3.16 TRANSBOUNDARY IMPACTS

3.16.1 INTRODUCTION

This section discusses the potential effects that extend across the international border below the NIB. Potential effects on resources could occur from changes in flows to Mexico as a result of adoption of interim surplus criteria. The changes in flow were previously discussed in section 3.3 and 3.4 and are described further in this section. The references cited in this section are located at the end of the list of references in this DEIS.

3.16.2 METHODOLOGY

The analytical approach used to evaluate potential impacts below the NIB is the same as was used for other resources and is fully consistent with Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, and Council on Environmental Quality Guidance on NEPA Analyses for Transboundary Impacts, dated July 1, 1997. The incremental hydrological changes between the baseline conditions and each of the interim surplus criteria alternatives were determined using the model of the Colorado River system. Environmental conditions currently existing and those expected to result from the full development of the Upper Division states' entitlement are part of the baseline conditions. The potential effects on Mexico's resources cannot be specifically determined due to the uncertainty of water use once it flows across the NIB into Mexico. The waters of the Colorado River, once delivered to Mexico, as agreed upon in the Mexican Water Treaty of 1944, are the exclusive property of Mexico. This treaty contains no provisions requiring Mexico to provide water for environmental protection, nor any requirements relating to Mexico's use of that water. It is reasonably foreseeable that Mexico will continue to maximize consumptive use of its Colorado River water apportionment for agricultural, municipal and industrial purposes.

3.16.3 CONSULTATION WITH MEXICO

Pursuant to an international agreement for mandatory reciprocal consultations, Reclamation, through the International Boundary and Water Commission (IBWC) is in the process of consulting with Mexico in completing analysis of potential transboundary impacts from adoption of interim surplus criteria. An initial meeting was held in Henderson, Nevada, on April 12, 2000, during which the topic of developing interim surplus criteria was described for the Mexican delegation. A subsequent meeting was held in Mexico City, Mexico, on May 11 and 12, 2000. During the May 11-12, 2000 meeting, Reclamation provided additional data which had been requested by Mexico and technical issues were discussed. Reclamation requested that Mexico provide an analysis of how the incremental changes between baseline conditions and the interim surplus criteria would affect Mexico. In response,

a letter from the Mexican IBWC Commissioner, J. Arturo Herrera Solís, was received by the United States section of the IBWC on June 5, 2000. The original letter, and an English translation, is included in Attachment Q. Mexico advised the IBWC that there is no objection to the public release of this diplomatic document. Inclusion of this document does not indicate Reclamation acquiescence in or adoption of the positions expressed by Mexico in its transmittal.

In his transmittal, Commissioner Solís expressed a concern that currently proposed plans for the distribution of surplus water among the Lower Division states tend to eliminate flows below Morelos Dam over the 15-year period of the interim surplus criteria. Mexico estimates that the elimination of these flows would have the following effects on the Mexican natural and physical environment:

Effects on the recharge of the aquifer both in quantity and quality, reducing the beneficial use of the same;

Increase in salinity in the 200,000 hectares [500,000 acres] of cultivation in the Mexicali Valley, since part of the surplus is used to leach this soil;

Deterioration in the quality of water delivered to Mexico at the Southerly International Boundary (SIB), especially in terms of salinity given that the flows of fresh water are used to reduce high concentrations of salinity at this site;

Deterioration in the quality of water received by Mexico at NIB in reducing the flow to the value of the Mexican demand and maintaining the discharges to the river from agricultural drains in the Yuma, Arizona area;

In the upper part of the Sea of Cortez, species in danger of extinction or which require special protection will be affected, such as the rarest and most scarce cetacean in the world, the sea cow (Vaquita) and the Totoaba. Also, commercial fishing activities will be affected in the region, especially shrimping and two species of Corvina, fish which had not appeared in significant numbers in the last 25 years; and,

In terms of the existing flora in the reach between Morelos Dam and the mouth of the Colorado River at the Sea of Cortez, in recent years around 33,000 hectares [85,500 acres] of native riparian vegetation have been restored in the channel, mostly poplars, willows, mesquite and salt cedar, among other species which are fundamental in the ecosystem since many of these are used as nesting areas for a great number of birds, such as the Yuma Clapper Rail, the yellow seagull, the sea swallow and the royal blue swan, among others, same which would be affected by these measures.

Although Reclamation recognizes the potential for the United States, acting through the Secretary of State, to continue to work with Mexico on a bi-national basis to clarify and resolve Mexico's concerns, it is not clear that these concerns are a result of interim surplus criteria. Issues not arising from interim surplus criteria are outside of the scope of this DEIS. However, they could become the subject of other cooperative, bi-national processes of a voluntary nature.

Attachment Q also contains a draft document that states the United States "Authority and Assumptions" of December 28, 1999, for the U.S.-Mexico consultations under the 1944 Water Treaty and subsequent resolutions and Minutes. Within that document, the U.S. acknowledges Mexico's rights under the authority of Article 10 of the 1944 Water Treaty: "Mexico has the right to 1.5 maf annually." Statistical predictions from the model as to what may occur with respect to flows to Mexico verified that under baseline conditions and all the interim surplus criteria alternatives, Mexico would receive no less than its apportionment of 1.5 maf per year. (see discussion in Section 3.4.4.1.5). Thus, interim surplus criteria would not affect the ability of the Secretary to meet Mexican Treaty Obligations. However, as noted in Chapter 1, Mexico would be subject to reductions if extraordinary drought conditions were to occur.

The "Authority and Assumptions" also states the U.S. position that "Mexico may schedule an additional 200,000 af of surplus annually, but does not have the right to Colorado River water beyond the 1.5 maf" and provides that the U.S. will develop and supply technical data that identify the potential future deliveries of up to 200,000 af of surplus for use in Mexico. Technical information regarding the frequency of Mexico's 200,000 af delivery pursuant to the Treaty is presented in Section 3.4.4.5.

Reclamation wishes to distinguish between Mexico's receipt of up to 200,000 af of scheduled surplus water from that of additional water, which this analysis refers to as "excess flows." Excess flows result from flood control operations, unanticipated contributions from events such as flooding along the Gila River and/or other factors resulting in canceled water orders by water users below Parker Dam. It is acknowledged that Mexico has complete autonomy as to how they choose to manage apportioned and excess Colorado River flows.

3.16.4 AFFECTED ENVIRONMENT

3.16.4.1 HISTORICAL COLORADO RIVER BETWEEN THE SOUTHERLY INTERNATIONAL BOUNDARY AND THE GULF OF CALIFORNIA

Historically, the Colorado River flowed approximately 1,440 miles from its headwaters in the Rocky Mountains to its mouth at the Gulf of California. Although the section of the river between the Southerly International Boundary (SIB) and the Gulf of California is less than 50 air miles in length, the river meandered as much as 175 miles through this stretch (Browne, 1869; Rudkin, 1953). Historically, this

section of the river could be divided into two reaches: the upper reach, which was influenced mainly by flood events; and the lower reach, which was influenced mainly by tidal fluctuations in the Gulf of California. A third reach of the river, stretching from the NIB to the SIB, is analyzed in this section as it acts as the east-west boundary between Baja California and the state of Arizona. This section of the river is known as the Limotrophe Division.

The upper reach of the Colorado River in Mexico, between the SIB and the Gulf of California, extends from the international boundary to approximately the confluence of the Rio Hardy and the Colorado (Mearns, 1907). The plant community found in this reach of the Colorado was similar to that found in the Yuma Valley. Large cottonwoods and dense willow thickets lined the river channel and oxbows within the floodplain (Johnson, 1869; Mearns, 1907) Honey and screwbean mesquites formed large dense thickets in areas that were subject to occasional overbank flooding (Bolton, 1930; Thwaites, 1905). Dense stands of arrowweed were noted in many historical journals throughout this reach of the river (Bolton, 1930; Mearns, 1907). Unlike the portion of the Colorado River that lies within the United States, large marshes were common within this stretch of the river. Several journals note expanses of cattails, rushes, and cane (Twaites, 1905; Mearns, 1907; Bolton, 1930). Large grass savannas were present within the floodplain that supported a cattle industry from the late 1800's through the early 1900's (Mearns, 1907; Kniffen, 1929 *in* Ohmart, 1982; Bolton, 1930).

The ecosystem found in the lower reach of the Colorado River, below the Rio Hardy to the Gulf of California, was heavily influenced by tidal fluctuations in the Gulf of California and by heavy soil deposition from annual flood events. As the river meandered south of its confluence with the Rio Hardy, cottonwoods became scarce. Dense thickets of mesquite and arrowweed were still recorded on the upper terraces within this reach of the river. Dense stands of willows formed on newly deposited sediments. Large marshes, comprised mainly of cattails, rushes, and cane, dominated this stretch of the river (United States War Department, 1852; Mearns, 1907). Saltgrass became prevalent at the mouth of the river (Kniffen, 1929 *in* Ohmart, 1982).

