

**Long-term Central Valley  
Project and State Water Project  
Operations Criteria and Plan Biological  
Assessment for Terrestrial Species  
Protected Under the State Endangered  
Species Act**

**Prepared by**

**Department of Water Resources for**

**U.S. Bureau of Reclamation**

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## **Acronyms and Abbreviations**

BA	Biological Assessment
Reclamation	U. S. Bureau of Reclamation
DFG	California Department of Fish and Game
CESA	California Endangered Species Act
CVP	Central Valley Project
CVP-OCAP	Long-term Central Valley Project Operations Criteria and Plan
Delta	Sacramento-San Joaquin Delta
DWR	California Department of Water Resources
FESA	Federal Endangered Species Act
USF&WS	U. S. Fish and Wildlife Service
SWP	State Water Project
EWA	Environmental Water Account
SDIP	South Delta Improvement Program

# Introduction

The Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) operate the Central Valley Project (CVP) and State Water Project (SWP) to divert, store, and convey CVP and SWP water consistent with applicable law. The CVP and the SWP are two major inter-basin water storage and delivery systems that divert water from the southern portion of the Sacramento-San Joaquin Delta (Delta). Both projects include major reservoirs north of the Delta and transport water via natural watercourses and canal systems to areas south and west of the Delta. The CVP also includes facilities and operations on the Stanislaus and San Joaquin Rivers.

Reclamation has prepared a Biological Assessment (Long-term Central Valley Project Operations Criteria and Plan [CVP-OCAP] Biological Assessment) addressing the effects of operating the CVP and SWP in accord with the CVP-OCAP on listed fish species including:

- Winter-run Chinook salmon
- Spring-run Chinook salmon
- Central Valley steelhead
- Delta smelt
- Coho Salmon

Reclamation has also prepared a Biological Assessment (Long-term Central Valley Project Operations Criteria and Plan [CVP-OCAP] Biological Assessment) addressing the effects of operating the CVP and SWP on wildlife and plant species that are listed or proposed for listing under the federal Endangered Species Act (FESA). These species include:

- bald eagle
- California clapper rail
- salt marsh harvest mouse
- riparian brush rabbit
- riparian woodrat
- California red-legged frog
- giant garter snake
- valley elderberry longhorn beetle
- Suisun thistle
- soft bird's-beak

DWR has prepared this Biological Assessment (Long-term Central Valley Project Operations Criteria and Plan [CVP-OCAP] Biological Assessment) addressing the effects of operating the SWP on wildlife species that are listed or proposed

for listing under the State Endangered Species Act (CESA) and not already addressed by Reclamation's assessment. These species include:

- Bank swallow
- Swainson's hawk
- Western yellow-billed cuckoo

### **Description of the Action Considered**

DWR's proposed action is to operate the SWP in the future, as described in the CVP-OCAP. The CVP-OCAP provides a comprehensive description of the proposed action. A summary of the proposed action is provided in Chapter 1 of the *Long-term CVP-OCAP Biological Assessment* that addresses effects to listed fish species.

### **Other Actions Not Included in the Proposed Action**

The proposed action is limited to DWR's operation of SWP facilities for the purpose of diverting, storing, and conveying project water. The proposed action does not include diversion of water through non-SWP facilities or use of diverted water. Furthermore, the proposed action does not include maintenance activities associated with Oroville facilities. Impacts associated with maintenance activities are being addressed in a separate consultation process.

### **Action Area**

The action area covered under this BA consists of the Oroville Reservoir complex, the Feather River downstream of Oroville, the Sacramento River downstream of the Feather River, the Sacramento-San Joaquin Delta, and adjacent habitats that are dependent on or influenced by the hydrologic or water quality conditions of these waterways.

### **Threatened and Endangered Species Considered**

Per DFG recommendation, this BA will focus on evaluation of current and future SWP operational impacts to three State listed species including bank swallow, Swainson's hawk, and western yellow-billed cuckoo.

The purpose and need of Reclamation's and DWR's actions is to implement CVP-OCAP, which consists of operating CVP and SWP facilities primarily to:

- Deliver water to diversion points
- Provide flood control
- Release water to meet instream flow and water quality requirements.

The proposed action does not include the actual diversion of water (i.e., direct effects of diversion) or use of diverted water. Potential effects of the proposed action, therefore, consist of:

- Changes in flows in waterways downstream of the Oroville Reservoir complex
- Changes in water surface elevations in the Oroville reservoirs
- Changes in water quality of downstream waterways

Because the potential effects of the proposed action are limited to hydrologic and water quality changes, species potentially affected by the action are limited to species that are aquatic or require the resources supported by the affected waterways. All three species recommended by DFG for impact assessment can potentially be affected by hydrologic conditions of these waterways.

### **Study Period**

This BA evaluates the future effects of operation of the SWP in accordance with CVP-OCAP. The study period encompasses the current (circa 2001) level of development through a projected future level of development expected in approximately 2020.

### **Consultations to Date**

DWR has recently initiated consultation with DFG concerning potential current and future impacts to nesting bank swallows related to SWP operations. This potential impact is based on modeling results developed for and presented in this assessment. To date, take of bank swallow due to SWP operations has not been documented.

## **Species Accounts**

### **Bank Swallow**

The State of California listed the bank swallow as a threatened species during March 1989. This species is not listed under the Federal Endangered Species Act. However, bank swallows are protected under the Federal Migratory Bird Treaty Act.

Historically, bank swallows nested in suitable habitat throughout lowland California (Grinnell and Miller 1944). The bank swallow's range in California has decreased significantly with only four known populations south of San Francisco Bay and about 70 percent of the statewide population currently occurs along the Sacramento and Feather rivers (California Department of Fish and Game 1992).

Bank swallows are a migratory species and begin to arrive back in the Sacramento Valley in late March and early April, with the bulk of the birds arriving in late April and early May (Garrison 2001). Juveniles begin to disperse from the nest colonies around mid-June and early July and are absent from the nest colonies by mid-July (Garrison 2001).

Bank swallows occur in riverine habitat and require a sandy or silty vertical bluff or riverbank for nesting (Zeiner and others 1990). Bank erosion is required to create and maintain the eroded banks favored by this migratory, colonial species. The principal threat to bank swallows is bank protection projects (Remsen 1978). Over 133 miles of rip-rap bank protection have been installed along the Sacramento River since 1960 (Jones and Stokes Associates 1987).

### **Swainson's Hawk**

The Swainson's hawk was listed as a threatened species by the State in 1983. This species is not listed under the Federal Endangered Species Act. However, Swainson's hawks are protected under the Federal Migratory Bird Treaty Act.

Current distribution is limited to northeast California (primarily Modoc, Siskiyou and Lassen counties) and the Central Valley. Swainson's hawks arrive in California from wintering areas in South America, Central America, and Mexico between mid-March and early April (Estep 1989). Nesting is initiated by mid-April with most chicks fledged by mid-July. This species begins its southern migration during August and are generally absent from California by mid-September.

Swainson's hawks currently use a variety of agricultural crops for foraging including alfalfa, fallow fields, beet, tomato, irrigated pasture, rice (non-flooded), and cereal grains. Diet consists primarily of small mammals although birds and insects are also frequently consumed. Nesting habitat includes isolated trees, small groupings of trees, and linear groupings of trees associated with roadsides or narrow riparian zones near foraging areas.

### **Western Yellow-billed Cuckoo**

The western yellow-billed cuckoo was listed as a State threatened species in 1971 and reclassified to endangered in 1987. This species is not currently listed under the Federal Endangered Species Act. However, this species is protected under the Federal Migratory Bird Treaty Act.

Cuckoos are a neotropical migratory species wintering in South and Central America. This species arrives in California in late May and June. Nesting generally occurs in late-June or July with most cuckoos initiating fall migration out of the State by mid-September.

Cuckoos are a riparian obligate-forest interior species. Suitable cuckoo nesting habitat is described as deciduous riparian thickets or forests with dense low understory near slow moving waterways (Zeiner et al 1990). Preferred habitat is a mosaic of riparian habitats including willows, cottonwoods, and open water. Nesting cuckoos appear to require a block of suitable habitat at least 20 acres in size and 100 to 200 yards in width while habitat blocks of 80 acres in size and 600 yards in width are considered optimal (Laymon and Halterman 1988).

