United States Department of the Interior

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Consultation No. 02ENNM00-2012-F-0016
Previous Consultation No. 2-22-00-I-025

Gilbert G. Anaya, Chief
Environmental Management Division (Bldg C, Suite 310)
International Boundary and Water Commission
4171 N. Mesa Street
El Paso, Texas 79902

Dear Mr. Anaya:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological and conference opinion (Opinion) on the effects of the United States Section of the International Boundary and Water Commission (IBWC) proposed action of an Integrated Land Management Alternative for Long-Term Management (Land Management Alternative) of the Rio Grande Canalization Project (RGCP) in Sierra County and Doña Ana County, New Mexico, and El Paso County, Texas. This Opinion concerns the effects of the proposed Land Management Alternative on the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher) and on the flycatcher's proposed critical habitat. Your request for formal consultation, in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), was received on November 2, 2011. No permit or license applicants (16 U.S.C. 1532 and 1536(3)) were identified by IBWC as part of this consultation.

This Opinion is based on information submitted in the November 2, 2011, Land Management Alternative Biological Assessment (BA; SWCA Environmental Consultants 2011), Record Of Decision (IBWC 2009), Conceptual Restoration Plan (U.S. Army Corps of Engineers (USACE) et al. 2009), conference calls or meetings between IBWC and the Service, supplemental information provided by e-mail, and other sources of information available to the Service. The administrative record for Consultation No. 02ENNM00-2012-F-0016 is on file at the Service's New Mexico Ecological Services Field Office in Albuquerque, New Mexico.

The Service concurs with IBWC's findings that the proposed action "may affect, but is not likely to adversely affect" Aplomado falcon (*Falco femoralis*) or least tern (*Sternula antillarum*). As documented in your BA, and with additional IBWC commitment to allow these species to leave on their own volition when encountered prior to or during project activities, the Service finds that the proposed action will have insignificant and discountable effects to least tern and Aplomado falcon. Those conservation measures identified by IBWC described in the Service's 2004 concurrence letter for the proposed action (USFWS 2004) that address livestock management, mowing practices, and soil erosion remain in effect. If monitoring or other information results in modification or the inability to complete all aspects of the proposed action, consultation should be reinitiated. Please contact the Service if: 1) future surveys detect listed, proposed, or candidate species in habitats where they have not been previously observed; 2) the proposed action changes or new information reveals effects of the proposed action to listed species that have not been considered in this analysis; or 3) a new species is listed or critical habitat designated that may be affected by the action. Consultation for individual projects or river management plans may also be necessary during project planning if circumstances are different from those described in the BA. The remainder of this Opinion addresses direct, indirect, and cumulative effects of the proposed action on the flycatcher and its proposed critical habitat.

No critical habitat is currently designated for the flycatcher within the action area; however, critical habitat has been proposed for designation and this Opinion assesses effects of the proposed action on proposed critical habitat. The Service does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USDI Fish and Wildlife Service (CIV No. 03-35279) to complete the following analysis with respect to critical habitat. This consultation analyzes the effects of the action and its relationship to the function and conservation role of the physical and biological features of flycatcher critical habitat to determine whether the current proposed action destroys or adversely modifies flycatcher critical habitat.

BIOLOGICAL AND CONFERENCE OPINION

DESCRIPTION OF PROPOSED ACTION

The Final Environmental Impact Statement (FEIS; IBWC 2004), the Record of Decision (ROD; IBWC 2009), subsequent communications between the Service and IBWC, and the IBWC's BA (SWCA Environmental Consultants 2011) fully described of the purpose and need for the proposed action, the environmental consequences, details of the Land Management Alternative, and effects determinations for listed species and proposed critical habitat. The proposed action includes levee and levee road management, improvement and rehabilitation of certain levees, floodwall construction, floodway vegetation management including elimination of livestock grazing leases and mowing modifications, planting and maintaining riparian vegetation in up to 30 sites along the RGCP, and sediment management along the river channel and at irrigation facilities. Specifically, the proposed action includes maintenance of levees, and the construction or rehabilitation of approximately 105 miles (mi) or 169 kilometers (km) including the Hatch West levee from Salem Bridge to Bignell Arroyo, the Mesilla Phase 1 Project area near Mesilla Dam, the Mesilla Phase 2 levee Project from Radium Springs to Mesilla Dam, the Canutillo Phase 1 Project area near Vado Bridge, and the Sunland Project area from Borderland Bridge to the El Paso Electric Company power plant (BA). However, IBWC projects including those in the Vado Reach, the Courchesne Reach, the Nemexas Reach, or the Canutillo Reach have not been fully described or effects analyzed and therefore, were not evaluated in this Opinion. Also not included in this Opinion, were analyses of any potential effects from the River Management Plan (IBWC 2003), or dredging activities near Tonuco Drain, Montoya Drain, or Rincon Arroyo, and other non routine dredging projects.