3.16.4.2 PRESENT STATUS OF THE COLORADO RIVER BETWEEN THE NIB AND THE GULF OF CALIFORNIA

Human activities have significantly changed the lower Colorado River ecosystem since the early 1900's. The most current information available on the vegetation composition present along the upper reach of the Colorado River floodplain between the SIB and the Rio Hardy comes from a 1999 study conducted by the University of Monterrey (Guaymas), the University of Arizona, the Environmental Defense Fund, and the Sonoran Institute (Glenn, unpub. data and Luecke et al, 1999). Aerial and remote sensing methods, combined with ground surveys to check accuracy, were

used to estimate the number of acres of each habitat type. Habitat types were separated into two broad categories: (1) areas where Fremont cottonwood and Goodding willow comprised greater than 10 percent of the stand (determined by measuring percent vegetation cover by using remote sensing techniques); and (2) areas where Fremont cottonwood and Goodding willow comprised less than 10 percent of the stand. In stands where cottonwoods and willows comprised greater than 10 percent of the vegetative cover, the stands were further subdivided by height class and density (Open Gallery Forest, Closed Gallery Forest, and Shrub Dominated). In stands where cottonwoods and willows comprised less than 10 percent of the vegetative cover, the stands were further divided by species composition (saltcedar/arrowweed and saltcedar/mesquite).

The University of Monterrey study estimated approximately 9,545 acres of >10 percent cottonwood-willow habitat, 4,492 acres classified as open gallery forest and 5,053 acres classified as shrub dominated. Analysis of tree ring data indicated that the majority of these cottonwood-willow stands had been regenerated during high flow events over the last two decades, especially the 1993 Gila River flood event. This study also identified 25,829 acres of saltcedar/arrowweed habitat. Although the study does not specify, it is likely that these stands were actually monotypic saltcedar and monotypic arrowweed stands or clumps as arrowweed does not usually grow as a mixed stand with other vegetation types. Interestingly, this study did not identify any saltcedar/mesquite acreage within the entire study area (E. Glenn, University of Arizona, Tucson, unpub. report; CH2MHill, 1999).

In December, 1998, biologists from the Bureau of Reclamation, San Bernardino County Museum, and the Upper Gulf of California and Colorado River delta Biosphere Preserve conducted an aerial survey of the Rio Hardy and the Colorado River to determine potentially suitable Southwestern willow flycatcher breeding habitat. This survey noted that the vegetation at the confluence of the Rio Hardy and Colorado River was mostly narrow, dry stands of saltcedar. Northeast of the town of Venustiano Carranza, patches of Goodding willow and Fremont cottonwood were evident. Approximately 5 kilometers north of the Mexican Railroad crossing of the Colorado River, the river contained long, linear stands of Goodding willow with a few cottonwoods also present. Approximately 15 kilometers south of San Luis, Sonora, the Colorado River begins to broaden out and, from this point north to the *NIB*, a variety of habitats believed to be suitable breeding habitat for Southwestern willow flycatcher were present (McKernan, pers. comm.).

The Cienega de Santa Clara (Cienega) is a large wetland complex located adjacent to the mouth of lower Colorado river in Sonora, Mexico. It is a large basin approximately 80,000 acres in size, including roughly 9,700 vegetated acres with the remaining area consisting of highly saline tidal salt flats.

The Cienega was formed by a tectonic slump geologically. The Colorado River probably at many times in the geologic past flowed through the Cienega on its way to the Sea of Cortez. The Cienega's basin shape tends to retain sea water which intrudes into the southern end as a result of tidal action, and evaporation results in total dissolved solids (TDS) of the water exceeding 60,000 parts per million (ppm) in some areas. The upper end of the Cienega has two major brackish water inflows; the Main Outlet Drain Extension (MODE) which transports saline irrigation return flows from the Wellton-Mohawk Irrigation and Drainage District (WMIDD) east of Yuma, Arizona, and the Riito Drain (Drain) which carries irrigation return flows from the eastern Mexicali Valley in Sonora, Mexico. The MODE and the Drain annually contribute approximately 140,000 and 28,000 af of water, respectively. There are other smaller sources of inflow to the Cienega, including springs along the eastern edge.

Salinity in the MODE water is approximately 3,200 ppm TDS while the salinity of the Drain is approximately 4,600 ppm TDS. This brackish water inflow supports the wetland vegetation at the upper end of the Cienega. The vegetation is limited by the brackish water interface with the highly saline water and soils comprising the extensive salt flats of the southern portion of the Cienega. The salt flats and associated shallow water exceed 60,000 ppm TDS. This is a result of tidal action bringing sea water into the basin, and evaporation and subsurface drainage accounting for water loss from the basin.

The vegetation in the Cienega is dominated by cattail and bulrush. The cattail and bulrush is interspersed with small channels and open water pools. The water depths in the vegetated area vary from one to four feet.

The vegetated area supports a variety of bird species. There is considerable use of the open water by waterfowl, including many varieties of ducks and geese. Several fish species are found in the fresher water areas of the Cienega including largemouth bass, carp, channel catfish, and tilapia. Several species of shiners and mollies are also found in the Cienega.

Most notable about the fish and wildlife using the Cienega is the presence of several U.S. Federally listed, State designated special status species, and internationally recognized species of concern. These include the Yuma clapper rail, desert pupfish, bald eagle, peregrine falcon, and brown pelican.

The present size of the vegetated area of the Cienega is a result of construction of the MODE which carries brackish irrigation return flows from the WMIDD. Prior to the completion of the MODE the vegetated area of the Cienega was less than 500 acres, and this consisted mainly of a narrow fringe to the east of the present large vegetated area. Since 1977, when the MODE was completed, the vegetated area has expanded from virtually no vegetation to its present size.

Flows into the Cienega are not anticipated to be affected by the adoption of interim surplus criteria.

3.16.5 FLOWS IN MEXICO

Currently, water can flow past Morelos Dam under three circumstances (1) as a result of canceled water orders that Mexico is unable to divert at Morelos Dam; (2) during a Gila River flood event; and (3) during flood control releases along the mainstream Colorado River.

Water released from Parker Dam, under orders from irrigation districts in Imperial Valley, Coachella Valley, and the lower Colorado River Valley, normally takes up to three days to reach its point of diversion. Occasionally, unforseen events, such as localized precipitation, force the irrigation districts to cancel these water delivery orders after the water has been released at Parker Dam. Usually, the water is diverted at Morelos Dam for use in Mexico; however, some of this water may flow past Morelos Dam. The volume of water passing by Morelos Dam is rarely enough to have much effect on Mexico below the NIB. Adoption of interim surplus criteria will not effect water that flows past the NIB as a result of canceled water orders.

Gila River flood events are extremely rare. Only once has flow been recorded over 4000 cfs at the Dome, Arizona, gauging station since 1941. In 1993, up to 27,500 cfs flowed past the Dome gauging station as a result of the 1993 Gila River flood (USGS, 1999). The 1993 flood created much of the habitat presently found along the Gila River and Colorado River below its confluence with the Gila (Glenn, per. comm.).

Excess flows below Morelos Dam are almost entirely due to flood control releases originating at Hoover Dam. As discussed in Section 3.3.1.2, these flood control releases are dictated by the flood control criteria established for Lake Mead and Hoover Dam and are dependent upon hydrologic conditions. Mexico can schedule up to 200 kaf annually during years when flood control releases occur; however, it is important to remember that water which flows beyond the NIB are managed by Mexico and may be used for beneficial human uses and therefore, may not reach the affected areas.

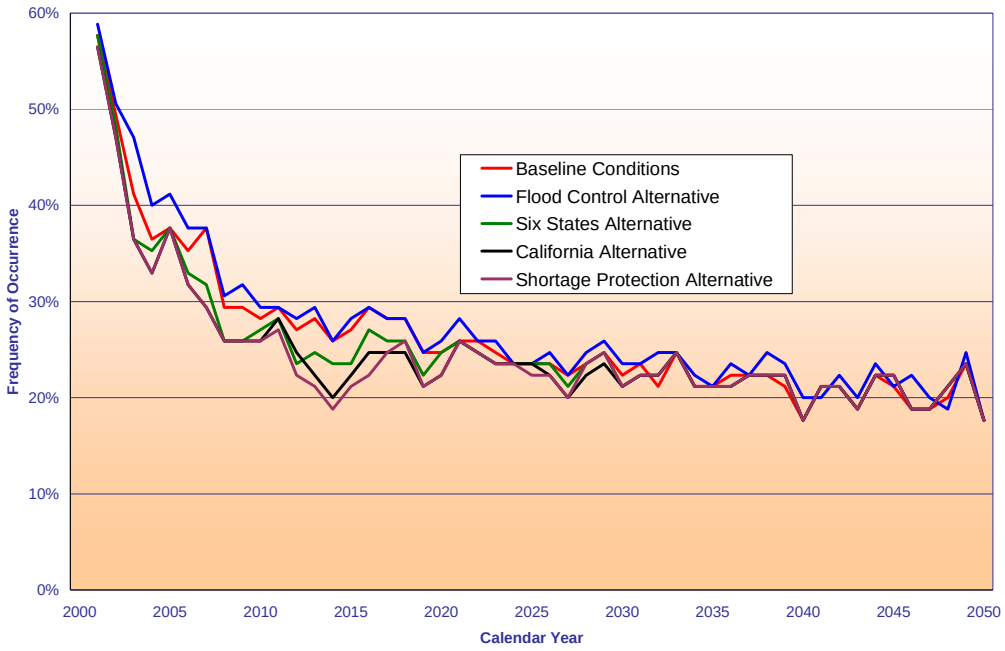
3.16.5.1 BASELINE CONDITIONS

The potential range of water deliveries to Mexico under the baseline conditions and surplus alternatives was discussed in Section 3.4.4.5. Flows below Morelos Dam at various seasons were also analyzed in Section 3.3.4.5.4. Both the frequency and magnitude of excess flows are important factors in restoring and maintaining riparian habitat below Morelos Dam and are analyzed in more detail in this section. It should be emphasized that Mexico's management decisions at and below Morelos Dam are not modeled; therefore, the hydrologic analyses assume that any water in excess of

Mexico's scheduled normal or surplus deliveries are those flows that would occur below Morelos Dam.