Foraging cuckoos appear to selectively prey on larger sized prey within riparian habitats including green caterpillars, katydids, tree frogs, and grasshoppers (Laymon 1998).

## Environmental Baseline and Status of the Species in the Action Area

2002 and 2003 survey results indicate that bank swallows, Swainson's hawks, and western yellow-billed cuckoos are absent from Oroville facility reservoirs.. This assessment focuses on evaluation of proposed OCAP changes in the magnitude, timing, and duration of project water releases to the Feather River.

### Bank Swallow

**Current Population**-2002 survey results indicate that eight active bank swallow colonies were present on the Feather River between Oroville Dam and Verona totaling 2,274 burrows (Table 1). An additional six inactive colonies were also identified within the same survey area totaling 813 burrows.

**Table 1 Bank swallow occurrence on the Feather River below Oroville Dam during 2002 and 2003.**

Category	2002	2003
# of colonies	14	18
# of active colonies	8	15
Total # of burrows	3,087	4,179
Total # of active burrows	2,274	3,594

The 2003 survey results documented the presence of 15 bank swallow colonies on the Feather River between Oroville Dam and Verona totaling 3,594 burrows (Figures 1 and 2). Three inactive colonies were identified totaling 585 burrows.

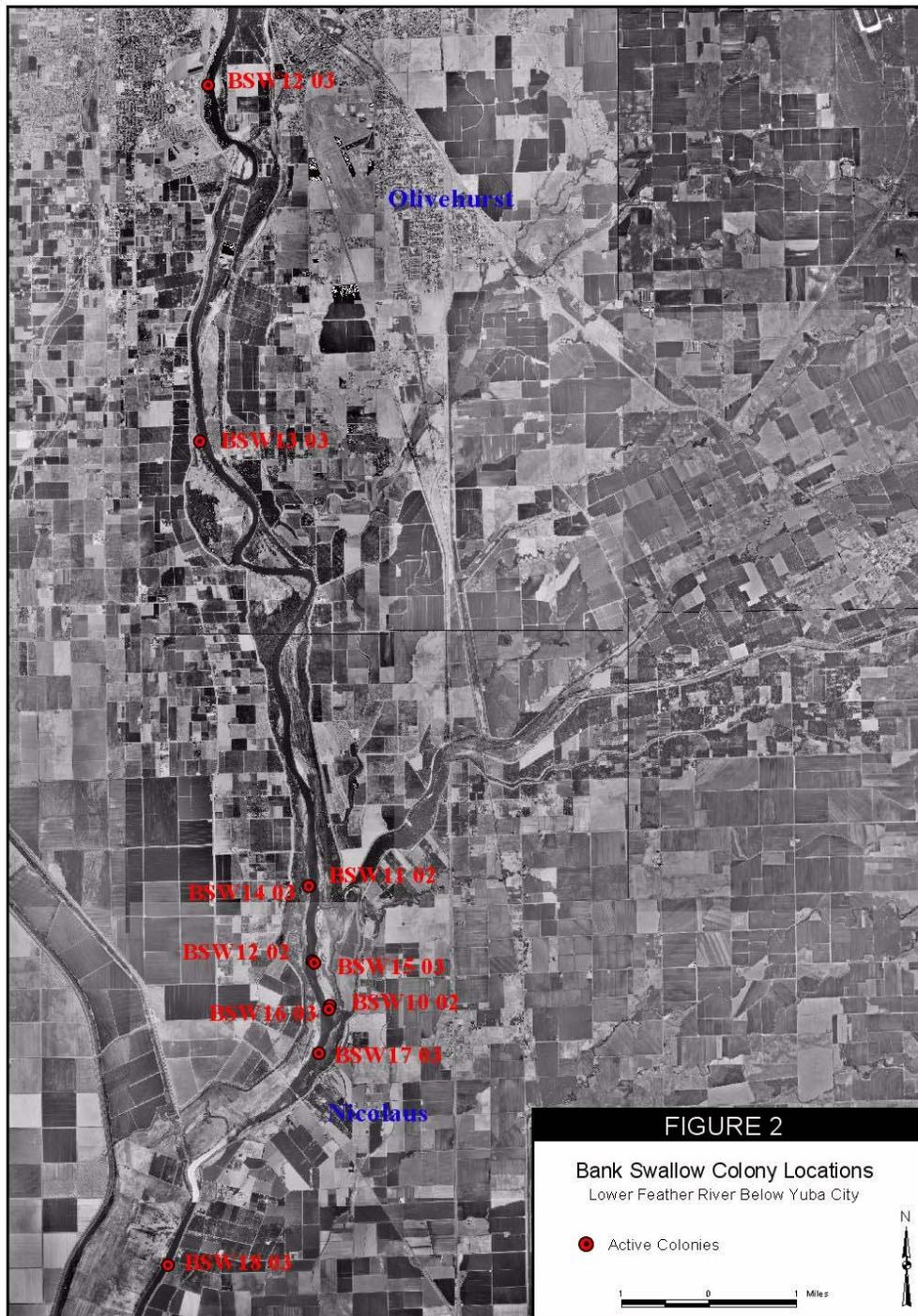
In 2003, inactive colony size ranged from 43 to 375 burrows. Active colony size ranged from 18 burrows to 1,164 burrows. An occupancy rate of 47 percent was applied to the number of burrows in active colonies yielding an adult population estimate of 1,056 pairs in 2002 and 1,689 pairs in 2003.

During 2002, five colonies were identified between Oroville Dam and Yuba City with an estimated population of 890 pairs. An additional 3 colonies were present between Yuba City and Verona with an estimated adult population of 166 pairs. In 2003, 9 colonies were present between Oroville Dam and Yuba City with an estimated adult population of 1,411 pairs. Six additional colonies were present downstream from Yuba City with an estimated adult population of 278 pairs.

Comparison with historic nest survey information indicate that the 2002 and 2003 bank swallow nesting populations on the Feather River is substantially lower than those collected in 1987 which identified seven colonies ranging in size from 140 to 2,000 burrows (Humphrey and Garrison 1987). During the 1988 survey, 18 colonies containing a total of 6,592 burrows were recorded (Laymon and

others 1988). The 1987 and 1988 DFG surveys are the most recent previous complete surveys of the entire Feather River.





### Swainson's Hawk

Swainson's hawks were historically common throughout most of lowland California (Grinnell and Miller 1944). By 1979, it was estimated that this migratory species had experienced a 91 percent population decline in California (Bloom 1980). The Statewide population was estimated at 550 pairs in 1989 with approximately 80 percent of the population occurring in the Central Valley (Estep

1989). This species decline is believed to be related to agricultural and urban land conversions which have virtually eliminated native grassland foraging habitat (Estep 1989).

In addition to habitat losses associated with conversion of native grasslands to agriculture, recent trends in agricultural land use have further diminished potential foraging habitat. These changes include conversion of croplands suitable for Swainson's hawk foraging to unsuitable crops including vineyards, orchards, cotton, and rice.

Historical survey data indicate that Swainson's hawks nest within strips of riparian habitat in the Feather River floodplain between Marysville and Verona (DFG 2003). Two recently discovered nests were present between the Thermalito Afterbay outfall and Sunset Pumps during 2003. Complete nesting surveys of the Feather River floodplain have not occurred. However, potentially suitable nesting habitat is present along a substantial portion of the approximately 55 mile reach of the Feather River downstream from the Oroville Wildlife Area. In most areas, a thin strip of potential nest trees are present on levees adjacent to agricultural fields.

### **Western Yellow-billed Cuckoo**

Historic records indicate that this species was common in the Central Valley (Belding 1890). However by the 1940's the species is described as rare (Grinnell and Miller 1944). Today its distribution is limited to several small isolated areas of the State. The two largest remaining populations in the State are near the Kern and Sacramento rivers. The 1977 statewide population was estimated at between 122 and 163 pairs (Gaines and Laymon 1984). A subsequent statewide survey in 1988 estimated that only 31 to 33 pairs remained (Laymon and Halterman 1988). Loss and fragmentation of riparian habitat accounts for most of the population decline (Laymon 1980).