The following text is further description of the proposed action and relevant material summarized from the BA, other sources cited, and any IBWC commitments that pertain to this consultation. The proposed action describes a plan for 30 distinct sites along the lower Rio Grande that will variously include removal of existing river bank protection, bank destabilization and cessation of maintenance dredging activities to encourage future channel migration to overbank, excavation, and native vegetation plantings to increase the frequency of flooding and improve the success and mix of riparian vegetation and riparian restoration efforts in those sites (BA; and see USACE et al. 2009). The selected sites for restoration were spread throughout the RGCP with 11 sites within the Rincon Valley between Percha Dam and Selden Canyon, 5 sites within Selden Canyon, and the remaining 14 sites spread throughout approximately 62 mi (100 km) of the RGCP within the Mesilla Valley between Selden Canyon and American Dam (Figure 1). The Restoration Sites will range from 3 to 90 ac (1.2 to 36.4 ha) in size with a total area of about 553 ac (224 ha) (BA or see USACE et al. 2009). Several habitat types were targeted for restoration including riparian forests, woodlands, mesquite (*Prosopis* spp) scrub-shrub, meadows and grasslands, savanna habitat, and dense riparian shrub habitat that will benefit flycatcher breeding and migration, and other riparian wildlife species.

The BA describes the name and location of the 30 restoration sites (Figure 1), the specific restoration prescriptions (e.g., removing riprap, destabilizing and lowering the riverbank opposite the arroyo mouth, and ceasing channel dredging for aquatic habitat restoration, vegetation prescriptions for the type of riparian habitat designed); a water budget for each site comprising an offset for an increase in depletions or an allocation for supplemental irrigation; and an estimated average water budget of 9,000 acre-feet (ac-ft; or 11,101, 337 cubic meters, m^3) for a restoration flows that include periodic environmental peak release of 3,500 cubic feet per second (cfs; 99 cubic meters per second; cms) from Caballo Lake (once every three to five years) between April 24 and June 7 to enhance river floodplain hydrologic connectivity at 12 of the 30 sites, including 7 of the 12 sites targeted for restoration with dense riparian shrub that may be suitable as flycatcher breeding habitat.

River flow in the Rio Grande is appropriated by individuals, corporations, and government entities that own rights to withdraw and use water within a specific set of allocations and priorities (Graf et al. 2002). Water rights may be leased or bought and sold, offering the opportunity in some cases for acquisition of water for use on riparian restoration sites to be used by wildlife. The acquisition of water rights for water use at proposed Restoration Sites is expected to rely to some extent on arrangement of water rights and restoration flows (IBWC 2009).

Therefore, a critical element of the proposed action is the Environmental Water Transaction Framework (Water Transfer Framework). Water delivery and flood control will remain the core mission of the RGCP. However, IBWC (2009) can use water to enhance river ecosystem processes and function as well as restore riparian habitats without adversely impacting flood control or water deliveries and the associated depletions will be offset through the Water Transfer Framework. The proposed riparian Restoration Sites were evaluated to estimate the net change in water depletion on an annual basis resulting from an increase in evapotranspiration, evaporation, infiltration, and floodplain storage losses (USACE et al. 2009). Supplemental water to irrigate some restoration sites was considered necessary to increase productivity and sustain native plant communities over the long term. Other restoration sites may not require but could benefit from supplemental irrigation water as well as restoration flows. Supplemental water would be applied to the sites through existing or modified irrigation canals, laterals, spillways and drains, river pumping and/or groundwater pumping. A periodic restoration flow release was identified for enhancing river-floodplain hydrologic connection during spring. Insufficient information was available on the availability and frequency of restoration flow releases acquired through the Water