The potential for future excess flows below Morelos Dam is shown in Figure 3.16-1. The frequency of occurrence is computed by simply counting the number of modeled traces for each year that have excess annual flows and normalizing by the number of traces (85). As shown in Figure 3.16-1, the relatively high frequencies occurring in years 2001 through 2005 result from the current full reservoir conditions. Under baseline conditions, the probability declines from approximately 58 percent in 2001 to approximately 38 percent by 2005. The gradual declining trend occurring after 2005 can be attributed to increasing Upper Basin depletions. Under baseline conditions, the frequency of occurrence declines to about 17 percent in 2050.

Figure 3.16- 1
Frequency of Excess Flows Below Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions



The potential magnitudes of excess flows below Morelos Dam were also evaluated. Figures 3.16-2 through 3.16-5 present the cumulative distribution of the annual flows for years 2005, 2015, 2025, and 2050. Under baseline conditions for year 2005, the potential maximum annual flow observed below Morelos Dam was about 8.4 maf. This potential maximum decreases over time to about 6 maf in year 2050.

Figure 3.16-2
Colorado River Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2005

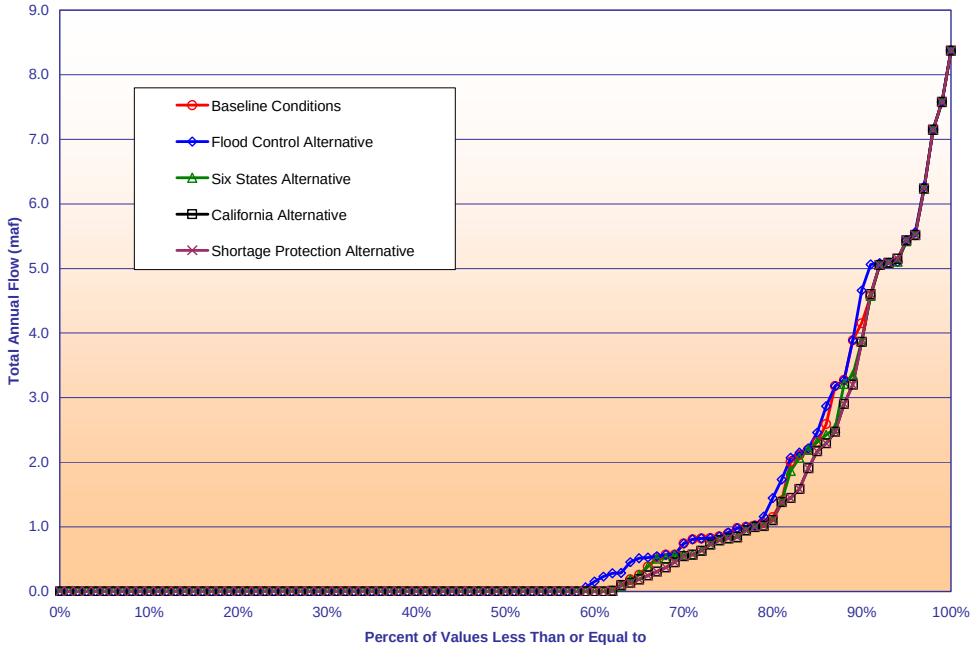


Figure 3.16- 3
Colorado River Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2015

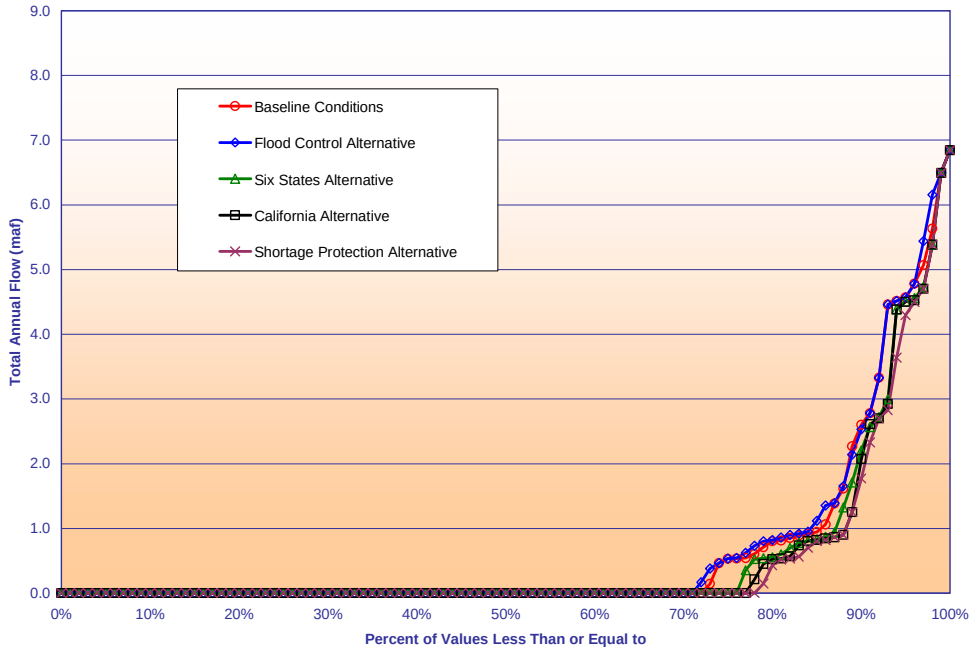


Figure 3.16-4
Colorado River Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2025

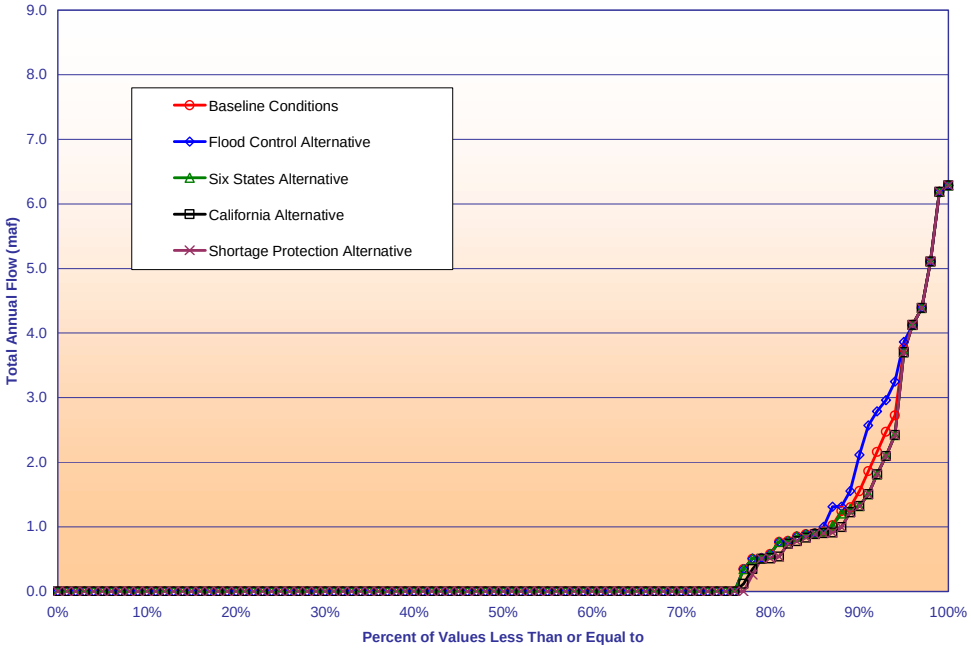
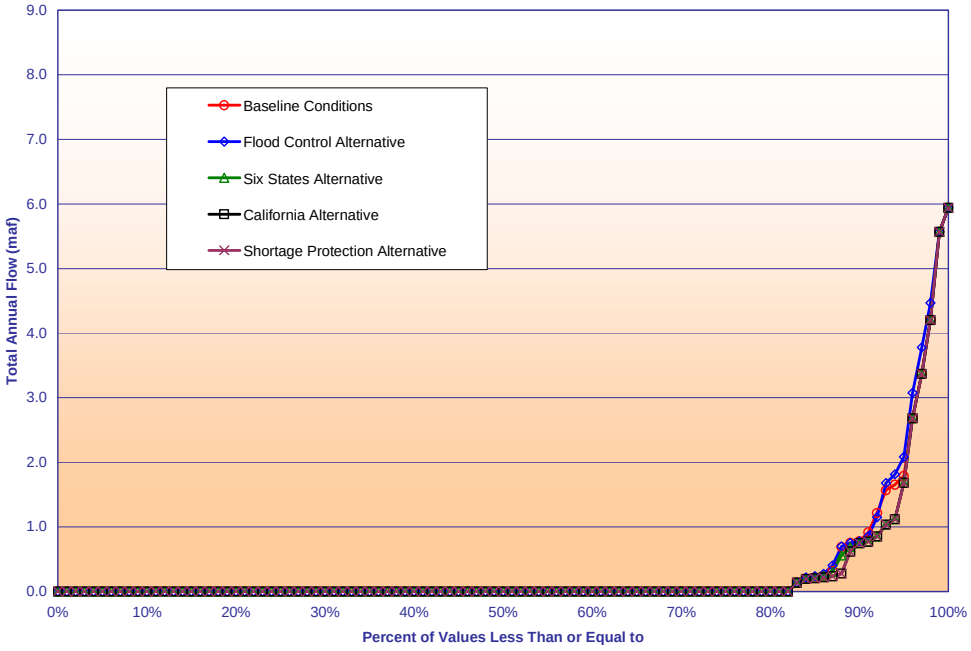