The 1988 statewide survey identified 900 acres of potentially suitable cuckoo nesting habitat along the Feather River. One pair of cuckoos was identified within this potentially suitable habitat.

Both direct and indirect effects of pesticide use have been identified as a potential factor in this species population decline (Laymon 1998). Another potential threat to the species is the establishment and spread of exotic/invasive plant species into riparian habitats including salt cedar, giant reed, and domestic fig.

## **Effects of Proposed Action**

### **Bank Swallow**

The SWP has the potential to impact bank swallow populations on the Feather River below Oroville Dam through flood control and water supply operations.

**Flood Control**- Bank swallows are dependent upon vertical eroded banks of a proper friable soil composition. High flows and associated bank erosion can result in both positive and negative impacts on this species. Flooding causes bank erosion and soil deposition. Erosion produces the vertical banks, while soil deposition is the source of the friable soils needed for burrow construction. Lack of high flows results in decreased slope of eroded banks and subsequent abandonment by nesting bank swallows. However, bank erosion and flooding can also result in the need for flood control, bank protection, and channelization which reduce the quantity and quality of bank swallow habitat.

Bank erosion does occur at certain locations on the Feather River at flows as low as 10,000 cfs. However, major flows in the 20,000 to 30,000 cfs range are generally required to create and maintain significant amounts of bank swallow nesting habitat. These channel forming events can create extensive amounts of high quality bank swallow habitat for a period of time. Data analyses indicate that flows > 20,000 cfs have occurred post-project on the average at a 2.3 year return intervals (Gridley Gage data). Further, data analyses indicate that flows greater than 20,000 cfs occurred pre-project on the average of 0.09 year return interval (Oroville gage data). Project related flood control activities have substantially altered the reoccurrence interval of flows in the 20,000 cfs range. Further, the reoccurrence interval of major flood flows (>than 50,000 cfs) have also been substantially reduced from a 1.9 year return interval pre-project (Oroville gage data) to a 3.1 year return interval post-project (Gridley gage data). Streamflow is not the only factor controlling bank erosion rates. Bank saturation, length of the period of high flow, bank vegetative cover, channel geometry, soil composition, geologic structure, and bank protection measures can also influence erosion rates. Bank protection measures are currently in place along 11.2 percent of the Feather River channel below the Thermalito Outlet (DWR unpublished data). In general, these bank protection measures prevent bank erosion at flows up to bank full events. Both bank protection measures and project related flood control activities serve to limit/restrict the quantity and quality of bank swallow habitat created and maintained. Further, U.S. Army Corps of Engineers mandated flood releases have occasionally occurred during the bank swallow nesting season resulting in increased river stage and possible inundation of nests and eggs.

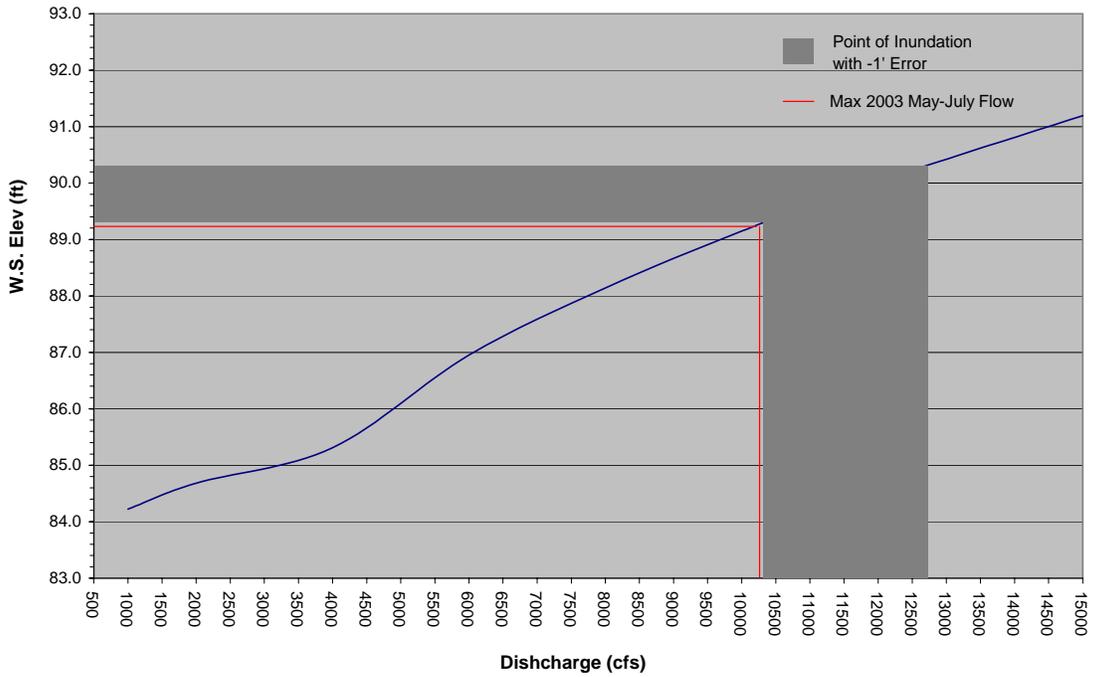
**Water Supply Operations**- The SWP also has the potential to impact bank swallow production through water supply operations. Bank swallows are a migratory species and begin to arrive back in the Sacramento Valley in late March and early April, with the bulk of the birds arriving in late April and early May (Garrison 2001). Juveniles begin to disperse from the nest colonies around mid-June and early July and are absent from the nest colonies by mid-July (Garrison 2001). Excluding uncommon spring emergency flood releases, project operations historically have resulted in relatively low flows (<2500 cfs releases) during April, May and June. However, water supply deliveries frequently result in

much higher releases during July (>9,000 cfs). Historic data indicate that July pre-project flows of 9,000 cfs did not occur. However, pre-project flows in this range occurred about 14 percent of the time during June. The operational pattern of relatively low Feather River flows throughout the majority of the nesting season with greatly increased flows at the end of the nesting season could result in losses of prefledged nestlings.

To evaluate the potential for project-related inundation of pre-fledged nestlings, stage discharge relationships were modeled for each of the 2003 active colony locations. These stage/discharge relationships were compared to the elevation of the lowest burrow in each colony with a 1-foot buffer (Figures 3 through 17). This modeling indicates that current (2003) project operations during early July have the potential to inundate at least a portion of nine of the fifteen active colonies while pre-fledged young are potentially present within the nest burrows. This modeling does not take into account potential losses related to flow induced bank collapse or saturation which could also potentially induce losses of adults and pre-fledged young.

Projected flow increases in July under the OCAP 2020 SDIP scenario of 400 to 800 cfs (depending on water year type) could result in increased potential for take of bank swallows over and above current losses as they would result in a higher percentage of the burrows being flooded prior to fledging. Projected flow increases in July under the OCAP future Environmental Water Account (EWA) scenario would further exacerbate this potential problem with SWP project releases increasing by as much as 1400 cfs over current conditions. These increased July future EWA flows could increase river stage an additional 1.5 feet at some bank swallow colony locations. Further, the OCAP proposes to continue the existing operational pattern of relatively low flows throughout the majority of the bank swallow nesting cycle (allows burrow excavation and nesting on the lower portions of eroding river banks) followed by significant increases in stream flow and water surface elevation at the end of the nesting season.

