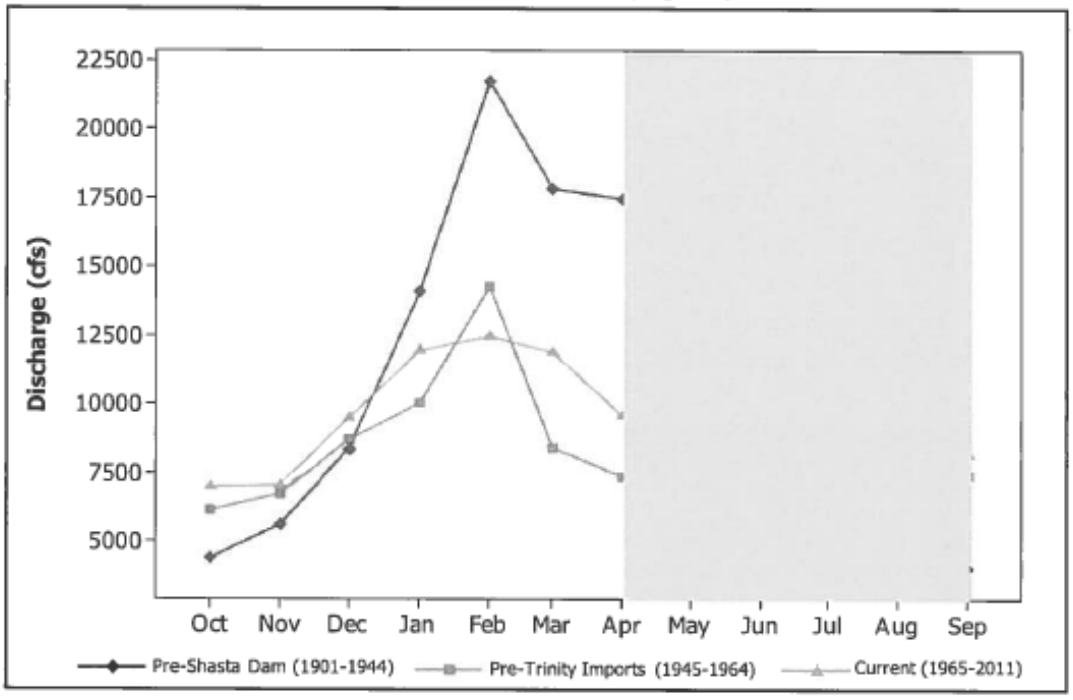

Figure 14. Monthly median flows in the Sacramento River at Bend Bridge, River Mile 258 (USGS Gage 11377100). Shaded bar indicates period of Bank Swallow nesting on the river.

the construction of Shasta and Oroville dams, winter and spring flows have been reduced while summer and fall flows have been increased above natural levels to accommodate water delivery schedules and agricultural and environmental water needs.

Dampened winter and spring flows result in habitat degradation due to reduced bank erosion. When banks are not regularly eroded by high flows, minor bank sloughing can reduce bank slope and create debris piles at the base of the bank. This can lead to vegetation growth which makes banks unsuitable for nesting and provide access for predators to reach nest burrows. Further, high populations of ectoparasites may build up in nests over time, reducing nest success and leading to abandonment of nests or colonies that are not renewed by erosion (Hoogland and Sherman, 1976).

In some instances, dam releases result in unnaturally late high-flow events on the Sacramento and Feather rivers, which can adversely affect Bank Swallow colonies if they occur during the breeding season (April 1-August 31). For example, breeding season flows in the range of 14,000 to 30,000 cfs on the Sacramento River have been associated with localized bank collapse events that resulted in partial or complete colony failure (Stillwater Sciences, 2007). Flows over 50,000 cfs on the Sacramento River can cause extensive bank erosion which is beneficial during the non-breeding season but likely to lead to the loss of multiple colonies if such flows occur during the breeding season (Stillwater Sciences, 2007). Additionally, high flows that cause large increases in river stage (water surface elevation) during breeding season may inundate nests and cause direct mortality of Bank Swallows (Stillwater Sciences, 2007; Joe Silviera, pers. comm.).

Loss of Foraging Habitat

The loss of natural land cover (riparian, grassland, and wetlands) adjacent to waterways and nesting sites throughout the Central Valley has likely impacted Bank Swallow populations through the reduction of food resources; however, the magnitude of this impact remains difficult to quantify (Moffatt et al, 2005).

Ongoing and Future Impacts

Bank Swallow populations continue to be threatened by river and flood management activities, reservoir releases, and conversion of remaining natural land cover. The primary concern is the immediately planned flood projects that include: Central Valley Flood Protection Plan (CVFPP), DWR's Small Erosion Repair Program (SERP) which includes up to 75,000 linear feet of bank stabilization along the Sacramento River, and the SRBPP Phase II authorization to place an additional 80,000 linear feet of bank

stabilization along the Sacramento River. These bank stabilization programs, planned for the next five years on the Sacramento River will result in the loss of more than 29 miles of eroding banks, habitat important for the recovery of the Bank Swallow. In addition to agency projects, unauthorized stabilization of eroding river banks continues on private lands throughout the Bank Swallows range (Fig. 13).