Figure 3.16- 5
Colorado River Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2050



3.16.5.2 COMPARISON OF SURPLUS ALTERNATIVES TO BASELINE CONDITIONS

Figure 3.16-1 (on page 3.16-8) presented a graphical comparison of future excess flows below Morelos Dam under the surplus alternatives to those under the baseline conditions. The probability of excess flows below Morelos Dam for the surplus alternatives are compared to baseline conditions for selected years in Table 3.16-1. In general, the flood control alternative has the highest probability while the shortage protection alternative has the lowest. The largest difference in frequency is observed a the end of the interim surplus criteria period (2015) and is about 6 percent between the Shortage Protection Alternative and baseline conditions. This difference is reduced to approximately 2 percent by 2025 and to zero by 2050.

Table 3.16-1
Colorado River Flows To Mexico
Frequency of Occurrence of Flood Flows

	2005	2015	2025	2050
Baseline Conditions	38%	27%	24%	18%
Flood Control Alternative	41%	28%	24%	18%
Six States Alternative	38%	24%	24%	18%
California Alternative	38%	22%	24%	18%
Shortage Protection Alternative	38%	21%	22%	18%

Figure 3.16- 6
Potential Magnitude of Excess Flows Below Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions 90th and 75th Percentile Values

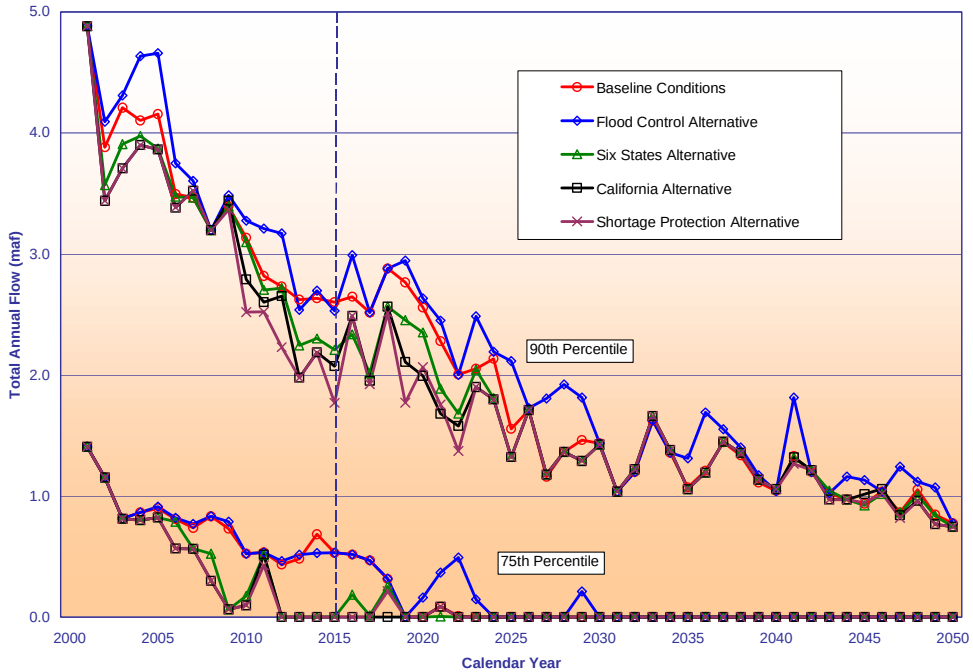


Table 3.16-2
Comparison of Surplus Alternatives to Baseline Conditions for 75th Percentile Values, kaf
Potential Magnitude of Excess Flow Below Morelos Dam

Year	Baseline	Flood Control	Six States	California	Shortage Protection
2001	1,407	1,407	1,407	1,407	1,407
2002	1,154	1,154	1,154	1,154	1,154
2003	814	814	814	812	812
2004	864	865	801	801	801
2005	900	914	823	823	823
2006	810	818	789	568	568
2007	738	770	565	565	565
2008	832	832	525	301	301
2009	731	788	64	64	64
2010	525	525	175	97	97
2011	535	535	516	516	429
2012	434	463	0	0	0
2013	482	515	0	0	0
2014	685	529	0	0	0
2015	531	532	0	0	0
2016	517	517	186	0	0
2017	469	469	14	0	0
2018	316	318	255	0	215
2019	0	0	0	0	0
2020	0	161	0	0	0
2021	86	368	6	86	86
2022	8	492	0	0	0
2023	0	146	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0

The potential magnitudes of excess flows for the surplus alternatives are compared to baseline conditions for the 75th and 90th percentiles as shown in Figure 3-16.6. The 75th percentile are values also detailed for years 2001 through 2025 in Table 3.16-2.

There are no significant differences in the potential magnitudes of excess flows between baseline conditions and the surplus alternatives. There are some differences in the potential frequencies between baseline conditions and the Six States, California, and Shortage Protection Alternatives during the interim surplus criteria period. The Flood Control Alternative shows slightly higher frequency of occurrence (about 3 percent). By the end of the interim surplus criteria period, the baseline conditions and Flood Control are similar, while the other surplus alternatives exhibit slightly lower frequencies (between 3 percent and 6 percent

lower). By 2050, the surplus alternatives are essentially the same. Based on these small potential changes to human uses including farming, M&I consumption and other factors are not expected to be significant. Therefore, further analysis discusses only biological factors.

3.16.6 PRELIMINARY SUMMARY OF EFFECTS TO SPECIAL-STATUS SPECIES AND HABITAT IN MEXICO

3.16.6.1 POTENTIAL EFFECTS TO HABITAT IN MEXICO

The historic reduction in Colorado River flows below the NIB has had an affect on the ecosystem of the delta. However, these reductions have been instituted through an international treaty and the diversion and use of such treaty water is solely at Mexico's discretion. Except for periods of high flow or flood control operations, little water reaches the delta and the upper Gulf. It is not within Reclamation's discretionary authority to make unilateral adjustments to water deliveries to the international border. As discussed previously, the potential magnitude of these excess flows is not affected by interim surplus criteria. Under baseline conditions, the frequency of excess flows declines over the next 25 years. The frequencies under the surplus alternatives follow this trend, with the maximum differences occurring in 2015.

Riparian habitat, along the Colorado River between the NIB and the Gulf of California, requires scouring flood events for regeneration. Both the frequency and magnitude of excess flows are important for this regeneration. As discussed previously, the potential magnitude of these excess flows is not affected by interim surplus criteria. Under baseline conditions, modeling indicates that the frequency of excess flows below Morelos Dam will decrease over the next 25 years. The frequencies under the surplus alternatives follow this trend, with the maximum differences occurring in 2015.

Predicting the effects of those differences to the existing habitat is difficult to quantify. The majority of the existing cottonwood-willow habitat regenerated during the 1983-87 Colorado River and 1993 Gila River flood events. This habitat has been sustained by a variety of potential water sources, including high groundwater and agricultural runoff.

Special status species that utilize riparian habitat along the Mexican reach of the Colorado River could be affected by the decrease in frequency of flood control releases and amounts of flow past Morelos Dam. Existing habitat will be threatened by wildfire, agricultural clearing, and clearing for channel maintenance and flood control. New habitat is unlikely to regenerate due to the decrease in flood frequency. However, these events are likely to occur whether surplus criteria are implemented or not. All alternatives plus baseline indicate a decrease in frequency of flood control releases and flow amounts. The potential effects of interim surplus criteria

are likely to be negligible as compared to the declines associated with predicted hydrologic inflows into the system and increased development in the Upper Basin.

The Cienega de Santa Clara is the largest wetland in the delta. This action will not affect the habitat occurring there, as the Cienega is sustained by irrigation return flows from the U.S. The Rio Hardy wetlands occurring at the confluence of the Rio Hardy are also expected to not be affected by the action. These wetlands are also sustained by agricultural runoff from the west side of the Mexicali Valley.