**Figure 3. 2003 stage/discharge relationship at bank swallow colony #1 - RM 54.95**



**Figure 4. 2003 stage/discharge relationship at bank swallow colony #4- RM 45.05**

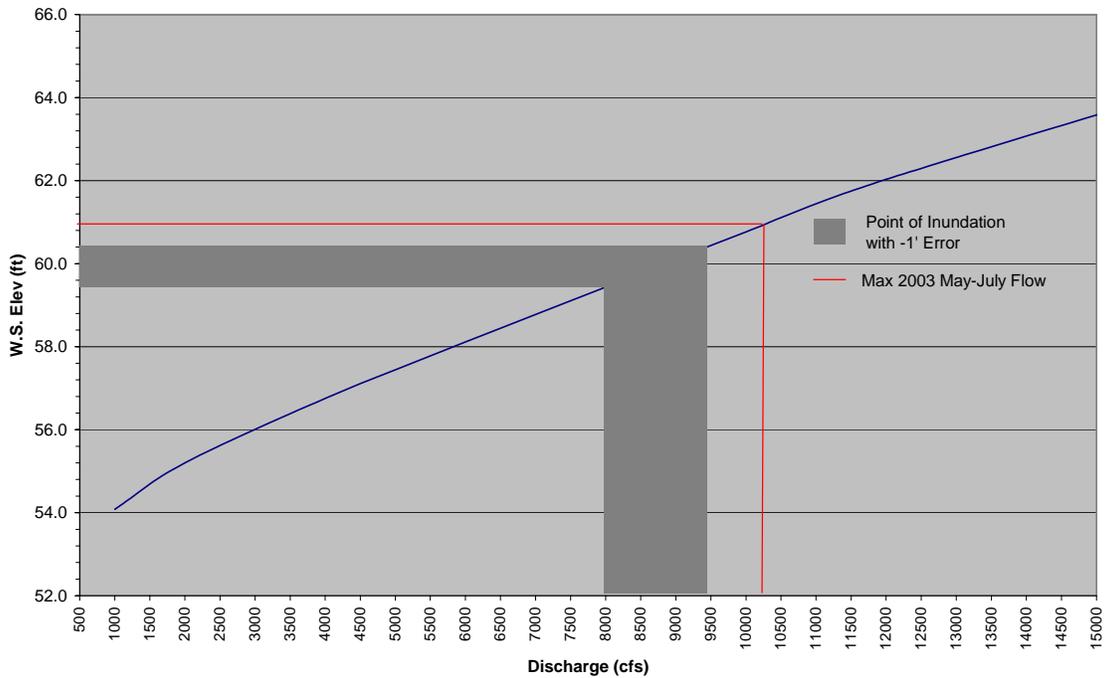


Figure 5. 2003 stage/discharge relationship at bank swallow colony #5 - RM 44.5

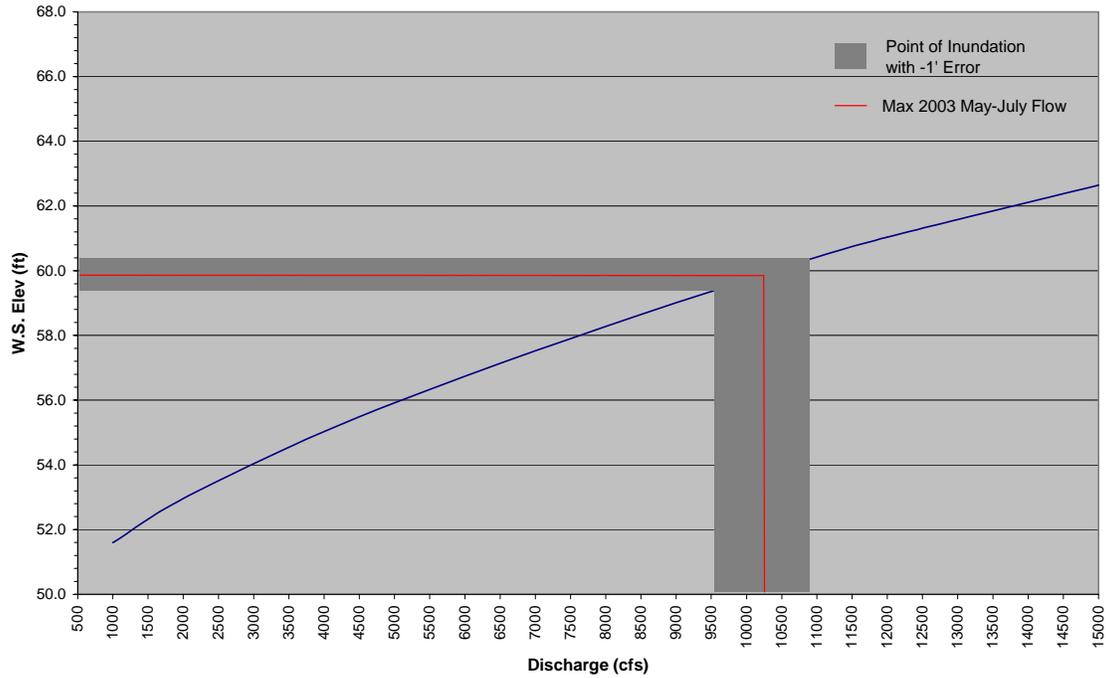


Figure 6. 2003 stage/discharge relationship at bank swallow colony #7 - RM 40.5

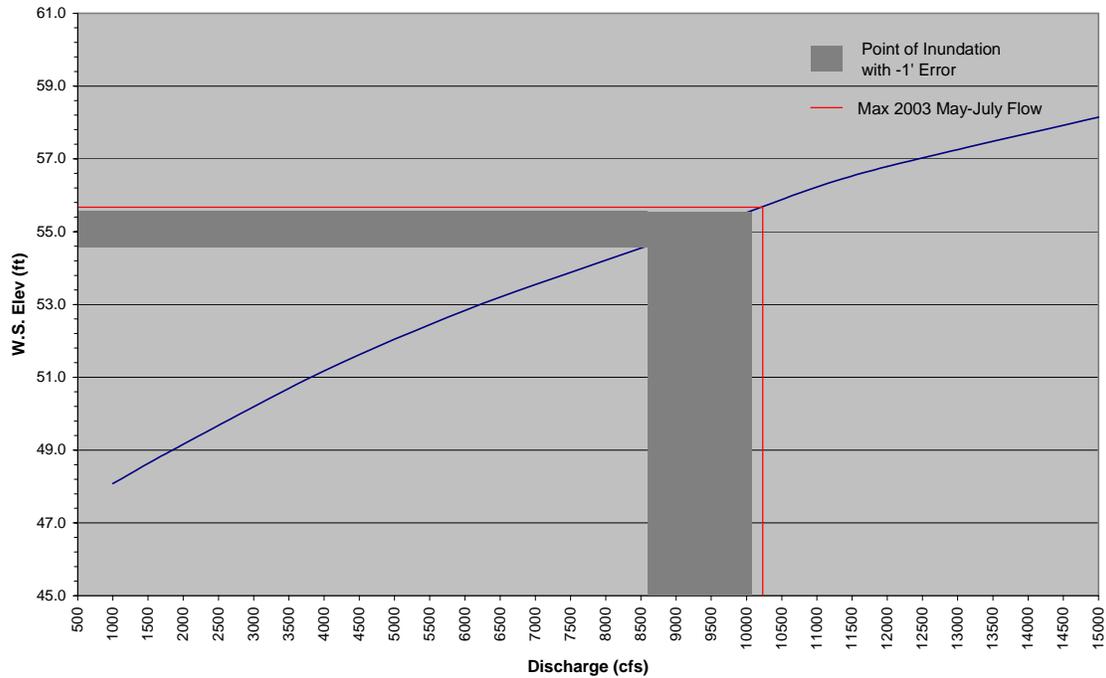