There has been a recent trend to mitigate for these projects onsite to enhance shaded riverine aquatic habitat for fish, specifically salmonids, by sloping and vegetating eroding banks. Proposed mitigation-banking projects include decreasing the slope of cut banks or stabilizing banks for fish habitat. Both mitigation practices fail to recognize the needs of the Bank Swallow as they are single species focused, do not restore river processes, and potentially impair Bank Swallow recovery through the loss of dynamic eroding banks.

In the long term, continued human population growth in California, increasing water demand, and climate change also pose serious threats to Bank Swallows.

RECOMMENDED CONSERVATION ACTIONS

The primary causes of the Bank Swallow population decline are permanent and semi-permanent loss of nesting habitat (eroding banks) from bank armoring and unnatural river flows that inundate and destroy active nest sites. Virtually all of these changes to the river system have occurred in the last 75 years, and most of these impacts have gone, and continue to go, unmitigated even though the standard mitigation ratio for loss of riparian and wetland habitat is 3:1. Because the Bank Swallow population has continued to decline since its CESA listing, it is obvious that an effective recovery plan or conservation strategy for the Bank Swallow must include mitigation and conservation activities that not only offset current impacts to the species habitat, but reverse the impacts that have already occurred.

The overall goal of this conservation strategy is to promote restoration of natural river processes on a sufficient portion of the Sacramento River and its tributaries to maintain and create habitat that will support a Bank Swallow population of at least 25,000 pairs (double the estimated population size at the time of proposed listing) based on a burrow count of at least 50,000. To achieve this goal, we propose that by 2050, State and federal agencies 1) remove 56 miles of river bank revetment, 2) use set back levees and conservation easements to increase the meander belt by 12,000 acres, and 3) modify flow regimes that create river processes to maintain and improve Bank Swallow habitat.

Specifically, we propose four conservation objectives:

1. Avoid impacts to individuals, colonies, current and potential habitat, and river processes;
2. Protect individuals, colonies, current and potential habitat, and river processes;
3. Restore habitat and river processes;
4. Mitigate unavoidable impacts to individuals, colonies, current and potential habitat, and river processes.

The goals and recommendations outlined here are based on our current knowledge of river processes and Bank Swallow ecology and can be reviewed and modified as new information becomes available.

Avoid Impacts to Individuals, Colonies, Current and Potential Habitat and River Processes

Project proponents should avoid impacts to Bank Swallows (individuals, colonies, and current and potential habitat), river processes, and natural banks. This applies to activities year-round, whether Bank Swallows are present or not. Because river meander modifies, refreshes, and exposes nesting habitat over time, installation of revetment should be avoided in any areas with suitable soils for nesting. High flow events may cause nesting failure from burrow collapse and inundation during Bank Swallow breeding season (April 1 – August 31). Where proposed water management or land-use projects would impact Bank Swallows or river processes, alternatives such as setback levees and acquisition of easements or fee title can be used to avoid those impacts. We recommend the following to avoid impacts to Bank Swallow individuals, colonies, habitat, and dynamic river processes:

Goal 1: No impacts to individuals, colonies, and habitat

Recommendations:

1.1 Identify all potential impacts to individuals, colonies, and habitat associated with a project. Use CNDDB, BIOS, and the BANS-TAC website for the most up-to-date information of colony locations (http://www.sacramentoriver.org/bans).

1.2 Consult with CDFW when planning projects within the floodplain of the Sacramento River and its tributaries to ensure projects do not impact colonies or current or potential habitat.

1.3 Maintain a construction buffer of 200 feet or more from active colonies, depending on project activities, and use biological monitors to ensure no disturbance to Bank Swallows during the breeding season (April 1 - August 31).

1.4 Develop flow criteria that avoid impacts of high water flows, by limiting frequency and duration of peak flows over 14,000 cfs (Sacramento River), or rapid draw-downs to nesting Bank Swallows during the breeding season (April 1 - August 31); this includes considering downstream tributary flows when timing dam releases.

Goal 2: No impacts to river processes

Recommendations:

2.1 Use alternatives to bank stabilization that preserve dynamic river processes, such as setback and adjacent levees.

2.2 Maintain flow regimes during the non-breeding season (September 1 - March 31) that promote natural river processes and create Bank Swallow habitat.

Protect Existing Colonies, Suitable Habitat, and River Processes

Agencies, non-governmental organizations, and private landowners should protect existing colonies, suitable habitat, and river processes by acquiring property or easements. Priority should be given to properties with the highest value to Bank Swallows, with consideration to the risk of habitat loss. This document and CDFW, USFWS, and the BANS-TAC can provide information to assist with determining priority. We recommend the following to protect suitable Bank Swallow habitat, existing colonies, and river process:

Goal 3: Protect Existing Bank Swallow Colonies and Lands with Banks Suitable for Bank Swallow Nesting.

Recommendations:

3.1 Develop protection priorities and risk analysis for Bank Swallow colonies and lands with banks suitable for Bank Swallow nesting.

3.2 Acquire property or easements on private lands with Bank Swallow colonies and lands with banks suitable for Bank Swallow nesting.

3.3 Develop and promote incentives to private landowners to protect Bank Swallow colonies and lands with banks suitable for Bank Swallow nesting.