The small isolated areas where the desert pupfish occur, as well as the Cienega de Santa Clara are also expected to not be affected by any of the actions.

3.16.6.2 SPECIAL STATUS-SPECIES OF THE COLORADO RIVER BETWEEN THE SOUTHERLY INTERNATIONAL BOUNDARY AND THE GULF OF MEXICO

Desert pupfish (*Cyprinodon macularius*) – Federally Endangered

The desert pupfish is a small killifish with a smoothly rounded body shape. Adults generally range from 2-3 inches in length. Males are smaller than females and during spawning the males are blue on the head and sides and have yellow edged fins. Most adults have narrow, dark, vertical bars on their sides. The species was described in 1853 from specimens collected in San Pedro River, Arizona. There are two recognized subspecies and possibly a third form (yet to be described). The nominal subspecies, *Cyprinodon macularius macularius*, occurs in both the Salton Sea area of southern California and the Colorado River delta area in Mexico and is the species of concern, herein. The other subspecies is *C.m. eremus* and is endemic to Quitobaquito Spring, Arizona.

The desert pupfish was listed as an endangered species on March 31, 1986. Critical habitat for the species was designated at the time of listing and included the Quitobaquito Spring which is in Organ Pipe Cactus National Monument, and San Felipe Creek along with its two tributaries Carrizo Wash and Fish Creek Wash in southern California. All of the former and parts of the latter were in Federal ownership at the time of listing. Reclamation purchased the remaining private holdings along San Felipe Creek and its tributary washes and turned them over to CFG in 1991. All of the designated critical habitat is now under State or Federal ownership.

Desert pupfish are adapted to harsh desert environments and are extremely hardy. They routinely occupy water of too poor quality for other fishes, most notably too warm and too salty. They can tolerate temperatures in excess of 110° F; oxygen levels as low as 0.1 ppm; and salinity nearly twice that of sea water (over 70,000 ppm). In addition to their absolute tolerance of these parameters, they are able to adjust and tolerate rapid, extreme changes to these same parameters (Marsh and Sada

1993). Pupfish have a short life span, usually only 2 years, but they mature rapidly and can reproduce as many as three times during the year.

Desert pupfish inhabit desert springs, small streams, creeks, marshes and margins of larger bodies of water. The fish usually inhabit very shallow water, often too shallow for other fishes. Present distribution of the subspecies *C. m. macularius* includes natural populations in at least 12 locations in the United States and Mexico, as well as over 20 transplanted populations.

One of the natural populations in Mexico is in the Cienega de Santa Clara, a 100,000 acre bowl on the Colorado River delta 60 miles south of the U.S./Mexico border. The area is about 90 percent unvegetated salt flats with a number of small marsh complexes along the eastern edge of the bowl where it abuts an escarpment. The area is disconnected from both the Colorado River and the Gulf (Sea of Cortez), however extreme high tides result in the lower half of the bowl becoming inundated to a level of one foot or less of salt water from the gulf. The marsh areas on the east side are small and are spring fed. The largest marsh complex is on the northeast side where two agricultural drains provide relatively fresh water inflows. The desert pupfish occur in a number of these marsh complexes.

Reclamation biologists discovered this population of desert pupfish in 1974 during preproject investigations for a feature of the Colorado River Basin Salinity Control Project. At that time, the Cienega was being fed by agricultural return flows from the Riito Drain in Mexico which provided about 35 cfs flow. The project feature being investigated was construction of a bypass canal for drain water from WMIDD.

Desert pupfish were found in the marsh along with mosquitofish, sailfin mollies, carp and red shiners. The bypass canal was completed in 1978 and provided a steady flow of over 150 cfs to the marsh. Based upon aerial surveys, the added inflow caused the marsh to grow from an estimated 300 acres of vegetated area in 1974 to roughly 10,000 acres in 1985. Recent aerial surveys show that while the inflows have continued, the marsh has not continued to grow in size. Desert pupfish continue to exist in the marsh. The fish tend to inhabit the shallow edges of the marsh in vegetated areas. Desert pupfish from the Cienega were transported to Dexter National Fish Hatchery during May 1983, and many of the transplanted populations in the United States are of this subspecies and stem from this initial transplant.

Desert pupfish would not be expected to be affected by the interim surplus criteria. The main population exists in the Cienega de Santa Clara which is not directly connected to the lower Colorado River. The other populations of desert pupfish are not found proximate to the Colorado River.

Vaquita (*Phocaena sinus*)

The Vaquita is a small porpoise and is widely believed to be the most endangered marine cetacean in the world (Klinowska 1991; Taylor and Gerrodette 1993). It is also the only endemic species of marine mammal from the Gulf.

The Vaquita is very similar in external morphology to the harbor porpoise (*Phocaena phocaena*). Based on a very small sample and a maximum recorded total length of about 5 feet, the Vaquita may be the smallest of all the delphinoids (Brownell et al. 1987). The pectoral fins are larger and the dorsal fin is higher proportionally to the body length than in any other extant porpoise species (Brownell et al. 1987).

The coloration of adult vaquitas is unique. On the dorsal portion, the color is dark gray, the sides are pale gray, and the ventral surface is white with some pale-gray elongated spots. The porpoise has a large, dark eye spot and lip patches that contrast with the gray background (Ramirez 1993).

Little is known about the reproductive biology of the species. It has been suggested that calving occurs in the spring and mating in late spring or soon thereafter (Vidal 1990). Food habits are also practically unknown; Fitch and Brownell (1968) reported small fish such as grunt (*Orthopristis reddingi*) and croaker (*Bairdiella icistia*) from stomach contents and Brownell (1982) also reported squid.

The geographic distribution of the Vaquita appears to be confined to the upper Gulf, representing the most restricted range for any cetacean species (Ramirez 1993). Sightings outside of this region (south of 30E 45' N latitude) may represent occasional departures by some individuals from the center of distribution (Silber and Norris 1991) or temporary extensions in distribution due to climatic changes (Vidal 1990). The region south of Puerto Penasco, Sonora, Mexico, remains insufficiently monitored to further increase the accuracy of population estimates and to establish the southern limit of the geographic range of the species (Ramirez 1993).

The range of the Vaquita overlaps that of the endangered totoaba, to which it may be linked ecologically (Ramirez 1993).

A number of factors make the Vaquita an extremely difficult species to survey; habitat characteristics such as turbid water, fraction of the time spent at the surface, elusive behavior, and its erratic surfacing mode (Ramirez 1993). Despite these difficulties, and biases in collection of survey data, it is clear that the species is rare (between 224 to 855 individuals) (Barlow et al. in press). Barlow et al. (in press) expect that with current levels of mortality, a low reproductive potential, and a low population estimate in 1993 of 224, the species will continue a decreasing trend in abundance into the future.

Ramirez (1993) identified three actual and potential impacts to the Vaquita: incidental mortality caused by fishery activities, reduced Colorado River flows into the Gulf of California and pollution from various sources associated with Colorado River flows into the Gulf.

The potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of flows of freshwater into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions. Estuarine environments are subject to impacts when the delicate balance of fresh vs. salt water ratios change. These impacts may result in changes in food resources at all levels of the food chain. Species at the top of the food chain may experience slightly increased cumulative effects from lowered freshwater into the Gulf and potential impacts from slight increased concentrates of pollutants. However, according to Rojas-Bracho and Urban-Ramirez (no date), the data suggest that pollution and reduced or null freshwater flow from the Colorado River are not significant factors in threatening the immediate survival of the Vaquita, whereas commercial fishing might be the most critical factor affecting continued survival.

Totoaba (*Totoaba macdonaldi*) – Federally Endangered

The totoaba is a fish endemic to the Gulf of California. On May 21, 1979, the totoaba was listed as endangered pursuant to the Endangered Species Act (44 FR 99). This international species was included in this assessment at the suggestion of the Service and a number of public stakeholders.

Totoaba are large schooling fish that undertake a seasonal migration within the Gulf and may live to 25 years of age (Cisneros-Mata et al. 1995). Totoaba are the largest of the sciaenid fish, with a maximum reported weight of over 100 kg and a length of over 2 meters (Flanagan and Hendrickson 1976). Adults spawn in the shallow waters of the Colorado River delta in the upper Gulf where they remain for several weeks before migrating south. Juveniles are thought to emigrate south after spending 2 years in the upper Gulf, which is considered their nursery ground (Flanagan and Hendrickson 1976).

Juvenile fish eat small benthic organisms, mainly crabs and fish, amphipods, and shrimp; adults eat larger more pelagic items, such as sardines and adult crabs (Flanagan and Hendrickson 1976, Cisneros-Mata et al. 1995). Many aspects of the biology and ecology of this species are unknown.

The totoaba is thought to have ranged from the mouth of the Colorado River to Bahia Concepcion on the west coast of the Gulf and to the mouth of the El Fuerte River in the east (Jordan and Everman 1896 cited in Berdegue 1955). Historically,

millions of totoaba migrated north in the spring to spawn at the mouth of the Colorado River (Gause 1969).