Figure 7. 2003 stage/discharge relationship at bank swallow colony #8- RM 40.4

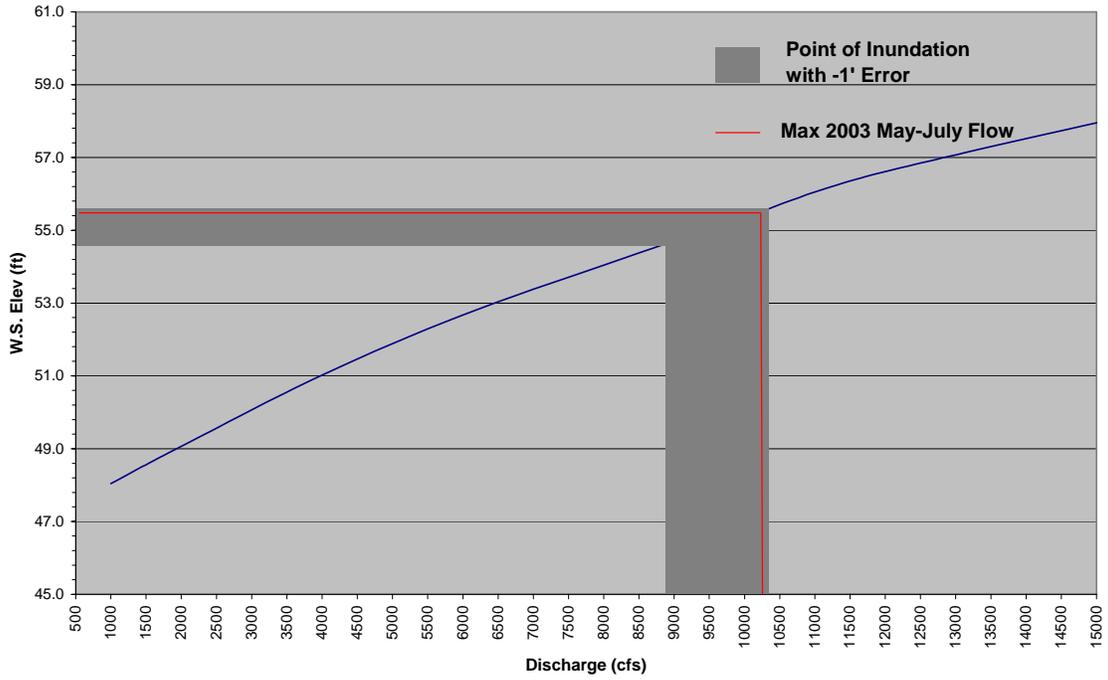


Figure 8. 2003 stage/discharge relationship at Bank Swallow Colony #9 - RM 35.6

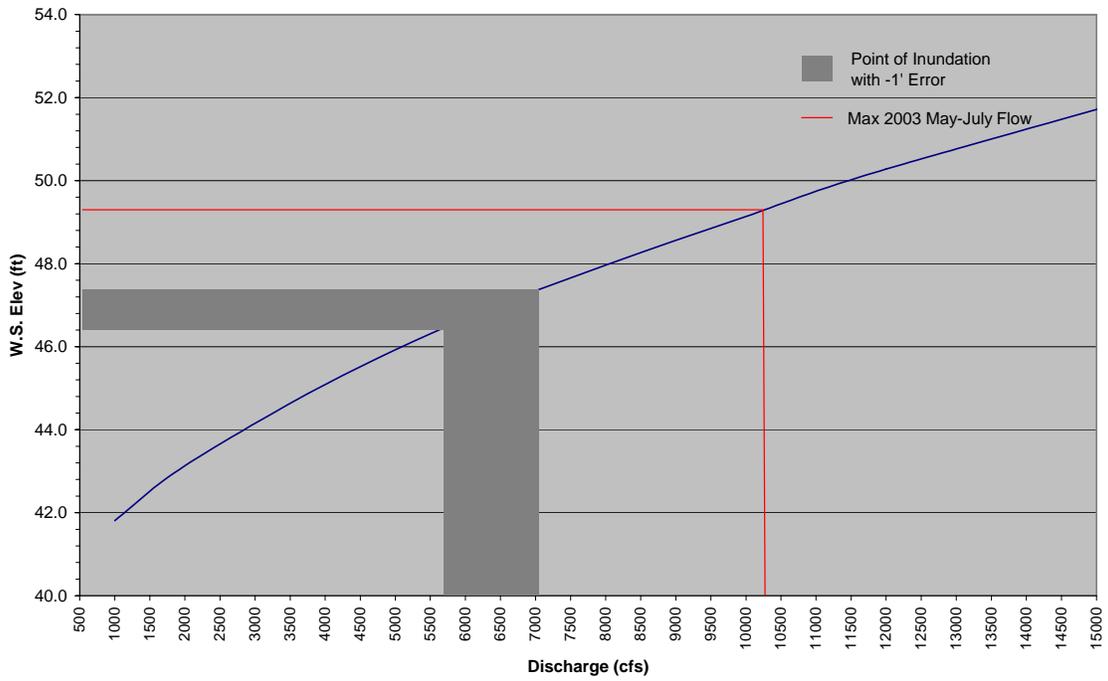


Figure 9. 2003 stage discharge relationship at bank swallow colony #10- RM 34.5

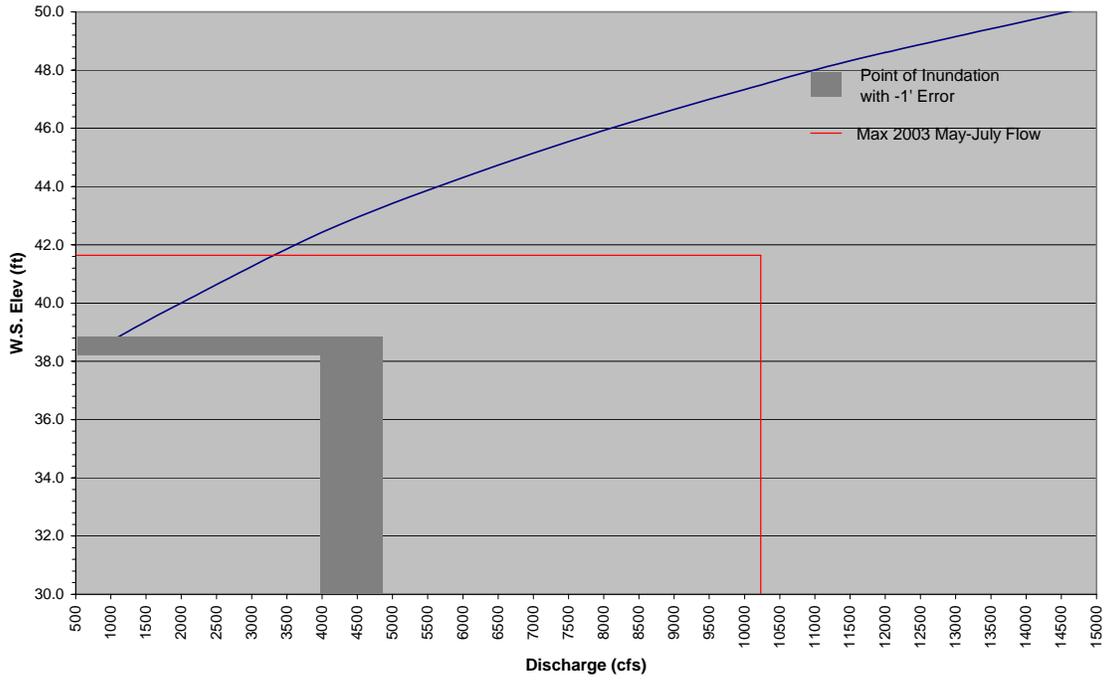


Figure 10. 2003 stage/discharge relationship at bank swallow colony #11 - RM 34.15