Goal 4: Protect Connected Floodplains and Dynamic Hydrologic and Geomorphic Processes on the Sacramento River and its Tributaries

Recommendations:

4.1 Develop protection priorities for connected floodplains and dynamic processes, as described in *Natural River Processes* (Pg. 4), along the Sacramento River and its tributaries.

4.2 Acquire property or easements on adjacent floodplain to allow dynamic river processes and restore floodplain vegetation, as outlined in Goal 8 through:

4.2.1 Completion of USFWS' Sacramento River National Wildlife Refuge (SRNWR), authorized to acquire up to 18,000 acres, including acquisition of 6,000 acres in the floodplain between Red Bluff and Colusa (USFWS, 2005).

4.2.2 Continued implementation of CDFW's Comprehensive Management Plan for the Sacramento River Wildlife Area (CDFG, 2004).

4.2.3 Continued acquisition of floodplain properties by non-governmental organizations, such as The Nature Conservancy and River Partners, to support agency goals.

Restore Habitat and Dynamic River Processes

Restoring natural floodplain land cover, particularly riparian grassland, next to the river channel would provide vital foraging habitat for local colonies (Moffatt et al., 2005). Bank Swallow colony persistence, from 1999 through 2008, was highest at sites with herbaceous vegetation or scrub, followed by riparian forest. Colony sites with agriculture (orchards, grain, and hay) above the bank persisted for a much shorter time (Garcia, 2009). Management of restored floodplain should promote open grass and wildflower vegetation, including protocols that stimulate new plant growth and reduce invasive plant species. Floodplain habitat restoration and management is currently underway on public lands, such as Sacramento River National Wildlife Refuge (USFWS, 2005), with positive results for many species (Golet et al., 2008).

Agencies, non-governmental organizations, and private landowners can increase available habitat through restoration of natural banks, meander potential, and dynamic river processes by removing revetment, constructing setback levees, and improving flow regimes. The restoration of river processes by removing rock revetment and levees has

resulted in successful colonization of formerly unavailable habitat by the Bank Swallow (Golet et al., 2003). Various entities, including the BANS-TAC, have developed a preliminary list of locations where bank stabilization can be removed to increase potential Bank Swallow nesting habitat without impacting public safety.

Water resource managers and regulators can work to develop criteria for flow regimes that more accurately mimic a natural river hydrograph to promote bank erosion, meander migration, and channel cutoff during the non-breeding season (September 1 – March 31) to increase availability of nesting habitat. We recommend the following to restore habitat and dynamic river processes:

Goal 5: Remove revetment to restore habitat and meander potential

Recommendations:

5.1 Remove 100,000 linear feet (19 miles) of rock revetment on the Sacramento River between Red Bluff and Chico Landing by 2050.
- 5.1.1 Remove 20,000 linear feet (4 miles) by 2025
- 5.1.2 Remove 50,000 linear feet (10 miles) by 2035
- 5.1.3 Remove 100,000 linear feet (19 miles) by 2050

5.2 Remove 50,000 linear feet (10 miles) of rock revetment between Chico Landing and Colusa by 2050.
- 5.2.1 Remove 10,000 linear feet (2 miles) by 2025
- 5.2.2 Remove 25,000 linear feet (5 miles) by 2035
- 5.2.3 Remove 50,000 linear feet (10 miles) by 2050

5.3 Remove 130,000 linear feet (25 miles) of rock revetment between Colusa and Verona by 2050. This recommendation will potentially require set back levees as outlined in Goal 6.
- 5.3.1 Remove 25,000 linear feet (5 miles) by 2025
- 5.3.2 Remove 65,000 linear feet (13 miles) by 2035
- 5.3.3 Remove 130,000 linear feet (25 miles) by 2050

5.4 Remove 10,000 linear feet (2 miles) of rock revetment from the Feather River by 2050.

5.5 Remove revetment where possible from other tributaries.

Goal 6: Construct setback levees to expand the meander belt by reconnecting floodplains to the river channel.

Recommendations:

6.1 Construct setback levees to restore 4500 acres of connected floodplain on the Sacramento River between Chico Landing and Colusa by 2050.

6.2 Construct setback levees to restore 7000 acres of connected floodplain on the Sacramento River between Colusa and Verona by 2050.

6.3 Construct setback levees to restore 500 acres of connected floodplain on the Feather River by 2050.

Goal 7: Manage flow regimes to improve floodplain connectivity and restore natural banks and river processes

Recommendations:

7.1 Consider Bank Swallows, their habitat, and natural river processes when developing flow criteria for ecosystem improvements and reoperation for water conveyance.

7.1.1 Evaluate potential effects of flow management on Bank Swallows using existing tools such as the Sacramento River Ecological Flows Tool (TNC et al., 2008)

7.1.2 Develop flow criteria that promote Bank Swallow habitat formation during the non-breeding season (September 1 - March 31) by providing annual flows that cause localized bank erosion and a minimum of one bankfull flood event every three years to promote bank erosion, meander migration, and channel cutoff.

Goal 8: Restore and manage floodplain vegetation to provide Bank Swallow nesting and foraging habitat.

Recommendations:

8.1 Continue to restore floodplain habitats on the Sacramento River through:

8.1.1 Implementation of the USFWS Sacramento River NWR riparian and floodplain habitat restoration program (USFWS, 2005).