The first commercial harvesting of totoaba began in the early 1890s and by 1942, annual catches peaked at 2.3 million kg. In 1975, the catch had declined to 59,142 kg (Lagomarsino 1991). Beginning as early as 1940, the Mexican government imposed restrictions on the commercial fishery for totoaba, and in 1975, the government designated totoaba as endangered and declared an indefinite prohibition on all types of commercial and recreational fishing (Flanagan and Hendrickson 1976).

Despite conservation efforts the totoaba population has continued to decline. Cisneros-Mata et al. (1995) review a variety of human activities that may have affected the totoaba population: prerecruits (egg to 1 year) may have been affected by decreased fresh-water input from the Colorado River, juveniles (1 to 2 years of age) by shrimp harvesting, preadults (3 to 5 years) by sport fisherman, and adults (6 years of age and older) by commercial fishing and poaching.

Despite the closure of the fishery, illegal exploitation continued. It is believed that the incidental catch of juvenile totoaba in the shrimp trawling fishery is the principal factor effecting the recovery of the species (Barrera 1990). Much of the illegal gillnetting for totoaba occurs during the spawning migration. As a result, gravid fish are being fished out of the population.

The potential impacts to this species are much the same as with the Vaquita. It is believed the brackish water interface is necessary for totoaba reproduction.

Southwester Willow Flycatcher (*Empidonax traillii extimus*) – Federally Endangered

Willow flycatchers are found throughout North America and are further divided taxonomically into four subspecies, *E.t. brewseri, E.t. adastus, E. t. traillii,* and *E.t. extimus.* The latter, *E.t. extimus*, the southwestern willow flycatcher, breeds on the Lower Colorado River and its tributaries (McKernan et al 1996, 1997, 1998, 1999, 2000). In January 1992, the Service was petitioned to list the southwestern willow flycatcher, *Empidonax traillii extimus* as an endangered species. In July 1993, the species was proposed as endangered with critical habitat (58FR39495). On February 27, 1995, the Service listed the southwestern willow flycatcher as an endangered species. (60FR10694). There are no recovery plans in place as of June 1996 and the designated critical habitat does not include the lower Colorado River (60FR10694).

As a member of the genus *Empidonax,* Willow Flycatchers are known for the difficulty in identifying individuals to species in the field (Phillips et al. 1964; Peterson 1990; Sogge et al. 1997). The southwestern willow flycatcher is a small bird, approximately 5.75 inches in length, with a grayish-green back and wings,

whitish throat, light grey-olive breast, and pale yellowish body. Two white wing bars are visible. The upper mandible is dark, the lower light. The most distinguishable taxonomic characteristic of the Southwestern Willow Flycatcher is the absent or faintly visible eye ring. The southwestern willow flycatcher can only be positively differentiated in the field from other species of its genus by its distinctive "fitz-bew" song.

Southwestern willow flycatchers nest in riparian habitat characterized by dense stands of intermediate sized shrubs or trees. Most southwestern willow flycatcher nests are located in the fork of a shrub or tree from 4 to 25 feet above the ground (Unitt 1987; Sogge 1997) and almost always contains or are adjacent to water or saturated soil (Phillips et al. 1964; Muiznieks et al. 1994, McKernan 1998). The southwestern willow flycatcher is an insectivore, foraging within and above dense riparian habitat, catching insects in the air or gleaning them from the surrounding foliage. It also forages along water edges, backwaters, and sandbars adjacent to nest sites. Details on specific prey items can be found in Drost et al (1998). On the Lower Colorado River, Southwestern willow flycatchers begin arriving on breeding territories in early-May and continue to be present until August, with some records into early September (McKernan, 1998). Recent studies have documented nest building as early as May 1 (McKernan 1997) and fledging dates as late as September 9 (McKernan 1998).

A long-distance migrant, the southwestern willow flycatcher winters in Mexico from Nayarit and southwestern Oaxaca south to Panama and possibly extreme northwestern Columbia and migrates widely through the southern U.S. occurring as a regular migrant south to the limits of the wintering range (Peterson 1990; Sogge 1997, AOU 1998). Recent field studies in Costa Rica by Koronkiewicz and Whitfield (1999) and studies of museum specimens by Phil Unitt (1999) collaborate previous information on the species' range. One specimen of willow flycatcher captured in Costa Rica during the winter of 1999 was banded at the Ash Meadows National Wildlife Refuge (NWR) in southern Nevada in July 1998 (Koronkiewicz and Whitfield 1999) . The Ash Meadows NWR is within the identified breeding range of this southwestern subspecies and thus the capture in Costa Rica is the most recent confirmed wintering site of *E.t. extimus*. Breeding range for the species as a whole extends as far south as northern Sonora, and northern Baja California (AOU 1998) and north into Canada. Breeding range for the southwestern subspecies of the willow flycatcher, *E. t. extimus*, extends from extreme southern Utah and Nevada, through Arizona, New Mexico, and southern California, but records from west Texas and extreme northern Baja California and Sonora, Mexico remain lacking to date (Unitt 1987). The species has been documented at El Doctor wetlands, Colorado River delta, Sonora, Mexico June 7 and 8, 1999 (Huerta, University of Arizona, pers. comm.). This sighting confirms the area is used for migration, but does not confirm breeding. The presence of the subspecies after June 15 is required to confirm breeding (Sogge et al 1997; Braden and McKernan 1998).

The majority of southwestern willow flycatchers found during the past five years of surveys on the Lower Colorado River have been found in saltcedar *Tamarix ramosissima*, or a mixture of saltcedar and native cottonwood and willow, especially Gooddings willow, *Salix gooddingii*, coyote willow, *S. exigua* and Fremont cottonwood, *Populus fremontii.* Based on available information at the time of this writing, aside from this general description, no clear distinctions can be made based on perennial species composition or foliage height profiles, as to what constitutes appropriate southwestern willow flycatcher habitat. Due to the difficulty in determining the presence of this species in dense habitat, their presence should not be ruled out until surveys have been conducted if habitat meeting the general description given above is present.

Historically, the southwestern willow flycatcher was widely distributed and fairly common throughout its range, especially in southern California and Arizona (Unitt 1987; Schlorff 1990). Nest and egg collections by Herbert Brown suggest that the southwestern willow flycatcher was a common breeder along the lower Colorado River near Yuma in 1902 (Unitt 1987).

Grinnell (1914) also believed that the southwestern willow flycatcher bred along the lower Colorado River due to the similarities in habitat between the lower Colorado River and other known breeding sites. He noted the abundance of southwestern willow flycatchers observed in the willow association and possible breeding behavior. However, the date of his expedition corresponds more to the migration season of the southwestern willow flycatcher with only a small overlap with the beginning of the breeding season.

In 1993, the Service estimated that only 230 to 500 nesting pairs existed throughout its entire range (58FR39495). However, since extensive surveying has been implemented, this number has likely increased, especially on the lower Colorado River where the species was thought to have been extirpated (Hunter et al. 1987; Rosenberg et al. 1991; McKernan 1999). Sixty four nesting attempts were documented on the lower Colorado River from southern Nevada to Needles, California in 1998 (McKernan 1999).

Several factors have caused the decline in southwestern willow flycatcher populations. Extensive areas of suitable riparian habitat have been lost due to river regulation and channelization, agricultural and urban development, mining, road construction, and overgrazing (Phillips et al. 1964; Johnson and Haight 1984; Unitt 1987; Rosenberg et al. 1991; Sogge et al. 1997). The total acreage of riparian vegetation has changed little in the last 20 years (Anderson and Ohmart 1976; Younker and Anderson 1986.), although there is less native vegetation and more non-native present (Rosenberg 1991). The most recent estimate of historical, potentially suitable willow flycatcher habitat as delineated from 1938 aerial photography from the Grand Canyon to Mexico is 89, 203 acres (USBR 1999). The

total amount of occupied and potentially suitable but unoccupied habitat for willow flycatchers along the lower Colorado River is 15, 290 acres (USBR 1999). In December, 1998, biologists from the Bureau of Reclamation, San Bernardino County Museum, and the Upper Gulf of California and Colorado River delta Biosphere Preserve conducted an aerial survey of the Rio Hardy and the Colorado River to determine potentially suitable southwestern willow flycatcher breeding habitat. Results of this survey indicate suitable habitat is present in the vicinity of Campo Mosqueda and Cucapa El Mayor and San Luis, Sonora along the Rio Colorado.

Southwestern willow flycatchers utilize dense riparian habitat with moist soil or standing water present. Flood control releases are the only condition under which riparian habitats are established in the delta and a high ground water table is needed to maintain this habitat. Therefore, the potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of excess flows into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.

Yuma Clapper Rail (*Rallus longirostris yumanensis*) – Federally Endangered

Yuma clapper rails are found in emergent wetland vegetation such as dense or moderately dense stands of cattails (*Typha latifolia* and *T. domingensis*) and bulrush (*Scirpus californicus*) (Eddleman 1989; Todd 1986). They can also occur, in lesser numbers, in sparse cattail-bulrush stands or in dense reed (*Phragmites australis*) stands (Rosenberg et al. 1991). The most productive clapper rail areas consist of a mosaic of uneven-aged marsh vegetation interspersed with open water of variable depths (Conway et al. 1993). Annual fluctuation in water depth and residual marsh vegetation are important factors in determining habitat use by Yuma clapper rails (Eddleman 1989).