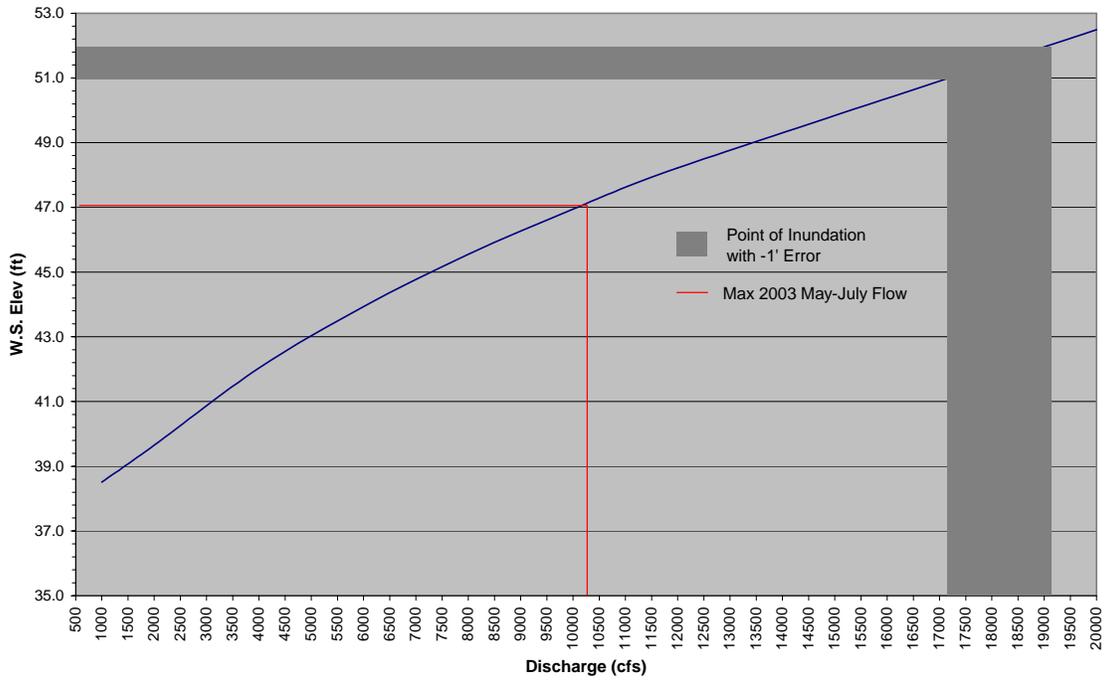


Figure 11. 2003 stage/discharge relationship at bank swallow colony #12 - RM 26.1

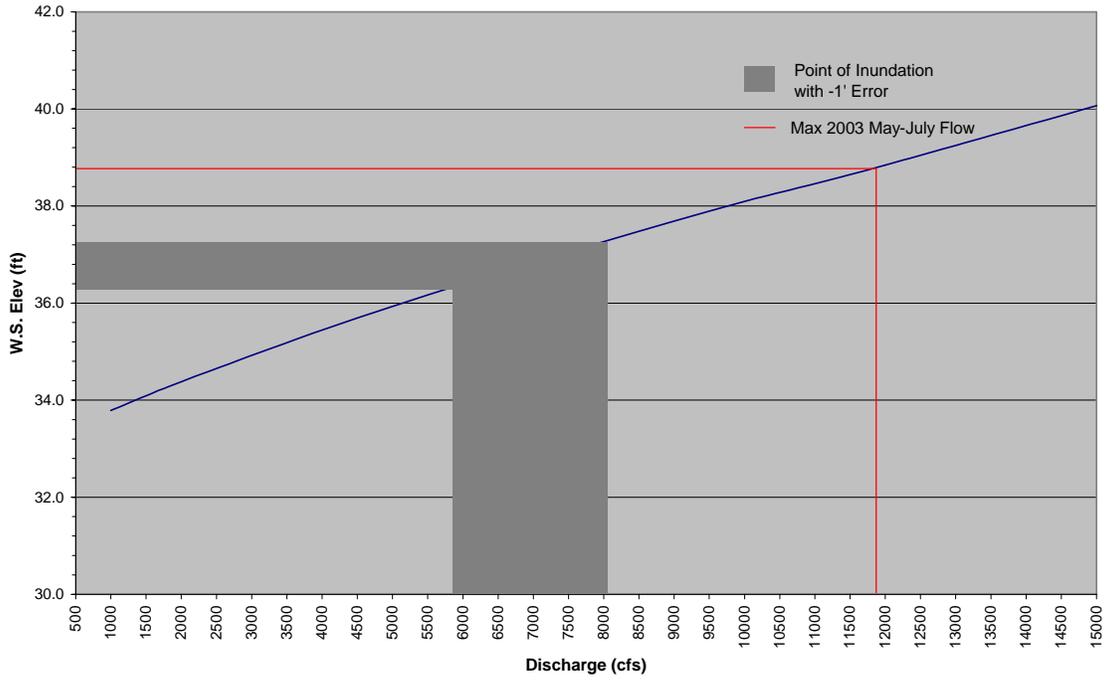


Figure 12. 2003 stage/discharge relationship at bank swallow colony #13 - RM 20.45

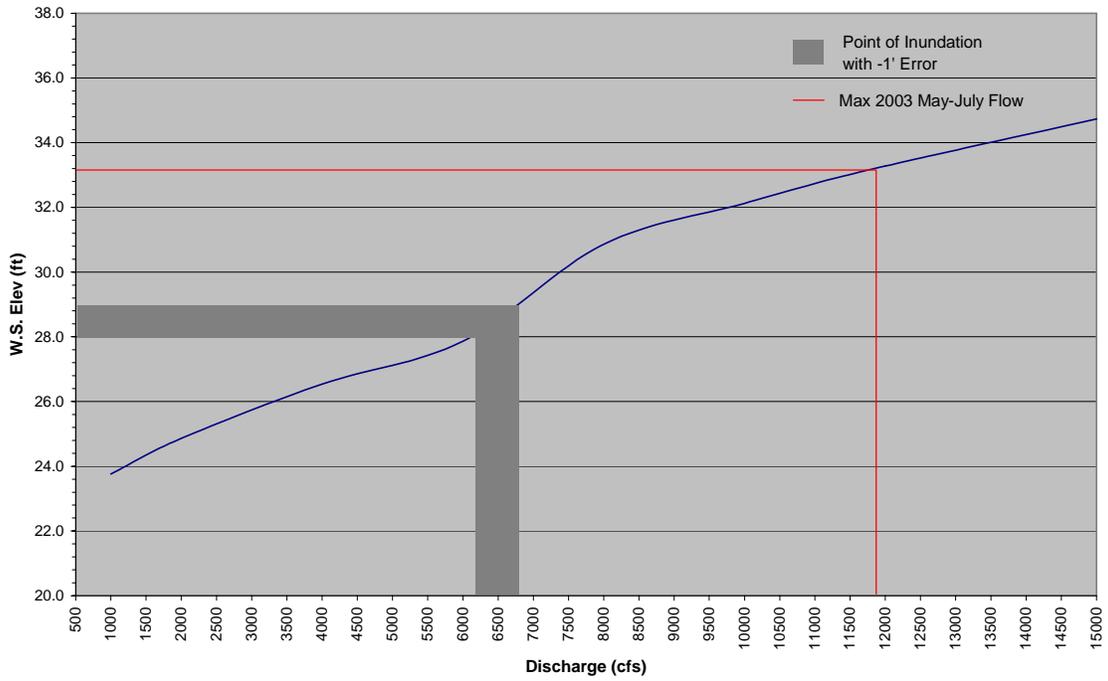


Figure 13. 2003 stage/discharge relationship at bank swallow colony #14 - RM 12.3