8.1.2 Implementation of the CDFW Comprehensive Management Plan for the Sacramento River Wildlife Area (CDFG, 2004).

8.1.3 Implementation of the California State Parks Central Valley Vision Implementation Plan (CDPR, 2009).

8.1.4 Continued support of agency efforts through the Sacramento River Project partnership to restore additional acreage (Golet et al, 2003; The Nature Conservancy, 2013; River Partners, 2013).

8.2 Manage restored floodplain habitats to promote long-term viability when undertaking floodplain restoration along the Sacramento River (USFWS, 2005; 2013).

Mitigate Unavoidable Impacts to Dynamic River Processes and Bank Swallow Habitat

Where impact avoidance is not possible through the use of alternatives, mitigation measures must provide a net increase in habitat of comparable value. Examples of projects with unavoidable impacts may include protection for the public and critical infrastructure, and certain changes in flow regimes associated with water conveyance. When revetment is added to Bank Swallow habitat, the only acceptable mitigation is removal of revetment from potential Bank Swallow habitat. Acquisition or protection of lands through fee title or conservation easement should continue to be included as a tool for offsetting impacts to Bank Swallows when coupled with recovery of river processes and natural bank through revetment removal, but should not be considered mitigation in and of itself.

The following measures will only apply after the conservation actions above have been implemented to the greatest extent possible, and only to remaining impacts that are demonstrably unavoidable and have been rigorously minimized. We recommend the following for mitigation of impacts to Bank Swallow habitat and natural river process associated with any project:

Goal 9: Mitigate unavoidable impacts

Recommendations:

9.1 Consult with CDFW when planning projects to assess the impacts to potential and suitable Bank Swallow nesting habitat and river processes, and to develop appropriate mitigation.

9.2 Mitigate at a ratio of 3:1 for impacts to natural banks with current or suitable Bank Swallow nesting habitat by acquiring a conservation easement on banks currently suitable for nesting habitat at a ratio of 1:1 linear feet, **and** removing revetment from previously stabilized banks at a ratio of 2:1 linear feet. Additional revetment removal may be counted towards restoration goals (see Goal 5).

9.3 Mitigate at a ratio of 2:1 for impacts to natural banks that are not currently suitable Bank Swallow habitat by acquiring a conservation easement on banks currently suitable for nesting habitat at a ratio of 1:1 linear feet, **and** remove revetment from previously stabilized banks at a ratio of 1:1 linear feet. Additional revetment removal may count toward restoration goals (see Goal 5).

9.4 Consult with CDFW before making dam releases that could impact Bank Swallows during breeding season (April 1 - August 31) **and** acquire a conservation easement of 1:1 linear feet of eroding bank whenever flows cause loss of occupied nests, eggs, or chicks due to bank collapse or inundate colonies on the Sacramento River during breeding season.

RESEARCH NEEDS FOR ADVANCING BANK SWALLOW (*RIPARIA RIPARIA*) CONSERVATION ON THE SACRAMENTO AND FEATHER RIVERS

To help identify and prioritize research that will generate information that supports Bank Swallow conservation on the Sacramento and Feather Rivers, the Bank Swallow Technical Advisory Committee has generated a list of suggested studies. This is not an exhaustive list of all possible studies, but rather a list of projects that would directly contribute to informing and improving conservation actions.

- *Continue and expand the annual CDFW/USFWS surveys of colonies along the Sacramento River and its tributaries.* The ongoing Bank Swallow surveys provide critical data for understanding the status of the population and the effectiveness of conservation actions. By increasing the frequency of surveys in the Redding to Red Bluff (RM 292–243), Colusa to Verona (RM 143–81) reaches, and the Feather River researchers could help eliminate the small but potentially significant data gap. Surveys of these areas would ideally be conducted annually, but if resources are limited, surveys in alternate years may suffice.

- *Investigate the relationship between the magnitude, timing, duration, and frequency of high flow events and potential impacts to Bank Swallow colonies and habitat.* There are documented observations of partial or complete loss of colonies caused by localized bank sloughing and erosion associated with high flow events during breeding season on the Sacramento River. However, much uncertainty exists regarding potential water management actions that might reduce the risk of such impacts. Research should be conducted to improve our ability to predict the locations that are most at risk of bank failure and colony loss, and the flow conditions most likely to cause such impacts.

- *Correlate soil mapping with expected bank erosion to prioritize locations for potential Bank Swallow colonies.* A quantitative and spatially explicit analysis that combines expected patterns of river channel migration and soil types is needed. This information will help guide the acquisition of floodplain parcels and easements. It will also help identify areas where benefits to Bank Swallows may be maximized when riprap is removed or allowed to degrade.

- *Quantify the need for surplus nesting banks.* An analysis of the percent of suitable nesting bank that needs to remain unoccupied to best support the metapopulation dynamics of the species could help inform decisions about banks protection and rip rap removal. A comparison could be made between the

Feather and Sacramento Rivers to evaluate if this unoccupied percentage is similar between the two systems.

- *Study reproductive biology at existing colonies.* Additional studies of reproductive biology are needed to develop a better understanding of the relationship between burrow counts and demographic parameters, such as burrow occupancy, number of nesting attempts, and number of young fledged per pair. Any information on how reproductive biology varies among colonies that differ in number of burrows, bank erosion rates, above-colony habitat types, proximity to different types of foraging habitat, or general geographic location would be valuable. This information could be used to revise parameter estimates in population viability analyses and to link the burrow index to actual population size.