Yuma clapper rails may begin exhibiting courtship and pairing behavior as early as February. Nest building and incubation can begin by mid-March, with the majority of nests being initiated between late April and late May (Eddleman 1989, Conway et al 1993). The rails build their nests on dry hummocks, on or under dead emergent vegetation and at the bases of cattail or bulrush. Sometimes they weave nests in the forks of small shrubs that lie just above moist soil or above water that is up to about 2 feet deep. The incubation period is 20-23 days (Ehrlich et al 1988, Kaufman 1996) so the majority of clapper rail chicks should be fledged by August. Yuma clapper rails nest in a variety of different micro habitats within the emergent wetland vegetation type, with the only common denominator being a stable substrate. Nests can be found in shallow water near shore or in the interior of marshes over deep water (Eddleman 1989). Nests usually do not have a canopy overhead as surrounding marsh vegetation provides protective cover.

Crayfish (*Procambarus clarki*) are the preferred prey of Yuma clapper rails. Crayfish comprise as much as 95 percent of the diet of some Yuma clapper rail populations (Ohmart and Tomlinson 1977). Availability of crayfish may be a limiting factor in clapper rail populations and is believed to be a factor in the migratory habits of the rail (Rosenberg et al. 1991). Eddleman (1989), however, has found that crayfish populations in some areas remain high enough to support clapper rails all year and that seasonal movement of clapper rails can not be correlated to crayfish availability.

One issue of concern with the Yuma clapper rail is selenium. Eddleman (1989) reported selenium levels in Yuma clapper rails and eggs and in crayfish used as food were well within levels that will cause reproductive effects in mallards. Rusk (1991) reported a mean of 2.24 ppm dry weight selenium in crayfish samples from six lower Colorado River backwaters from Havasu National Wildlife Refuge, near Needles, CA to Mittry Lake, near Yuma, AZ. Over the past decade, there has been an apparent two to five fold increase in selenium concentrations in crayfish, the primary prey species for the Yuma clapper rail (King et al 2000). Elevated concentrations of selenium (4.21- 15.5 ppm dry weight) were present in 95 percent of the samples collected from known food items of rails. Crayfish from the Cienega de Santa Clara in Mexico contained 4.21 ppm selenium, a level lower than those in the U. S., but still above the concern threshold. Recommendations from this latest report on the subject conclude that if selenium concentrations continue to rise, invertebrate and fish eating birds could experience selenium induced reproductive failure and subsequent population declines (King et al 2000).

Yuma clapper rail may be impacted by man-caused disturbance in their preferred habitat. In recent years the use of boats and personal watercraft has increased along the lower Colorado River. This has led to speculation that the disturbance caused by water activities such as those may have a negative impact on species of marsh dwelling birds.

This subspecies is found along the Colorado River from Needles, California, to the Gulf, at the Salton Sea and other localities in the Imperial Valley, California, along the Gila River from Yuma to at least Tacna, Arizona, and several areas in central Arizona, including Picacho Reservoir (Todd 1986; Rosenberg et al. 1991). In 1985, Anderson and Ohmart (1985) estimated a population size of 750 birds along the Colorado River north of the International Boundary. The Service (1983) estimated a total of 1,700 to 2,000 individuals throughout the range of the subspecies. Based on call count surveys, the population of Yuma clapper rail in the United States appears to be holding steady (Service, Phoenix, Arizona, unpublished data). Due to the variation in surveying over time, these estimates can only be considered the minimum number of birds present (Eddleman 1989; Todd 1986).

The range of the Yuma clapper rail has expanded in the past 25 years and continues to do so (Ohmart and Smith 1973; Monson and Phillips 1981; Rosenberg et al. 1991, SNWA 1998, McKernan 1999,), so there is a strong possibility that population size may increase. Yuma clapper rails are known to expand into desired habitat when it becomes available. This is evidenced by the colonization of the CFG Finne-Ramer habitat management unit in Southern California. This unit was modified to provide marsh habitat specifically for Yuma clapper rail and a substantial resident population exists there. There is also recent documentation of the species in Las Vegas Wash, Virgin River and the lower Grand Canyon (SNWA 1998; McKernan 1999)

A substantial population of Yuma clapper rail exists proximate to the Colorado River delta in Mexico. Eddleman (1989) estimated a total of 450 to 970 Yuma clapper rails were present there in 1987. The birds were located in the Cienega, Sonora, Mexico (200-400 birds), along a dike road on the delta proper (35-140 birds), and at the confluence of the Rio Hardy and Colorado River (200-400 birds). Piest and Campoy (Arizona Game and Fish Dept, Yuma, Arizona and Upper Gulf of California and Colorado River delta Biosphere Reserve, unpublished report) detected a total of 240 birds responding to taped calls in the Cienega. From these data, they estimate a total population of around 5,000 rails in the approximately cattail habitat the Cienega.

Crayfish were introduced into the lower Colorado River about 1934. This food source and the development of marsh areas resulting from river control such as dams and river management helped to extend the breeding range of the Yuma clapper rail. The original range of the Yuma clapper rail was primarily the Colorado River delta. The southernmost confirmed occurrence of Yuma clapper rail in Mexico was three birds collected at Mazaltan, Sinaloa; Estero Mescales, Nayarit; and inland at Laguna San Felipe, Puebla (Banks and Tomlinson 1974).

Yuma clapper rail were thought to be a migratory species, the majority of them migrating south into Mexico during the winter, with only a small population resident in the United States during the winter. Eddleman (1989) concluded the Yuma clapper rail was not as migratory as once thought and estimated approximately 70 percent remained in or near their home range during the winter.

A Recovery Plan was implemented in 1983 for the Yuma clapper rail. The criteria for downlisting of the species states there must be a stable breeding population of 700-1000 individuals for a period of 10 years. Other goals to be met include:

- Clarifying the breeding and wintering status in Mexico.
- Obtaining an agreement with Mexico for management and preservation of the species.

- Development of management plans for Federal and State controlled areas where the rails are known to breed.

Written agreements are made with Federal and State agencies to protect sufficient wintering and breeding habitat to support the proposed population numbers.

As of 1994 not all of the above recovery actions had been met, and the Service recommended the Yuma clapper rail remain classified as endangered.

The potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of flows of freshwater into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions. Yuma clapper rail use dense stands of cattail marsh habitat in the delta. Changes in water availability that helps to maintain this habitat would have the potential for impacting the species by slightly lowering the groundwater and surface water and possibly altering the prey availability.

Yellow-billed Cuckoo (*Coccyzus americanus*) – Federally Proposed Endangered, State Endangered-California, State Protected-Nevada

Cuckoos are riparian obligates, found along the lower Colorado River in mature riparian forests characterized by a canopy and mid-story of cottonwood, willow and saltcedar, with little ground cover (Haltermann 1998). Within the area of interest, cuckoos occur during the breeding season from interior California and the lower parts of the Grand Canyon, and Virgin River delta in southern Nevada (McKernan 1999) south to Southern Arizona, Baja California,, Chihuahua, Choahuila, Nuevo Leon, and Tamaulipas and have been recorded breeding as far south as Yucatan. The species winters in the southern United States, and from northern South America to Northern Argentina (AOU 1998, Hughes 1999). Cuckoos are largely insectivorous, with cicadas, (*Diceroprocta apache*) comprising 44.6 percent of their diet on the Bill Williams River National Wildlife Refuge (Halterman 1998). The Bill Williams River is a tributary of the lower Colorado River near Parker, AZ. The lower 10 miles of this tributary is designated as the Bill Williams River National Wildlife Refuge, comprised of a large expanse of native cottonwood and willow habitat, interspersed with saltcedar. This area is believed to contain the largest cuckoo population in the lower Colorado River Valley.

In February 1998, the western subspecies of the yellow-billed cuckoo, *C. a. occidentalis,* was petitioned for listing under the ESA. The Service determined that the petition presented substantial scientific or commercial information to indicate that the listing of the species may be warranted (Service 2000). Surveys for this species were conducted throughout Arizona in 1998 and 1999 (Corman and Magill 2000), and have been conducted on the Bill Williams River NWR, beginning in 1993

(Halterman 1994). In 2000, surveys have been expanded into southern Nevada and also include the Bill Williams River and Alamo Lake in Arizona.

As presented in Table 3.16-3, the numbers of cuckoos detected have fluctuated widely since surveying began in 1993 on the Bill Williams River. In 1997, on the Kern River in California, numbers of cuckoos detected declined in a similar manner as that seen on the Bill Williams River during the same time period, 1994-1997. On the Kern River, cuckoos detected declined from 14 pairs in 1996 to 6 pairs in 1997 (Halterman 1998); on the Bill Williams, cuckoos detected declined from 26 pairs to 12 pairs. In 1990, numbers were back up on the Bill Williams, but down again in 1999. In other areas of the lower Colorado River in the U.S., Cuckoos have been detected as far south as Gadsden and Imperial National Wildlife Refuge (Corman and Magill 2000, McKernan 1999).