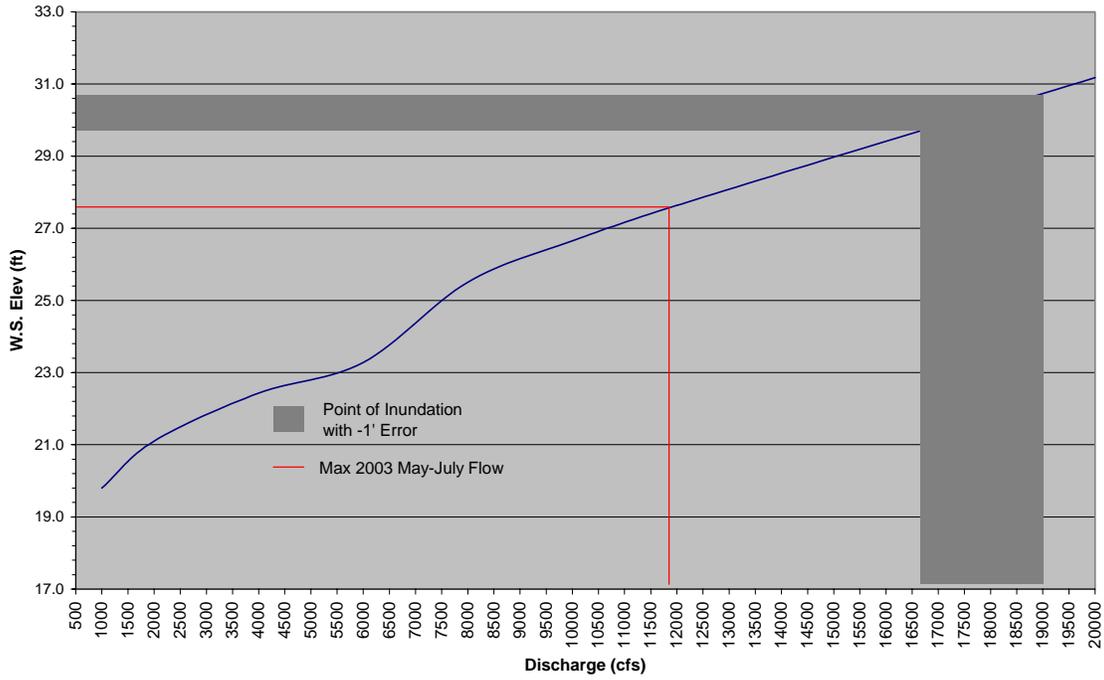


Figure 14. 2003 stage/discharge relationship at bank swallow colony #15 - RM 11.2

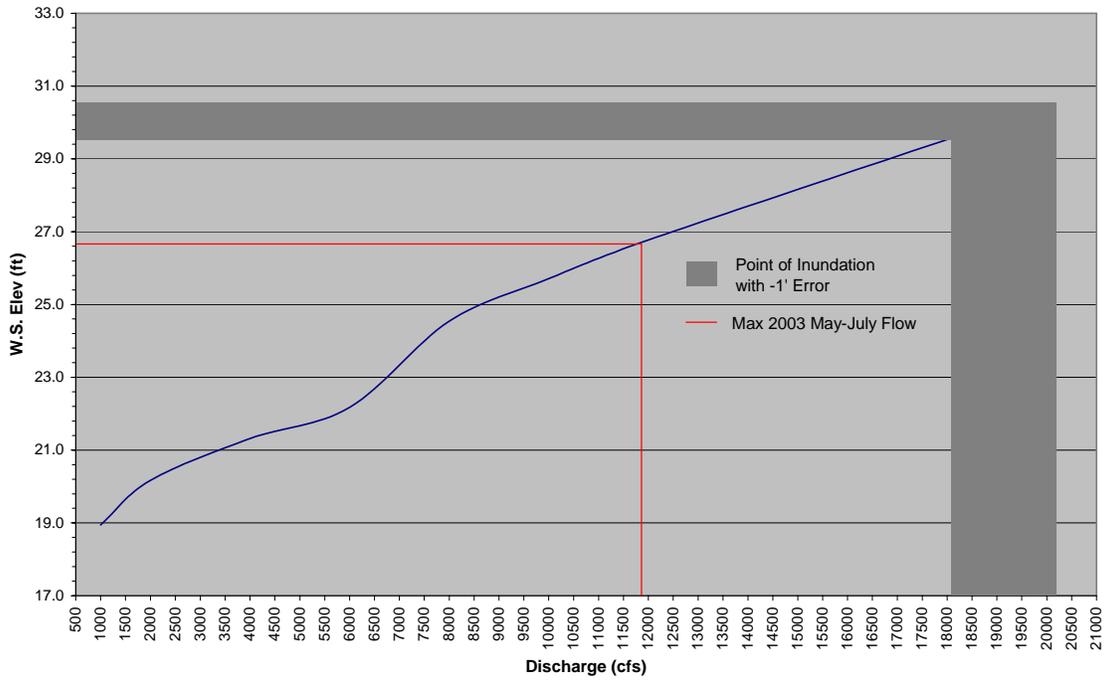


Figure 15. 2003 stage/discharge relationship at bank swallow colony #16 - RM 10.5