- *Develop and use other metrics to quantify the health of Bank Swallow of the Sacramento and Feather River Bank Swallow populations.* A number of tools, beyond the burrow counts that have been used to date, could provide valuable information about the status and health of the Bank Swallow population. These include population genetic analysis to generate information about population dynamics and toxicological analyses of adults and young to evaluate the risk associated with exposure to pesticides and other contaminants.

- *Investigate potential for bank restoration via removal of mining deposits (slickens) along the Feather River channel.* Approximately 160,000 linear feet of mining debris was deposited along the banks of the Feather River in the late 1800's. These deposits are composed of fine sediments, sand, and gravel which have hardened over time and are unusable by Bank Swallows. Often these deposits are on top of alluvial soils. Research should be conducted to determine if removal of these deposits is feasible, and whether the restored bank would provide suitable nesting habitat for Bank Swallows.

We encourage researchers interested in studying Bank Swallows to contact the Bank Swallow Technical Advisory Committee to ensure that projects can be developed in a manner that will support conservation in California.

ABBREVIATIONS

BANS-TAC - Bank Swallow Technical Advisory Committee

BIOS - Biogeographic Information and Observation System

CDFW - California Department of Fish and Wildlife. Formerly the California Department of Fish and Game (CDFG)

CESA - California Endangered Species Act

CEQA - California Environmental Quality Act

CFS - cubic feet per second

CNDDB - California Natural Diversity Database

CVFPB - Central Valley Flood Protection Board

CVFPP - Central Valley Flood Protection Program

DWR - California Department of Water Resources

ESA - Endangered Species Act

FWCA - Fish and Wildlife Coordination Act

MBTA - Migratory Bird Treaty Act

PRBO Conservation Science – Currently Point Blue Conservation Science, formerly Point Reyes Bird Observatory, or PRBO

SERP - Small Erosion Repairs Program

SRBPP - Sacramento River Bank Protection Program, also known as Sac Bank

SRCAF - Sacramento River Conservation Area Forum

SRNWR - Sacramento River National Wildlife Refuge

TNC - The Nature Conservancy

USACE - United States Army Corps of Engineers

USFWS - United States Fish and Wildlife Service

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Attachment 2. Ecological Flows Tool

EFT

Ecological Flows Tool

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ıe Ecological Flows Tool (EFT) is a decision support system that demonstrates how changes in flow manageme
ıd other actions) result in changes to the physical habitats for multiple species within the Sacramento River a
: Delta. EFT works by integrating a range of representative functional ecological response indicators with k
ysical variables obtained from widely used hydrologic models. EFT transparently relates multiple attributes of t
w regime to multiple species' life-history needs, contributing to an effective understanding of flow and non-fl
toration actions on focal species and their habitats. The hallmark of the EFT approach is integration and cle
mmunication of multiple ecological tradeoffs associated with different water operation alternatives.

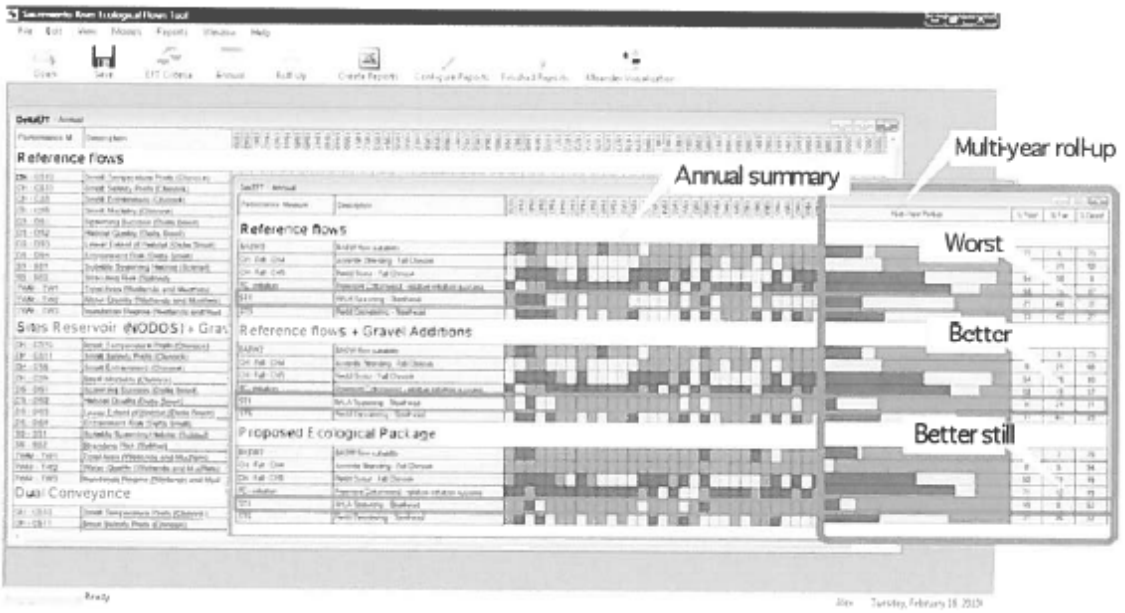

FIGURE 1 » Example of annual and multi-year roll-up traffic light indicator ratings.