Table 3.16-3

Yellow-billed Cuckoos Survey Results

Survey Results BWRNWR	1993	1994	1997	1998	1999
Pairs Detected	22	26	12	20	6
Single Birds Detected	11	14	11	11	8
Nests Found	6	5	3	4	2
Date First Pair Encountered	25 Jun	27 Jun	20 Jun	18 Jun	5 Jun

Without complete and standardized surveys, it can only be speculated that the birds are present in the Colorado River delta in Mexico. The range of this species includes the Colorado River delta (AOU 1998).

Yellow-billed Cuckoos utilize mature riparian habitat with some mid- and under-story present. Flood control releases are the only condition under which riparian habitats are established in the delta, and a high ground water table is needed to maintain this habitat. The potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the excess flows of freshwater into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.

California black rail (*Laterallus jamaicensis coturniculus*) – Federal Species of Concern, State Threatened – California

Black rails are most often found in shallow salt marshes, but also utilize freshwater marshes, wet meadow-like areas and riparian habitat along rivers. Both males and females of this species exhibit slate black plumage with narrow, white barring on the back and flanks and a chestnut nape with a very short tail and a small black bill. Juveniles look much the same as adults, but their eyes are brown or olive rather than red like those of adults. Full grown birds measure about 5 to 6 inches in length.

The life history and status of the California black rail are poorly known (Wilbur 1974, Todd 1977, Evens et al. 1991), due to its secretive nature and tendency to inhabit densely vegetated marshes. The preferred habitat of the California black rail is characterized by minimum water fluctuations that provide moist surfaces or very shallow water, gently sloping shorelines, and dense stands of marsh vegetation (Repking and Ohmart 1977). California black rails are most often found in areas where cattails (*Typha* sp.) and California bulrush (*Scirpus californicus*) are the predominant plant species (Rosenberg et al. 1991). While California black rails are more commonly associated with cattail and bulrush, habitat structure as described above was more effective than plant composition in predicting California black rail use of habitat. Water depth appeared to be a limiting factor, as the California black rails prefer shallow water (Flores and Eddleman 1995). The breeding season along the lower Colorado River extends from April through July (Flores and Eddleman 1995). California black rails eat mainly aquatic insects and some seeds (Ehrlich 1988, Rosenberg et al. 1991, Kaufmann 1996).

This subspecies of California black rail occurs along the California coast from Tomales Bay in Marin County, south to San Diego and extreme northern Baja California and Veracruz. It also occurs in interior California around the Salton Sea and along the Colorado River from Imperial National Wildlife Refuge south to the International Boundary (Peterson 1990; Rosenberg et al., 1991, AOU 1998). The species has also been recorded as recently as 1997 at the Bill Williams River National Wildlife Refuge and at Havasu National Wildlife Refuge. Historically, the California black rail primarily occurred along the California coastline. In the mid-1970s, an estimate of between 100 and 200 individuals was given for the area between Imperial National Wildlife Refuge and Mittry Lake, Arizona (Repking and Ohmart 1977). No quantitative data are yet available on the current populations of the California black rail along the lower Colorado River or in the Colorado River delta area, although the species is present in both areas. Surveys are currently underway on the Lower Colorado River between Havasu National Wildlife Refuge and Yuma, Arizona. Various agencies, including BLM and the Service, survey California black rail concurrently during surveys for the Yuma clapper rail.

California black rails utilize very shallow marshes containing cattail and bulrush and are sensitive to small changes in water levels. Some surface water is necessary for their presence to occur. Changes in water availability that would have the potential for impacting the species include lowering the groundwater and surface water and possibly altering the prey availability. Therefore, the potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of flows of freshwater into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.

Elf Owl (*Micrathene whitneyi*) – State Endangered – California

The Elf Owl is near the limit of its northwestern (central Riverside Co., California) range along the Colorado River (AOU 1998,) and, as such, has never been abundant here (Rosenberg 1991). However, declines associated with loss of trees containing suitable cavities for nesting and loss of appropriate foraging habitat are indicated (Rosenberg 1991). Elf Owls utilize abandoned woodpecker cavities or natural cavities for nesting. Declines in populations of woodpeckers on the lower Colorado River have been documented as well (Rosenberg 1991). In other parts of its range, namely central Arizona, saguaro cacti are more often used by Elf Owls than on the lower Colorado River. Although saguaros are utilized along the Colorado River to some degree (as well as cottonwood, willow and mesquites), this cacti species is at its northwestern range, not extending further north than Fort Mohave, Arizona on the river. Therefore, it is less abundant in the Mohave Desert than in the Sonoran Desert.

To the south in Mexico, the winter range of Elf Owls is from southern Sinaloa, Michoacan, Morelos and Guerrero, Pueblo and northwestern Oaxaca (AOU 1998). Breeding occurs in Coahuila and Nuevo Leon south to Sonora, Guanajuato and Puebla and in southern Baja California (AOU 1998). Elf Owls have been documented during breeding season as far south as Picacho, Imperial Co., California as recently as 1998 (McKernan 1999). Recent field documentation of breeding for this species in the Colorado River delta are not available at this time. However, there is suitable habitat present there (Briggs and Cornelius 1998 Glynn 1999), and similar species, such as the great horned owl, have been recently documented there (Huerta, University of Arizona, pers. comm). As with the willow flycatcher, if suitable habitat is present, the presence of the species should not be ruled out until adequate surveys have been conducted.

Elf Owls utilize mature riparian habitat with trees large enough to contain either natural cavities or cavities excavated by woodpeckers. Flood control releases are the only condition under which riparian habitats are established in the delta, and a high ground water table is needed to maintain this habitat. Therefore, the potential

impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of excess flows into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.

Bell's Vireo (*Vireo bellii arizonae*) – State Endangered – California

Bell's Vireo, a small, insectivorous grayish to greenish-yellow bird is found in riparian habitat along the lower Colorado River and its tributaries in dense brush, including willow, cottonwood, mesquite and saltcedar. In the vicinity of the lower Colorado River, the species breeds from interior California, southern Nevada and northwestern and east-central Arizona to northern Baja California, south through Sonora, southern Durango, Zacatecas, and southern Tamaulipas. During winter, it can be found as far south as north-central Nicaragua (AOU 1998). Bell's Vireos experienced a decline in southern California and throughout the lower Colorado River beginning in the 1950s. Between 1974-1984, breeding was documented at only a few locations on the river, all north of Cibola NWR (Rosenberg et al 1991). Loss of habitat due to extensive flooding in 1983 is thought to have contributed to this decline. Stable populations in other parts of its range, including northern Mexico, prevented the species from being listed as endangered after being proposed in 1981 (Rosenberg et al 1991).

Without standardized surveys, it is difficult to determine the species' current abundance. During 1994-1995, Bell's Vireos were detected on point counts during the breeding season at all four of the lower Colorado River refuges, with frequencies ranging from 0 - 4 percent of bird detections made (Lynn and Averill 1996). The species appears to be recovering from previous lows as its presence has been documented recently as far north as Meadow Valley Wash and the lower Virgin River in southern Nevada and below Imperial Dam to the south (McKernan 1999) and is one of the most frequently heard species throughout the area. Habitat does exist across the border in Mexico similar to what is utilized by this species in the United States and observations of this species there confirm its presence during the breeding season (Huerta, University of Arizona, pers. comm.)

Bell's vireos utilize mature riparian habitat with dense saltcedar, mesquite cottonwood and willow stands present. Flood control releases are the only condition under which riparian habitats are established in the delta and a high ground water table is needed to maintain this habitat. Therefore, the potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of excess flows into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.

Clark's Grebe (*Aechmophorus clarkii*) – Species of Special Concern – Arizona

Extensive knowledge of this species in the Colorado River delta in Mexico is not available, so any speculation on its abundance and status there is based on known available habitat only. Clark's grebes utilize marshes, lakes and bays with emergent vegetation and can also be found on inland reservoirs and rivers (AOU 1998, Kaufman 1996, Rosenberg 1991). In the area of interest, the species is resident year round in Mexico south to Guerrero and western Puebla, and north of Mexico on lakes that do not freeze in winter, and winters from central California south to southern Baja California (AOU 1998). Clark's grebes have been documented at the Cienega de Santa Clara (Huerta, University of Arizona, pers. comm.). The species is present during winter on the lower Colorado River and has been documented nesting in cattail marshes on the lower Colorado River at Havasu National Wildlife Refuge, near Needles, CA in recent years (M. Connolly Havasu National Wildlife Refuge, pers.comm).

Threats to this species include recreation during breeding, as increased boating activity can swamp nests. In addition, as with other fish-eating species on the river, bioaccumulation of selenium in grebes is a potential threat both in the U.S. and in Mexico (King et al 2000).

Clark's grebes utilize marsh habitat for nesting and some surface water is needed to maintain this habitat. They also require open water and a prey base of small fish and crustaceans for foraging. These habitats may be slightly impacted due to the potential impacts resulting from the interim surplus criteria. The potential impacts resulting from the interim surplus criteria would be due to the slight decrease in the frequency of flows of freshwater into the Gulf under the Six States, California and Shortage Protection alternatives compared to those under the baseline conditions. Under the Flood Control Alternative, the potential impacts would be due to the slight increase in the frequencies compared to those under the baseline conditions.