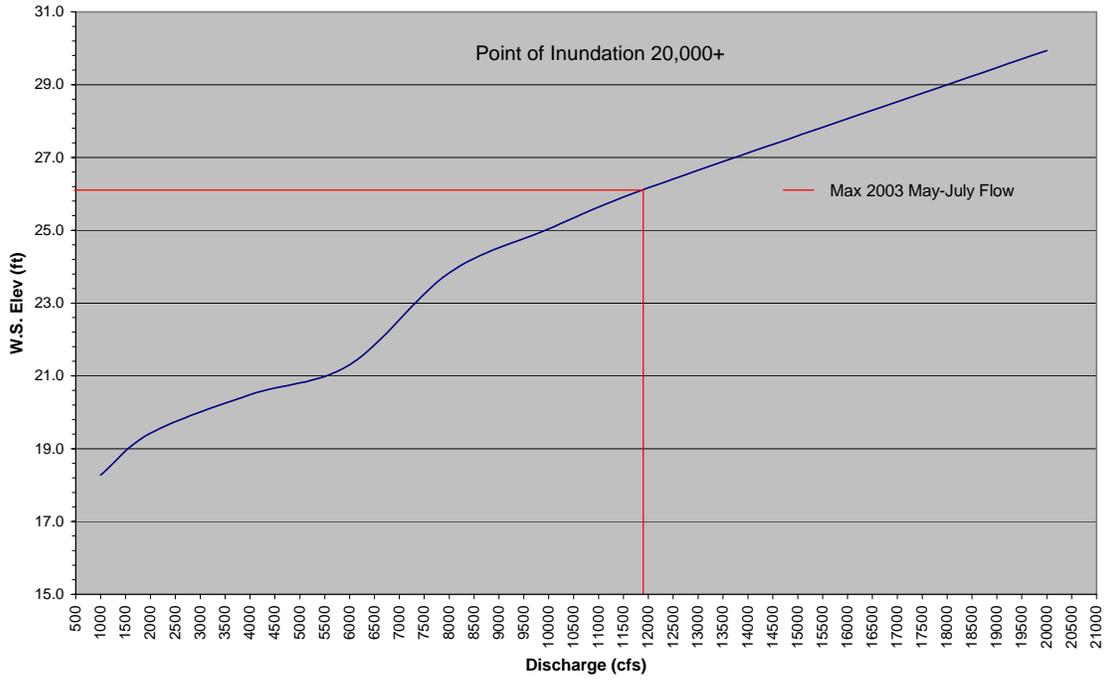


Figure 16. 2003 stage/discharge relationship at bank swallow colony #17 - RM 9.9

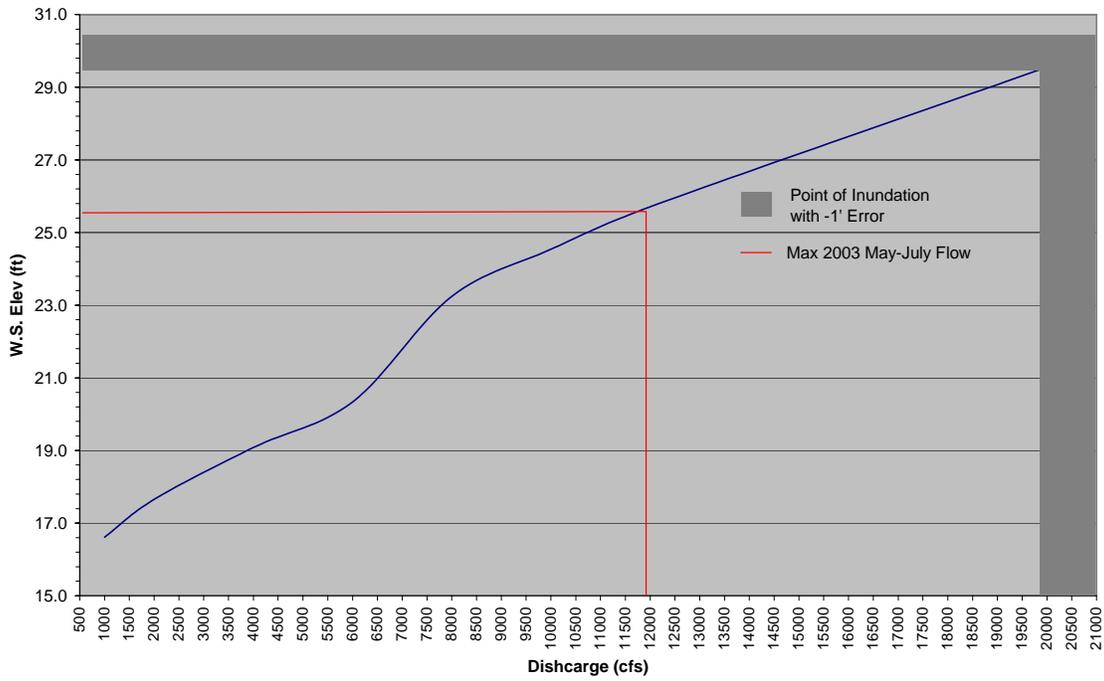
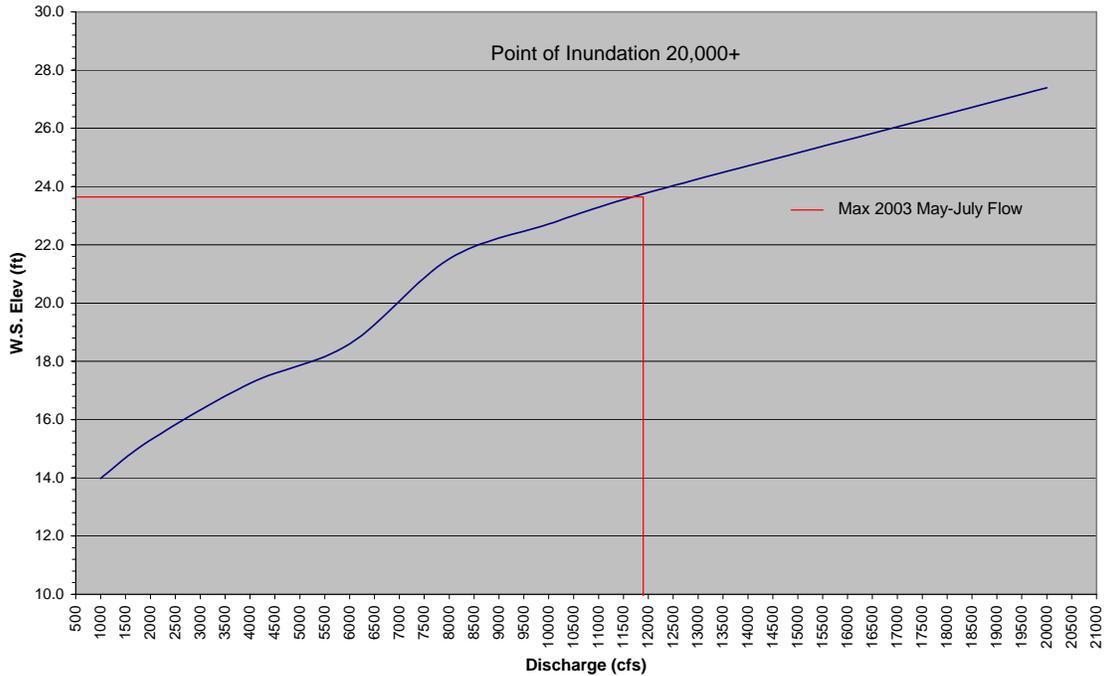


Figure 17. 2003 stage/discharge relationship at bank swallow colony #18 - RM 5.95



**Swainson’s Hawk**

Current and future project operations as described in the OCAP have little or no potential to result in take of Swainson’s hawk. Flood releases (both controlled and uncontrolled) have the potential to remove nest trees. However, floods of the magnitude required to remove mature trees have historically occurred outside of the breeding season when the birds are absent from California, thus flood related take is unlikely. Flow regime changes proposed in the OCAP are relatively minor and generally within the historical range of operations.

The current and future project operations described in the OCAP are unlikely to result in benefits to Swainson’s hawks or aide in the species recovery.

**Western Yellow-billed Cuckoo**

Current and future project operations as described in the OCAP have little or no potential to result in take of cuckoos. Flood releases (both controlled and uncontrolled) have the potential to inundate potential nesting habitat. However, flows of the magnitude required to inundate nesting habitat have historically occurred outside of the breeding season when the birds are absent from California, thus flood related take is unlikely. Flow related changes in channel geomorphology and riparian succession have the potential to enhance the quantity and quality of cuckoo habitat by creating the habitat mosaic preferred by cuckoos. However, the flow related changes proposed in the OCAP are unlikely to produce any measurable benefits to cuckoo habitat.

The current and future project operations described in the OCAP are unlikely to result in benefits to western yellow-billed cuckoos or aide in the species recovery.

## **Cumulative Effects**

Cumulative effects are those effects of State, local, and private actions on endangered and threatened species or critical habitat that are reasonably certain to occur in the action area. Future federal actions that are unrelated to the proposed action are not considered in this section because they will be subject to separate consultations pursuant to Section 7 of the federal ESA.

Numerous activities continue to affect the amount, distribution, and quality of habitat for State listed endangered and threatened species within the Feather River watershed. Habitat loss and degradation affecting State listed species continues as a result of urbanization, flood control, bank protection, changes in agricultural practices, spread of non-native plant species, and agricultural expansion.

### **Bank Swallow**

Bank swallows continue to be cumulatively affected by flood control and bank protection measures. Flood control activities continue to affect the quantity and quality of bank swallow nesting habitat created and maintained annually. Private and local government bank protection measures continue to permanently eliminate suitable nesting habitat along the length of the Feather River to protect private and public infrastructure and farmlands. These habitat losses are the greatest long-term threat to bank swallow populations in the Sacramento Valley.

### **Swainson's Hawk**

Swainson's hawks continue to be cumulatively affected by habitat loss or degradation associated with rapid urbanization, agricultural expansion, and changes in agricultural cropping patterns. Pesticide poisoning in wintering areas has been documented to result in significant mortality. Shooting remains a cause of direct mortality.

Ongoing and future project operations in the form of land fallowing associated with water transfers and water banking has the potential to adversely impact Swainson's hawk nesting success and production in localized areas. Swainson's hawks largely rely on agricultural habitats for foraging including: alfalfa, fallow fields, beet, tomato, irrigated pasture, rice (non-flooded), and cereal grains. DWR requires that lands fallowed under the Water Transfer and Water Banking programs be disked and maintained throughout the growing season in an unvegetated condition to minimize evapotranspiration losses. Replacement of suitable Swainson's hawk foraging habitat with barren habitat can affect individual Swainson's hawks foraging success and energetics and ultimately can reduce nestling survival and production. Due to the nature of the Water Transfer

and Water Banking programs the potential impacts to individual Swainson's hawks are difficult to predict or quantify.

### **Western Yellow-billed Cuckoo**

Western yellow-billed cuckoos continue to be cumulatively affected by habitat loss related to urbanization, flood control, pest management, and agricultural conversion. The rate of agricultural conversion may have slowed significantly in the last decade as extensive riparian restoration has occurred within the Sacramento Valley. Pest management activities, primarily mosquito abatement activities, may serve to reduce food resources for cuckoos. Control of West Nile virus may require increased mosquito control activities.

## **Conclusions and Determinations**

### **Bank Swallow**

Under the future level of development, the proposed action would result in higher SWP releases during the nesting season. These increased releases will result in increased Feather River stage during July and potentially increased loss of bank swallow nestlings. These changes are likely to adversely affect bank swallow populations.

### **Swainson's Hawk**

The proposed changes are unlikely to affect Swainson's hawk nesting or foraging habitat and will not result in direct mortality. The proposed action is not likely to affect Swainson's hawks.

### **Western Yellow-billed Cuckoo**

The proposed changes are unlikely to affect western yellow-billed cuckoo nesting or foraging habitat and will not result in direct mortality. The proposed action is not likely to affect western yellow-billed cuckoos.

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