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ESSA

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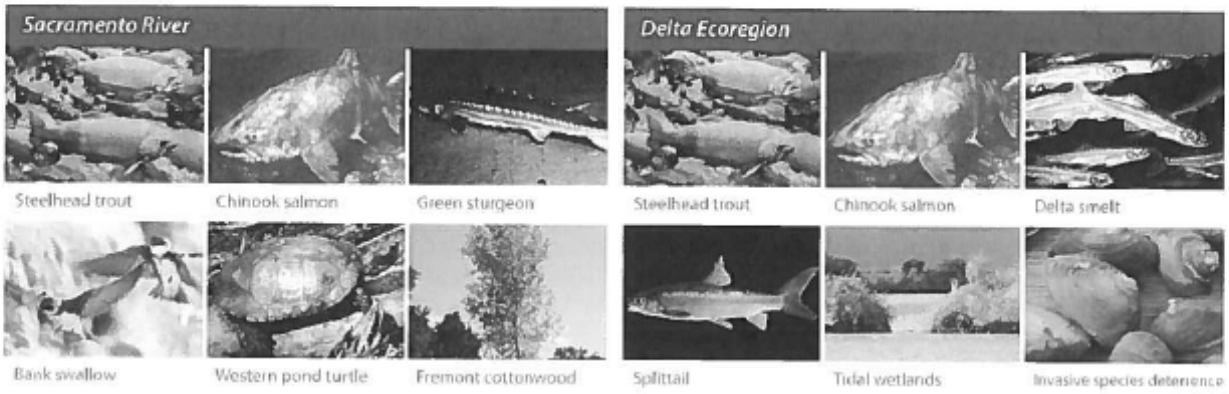
Multiple Focal Species & Indicators

In all, EFT includes conceptual models for eleven (11) species and twenty four (24) causally reasoned performance indicators (Figure 2). EFT performance indicators are based on a mixture of process-based ecological functions and empirical relationships between flow, habitats, and focal species response. EFT's representative ecological indicators capture the essence of existing conceptual models and are driven by widely used physical models for flow, stage, salinity, and water temperature. Intuitive output interfaces allow cross-walking of ecological consequences over policy alternatives.

FOCAL SPECIES & HABITATS



Sacramento River

Focal Species & Habitats		Performance Measures
Fremont cottonwood (FC)	FC1	Successful Fremont cottonwood initiation
	FC2	Cottonwood seedling scour
Bank swallow (BASW)	BASW1	Habitat potential/suitability
	BASW2	Risk of nest inundation and bank sloughing during nesting
Western pond turtle	LWD1	Index of old vegetation recruited to the Sacramento River mainstem
Green sturgeon (GS)	GS1	Egg-to-larvae survival
Chinook salmon, Steelhead trout (CS)	CS1	Area of suitable spawning habitat (ft^2)
	CS3	Egg-to-fry survival (proportion)
	CS5	Redd scour risk
	CS6	Redd dewatering (proportion)
	CS2	Area of suitable rearing habitat (ft^2)
	CS4	Juvenile stranding (index)

Delta Ecoregion

Focal Species & Habitats		Performance Measures
Chinook salmon, Steelhead trout (CS)	CS7	Smolt weight gain in alt. migration corridors
	CS9	Smolt mortality index as a function of passage time (negatively correlated with CS7)
	CS10	Smolt temperature preference index (departures from optimum v. weight gain)
Delta smelt (DS)	DS1	Spawning success index
	DS2	Index of habitat suitability
	DS4	Entrainment risk (index)
Splittail (SS)	SS1	Proportion of maximum potential spawning habitat (index)
Fresh/brackish tidal wetlands (TW)	TW1	Brackish wetland area
	TW2	Freshwater wetland area
Invasive species deterrence (ID)	ID1	Brazilian waterweed suppression
	ID2	*(Corbula)* Invasive clam larvae and recruit suppression
	ID3	*(Corbicula)* Invasive clam larvae and recruit suppression

FIGURE 2 » Species and their performance measures in EFT.

EFT is structured as an "ecological plug-in" to existing models that are commonly used for water planning in the Central Valley (Figure 3). Rather than reinventing models, EFT utilizes output data sets from daily disaggregations of CALSIM, DSM2, and other models that are used to investigate water delivery and other standards set for the CVP and SWP water system. EFT utilizes these data and adds ecological calculations to evaluate effects on multiple ecosystem targets.

Extensive scientific understanding of the Sacramento River and Delta ecosystem's likely response to changes in flow management has been developed over the past twenty years. Prior to EFT, much of this important information existed in a multitude of separate reports, independent conceptual models, and unconnected modeling tools. EFT has synthesized much of this disparate information, linking ecological submodels to existing physical planning models, providing a major advance in the region's capabilities for assessing ecological tradeoffs. The EFT framework also makes it easy to "swap in" (or remove) indicators as the state of scientific knowledge evolves.

The functional relationships and indicators that are encapsulated into the decision support tool represent the collective thoughts of more than seventy scientists from state and federal agencies, consulting firms, and research institutions who have participated in our workshops or who wrote primary papers on which the relationships are based.

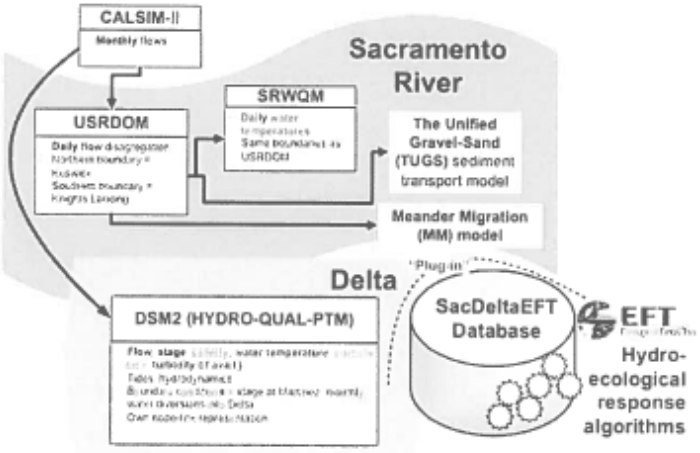


FIGURE 3 » EFT hydrologic foundation. Note: Physical models used in DeltaEFT are not necessarily limited to those shown here. Where it is feasible and practical to obtain outputs at a daily resolution for multi-decadal simulations, other models can be "swapped in" if they are deemed a better representation of the physical variables of interest.

In addition to integrating disparate sources of information, a challenge overcome by EFT's design is translating information into easily understandable results for managers. Practical synthesis and integration is challenging when considering multiple ecological targets, complex physical models, and multiple audiences (e.g., high-level managers as well as technical-level staff). EFT creates output that can span the range from high overview to daily and location-specific detail. The output interface makes extensive use of a "traffic light" paradigm that juxtaposes performance measure results and scenarios to provide an intuitive overview of whether a given year's performance measures are healthy (green), of some concern (yellow), or of serious concern poor (red).

EFT's output interface and reports for trade-off analyses make it clear how actions

FIGURE 4 » Example of map-based output information for DS4: Index of risk of entrainment.

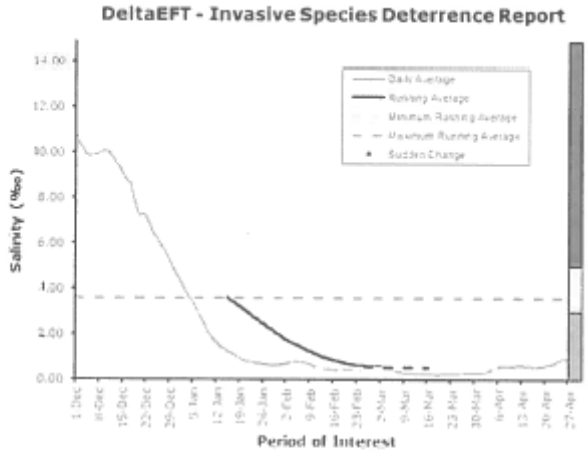


FIGURE 5 » Example of Excel output graph information for ID2: Brackish water invasive overbite clam suppression.

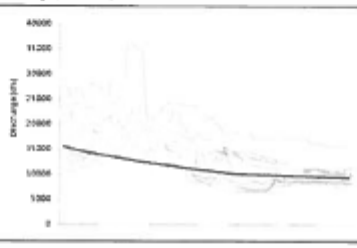
Ecoregion												
Species												
Indicator	FC1			Cottonwood relative initiation success								
Objective	Periodically provide recession flows that support areas for riparian initiation											
Timing	O	N	D	J	F	M	A	M	J	J	A	S
Location	Hamilton City (RM199)											
Variable & Condition												
Recurrence	At least once every 8 years											

FIGURE 6 » Example of functi for one EFT indicator.

implemented for the benefit of one area or focal species may affect (both positively and negatively) another area or focal species. For example, we can show how altering Sacramento River flows to meet export pumping schedules in the Delta affects focal species' performance measures both in the Sacramento River and the Delta.

One of the biggest challenges in the practical development of ecological flow regime guidelines is the wide range of objectives, focal species, and habitat types that need to be considered. EFT has brought into focus how these various objectives cannot all be simultaneously met. In nature, conditions often benefit one target or species to the potential detriment of another in any given year. Fortunately, flow characteristics that benefit the various ecological targets investigated are usually required on a periodic basis and not every single year. EFT studies simplify communication of these trade-offs and catalyze definition of state-dependent management practices that promote the development of needed flexibility in the water management system.

EFT focal species submodels are integrated and centered on a single SQL server relational database. The software's graphical user interface, model controller & analysis engine, and Excel & map visualization output reporting connect to and interact with this central database over the web. Users may perform Sacramento River (SacEFT) or Delta (DeltaEFT) effects analyses separately or in conjunction with one another. Users can choose which management scenarios to evaluate, what range of years to display, and which ecological indicators they wish to evaluate.

What Does EFT Contribute to Water Resource Management?

EFT contributes to a more comprehensive understanding of how proposed changes to water operations infrastructure and management (and future climate conditions) affect target species and habitats. EFT does not solve social value decisions about whether a particular action or alternative is "good" or "bad." Rather EFT is designed to provide information about the positive, neutral, and/or negative effects of a particular alternative, across a suite of representative focal species and their habitats. As noted above, EFT's intuitive outputs make it clear how actions implemented for the benefit of one area or focal species may influence (both positively and negatively) another area or focal species.

EFT is also useful for developing functional flow guidelines. Because of the multi-species approach, EFT helps communicate how to prioritize and trade off amongst ecological objectives and adjust these priorities based on emerging conditions (e.g., water year types) and the ability to realize different objectives over time.

Software

EFT Reader software is publicly available and free to download at http://essa.com/tools/eft/download. The EFT Reader links with a centralized copy of the EFT database located on a remote server. The public EFT Reader database currently contains a suite of fully configured scenarios, derived from the Sacramento River Ecological Flows Study and from test scenarios supplied by DWR and project partners. Future versions of the EFT Reader database will include results for simulations based on other effects analysis investigations, as they move into the public domain.

EFT was developed between 2004 and 2012 with funding from the Department of Fish and Wildlife's Ecosystem Restoration Program, The David and Lucile Packard Foundation, The Nature Conservancy, and ESSA Technologies.

Additional Information

- http://essa.com/tools/eft
- http://www.dfg.ca.gov/ERP/signature_sacriverecoflows.asp

D-SCSHA Duplicate of O-SCSHA

DUNCAN, KATHLEEN <kduncan@usbr.gov>

Fwd: Public Comment Submission to SLWRI Draft EIS

1 message

KATRINA CHOW <kchow@usbr.gov> Wed, Oct 23, 2013 at 1:06 PM
To: KATHLEEN DUNCAN <kduncan@usbr.gov>

Sent from my iPhone

Begin forwarded message:

From: Desiree La Maggiore <desiree.lamaggiore@gmail.com>
Date: September 30, 2013, 3:01:21 PM PDT
To: <bor-mpr-slwri@usbr.gov>
Cc: <kchow@usbr.gov>, "Rezeau, Nathan L -FS" <nrezeau@fs.fed.us>
Subject: Public Comment Submission to SLWRI Draft EIS

We are USFS special use permit holders with a cabin in the Salt Creek Recreation Residence tract that may be impacted by the plans put forth in the SLWRI Draft EIS (per tables 18-6 and 18-8 covering impacts on recreation of comprehensive plans (CPs) 3-5). We are participating in the public comment process for the following reasons:

Primarily,

- To establish our eligibility to comment/object to the Forest Service's draft decisions relating to this project. It is our understanding that the Forest Service will provide draft decisions later in the SLWRI process and we wish to participate in the public processes associated with these actions.
- Because there is a lack clarity on how we, USFS special use permit holders and cabin owners, can determine or will be notified as to the specific impacts of this project on our personal property (the recreational residence structure itself).
    - Our tract association has been proactive in seeking out

information about the SLWRI work for the past decade and how it may impact us, however, it was not until late June that our tract received a mailing with a copy of the SWRI Draft EIS. We reviewed the Preliminary Draft EIS in February 2012 and attended community meetings - at that time there was no indication our recreational residence tract would be impacted in any of the materials distributed.

- We attended the SLWRI Public Workshop held on July 16, in Redding, CA. At that meeting, when queried on the issue of how we, cabin owners, would receive specific information on if and how our cabin would be impacted, we were referred to the Real Estate breakout session. Ms. Mary Paasch led the session and had no clear answer on how we'd get a more definitive answer. She recommended we make the request through this public comment process. I also followed up with Mr. Nathan Rezeau, deputy district ranger, Shasta-Trinity National Forest, who concurred with Ms. Paasch's recommendation. Per this comment, we are requesting specific impacts to our cabin be made available and if a ground-based survey is required to do that, that it be offered in accordance with the SLWRI Draft EIS Real Estate Appendix.

Secondarily,

- It is unclear how comprehensive the cost estimates tied to this project are, for example, when reviewing the plan, it seems like the full expense impact to the USFS has not been captured, e.g. cabin relocation or buyout (they've been estimated and identified in the Draft EIS, but it's not clear if they've been included in the project funding outlined in the SLWRI Feasibility Report. Where can the public obtain a summary of what is and what is not included in the funding proposed for this project?
- It is not clear enough effort is being made to protect surrounding communities, such as Lakehead,that will be significantly impacted by this proposal. There are indications of re-routing, replacing, removing parts of these communities, but there appears to be no thought as to how to holistically support/sustain these communities through the implementation of this project. In light of the forecasted increasing demand for recreation outlined in the SLWRI Draft EIS, it would seem more attention should be given to how to assist the communities that support recreation on the lake.

- When reviewing this plan and attending the 7/16 Public Workshop meeting, it became increasingly unclear how the proposal for raising Shasta Dam plays into a larger water conservation strategy for California, including the proposed Sites and Temperance Flat Reservoirs or the Bay-Delta plan. What is the scale of the problem being addressed and, how these large projects combined with other types of water conservation measures will help resolve the water shortage (not water storage shortage) issue.

By participating in the Public Comment Period for the SLWRI Draft EIS, we are, respectfully, reserving our right to participate in any future Bureau of Reclamation's, USFS's, or other governmental entities' draft plans and/or public processes related to this and any future SLWRI proposals for raising Shasta Dam.

Sincerely,
Vince Maggiore and Desiree LaGrone - La Maggiore
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desiree.lamaggiore@gmail.com