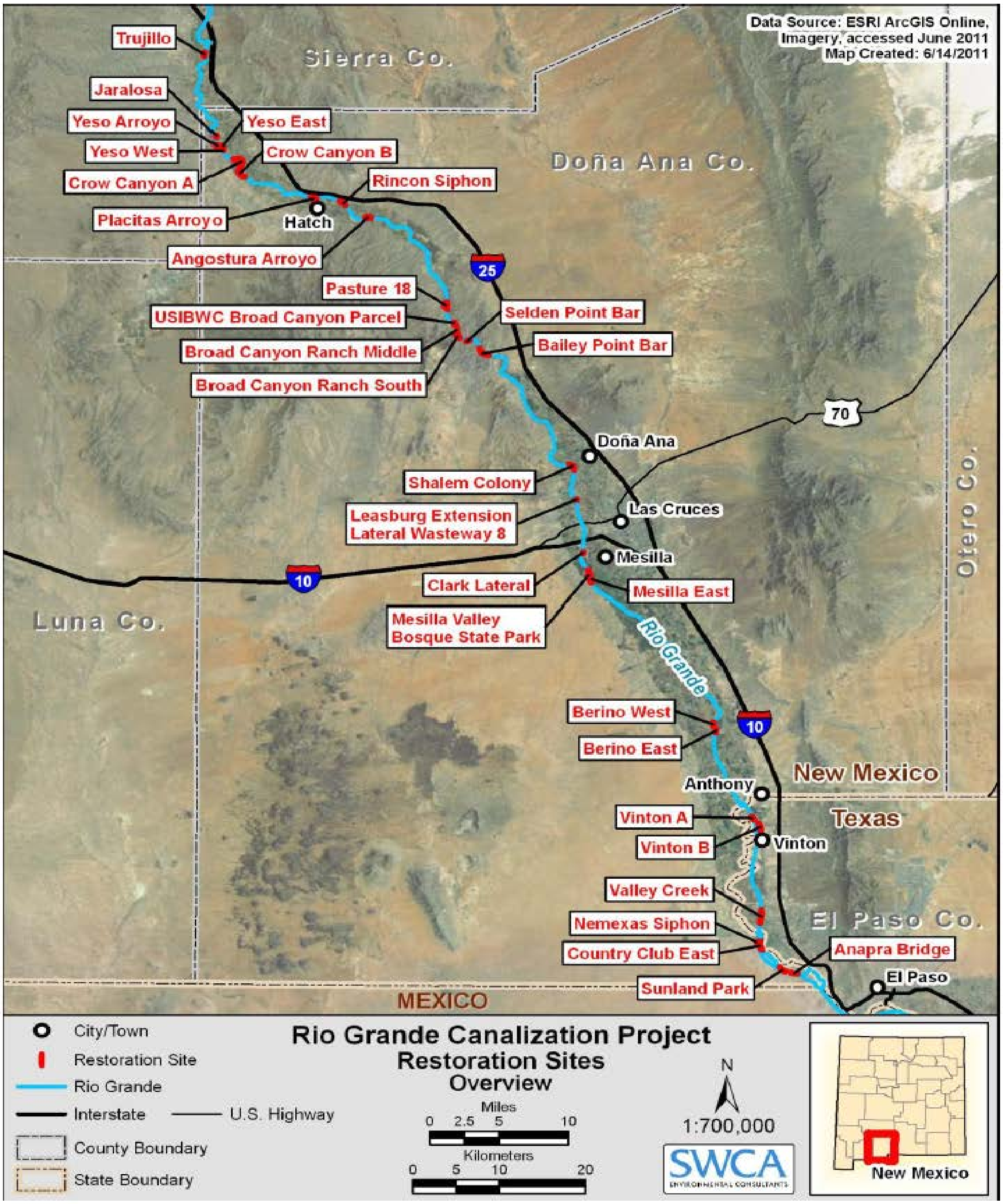

Figure 1. Location of IBWC Restoration Sites on the Rio Grande Canalization Project.

Transfer Framework so as to evaluate potential impacts on riparian habitat conditions and flycatcher nesting success. In addition to the Water Transfer Framework there may be additional agreements and contracts necessary in order to achieve an appropriate timing, volume, and available water sources necessary for achieving the desired goals. Additionally, restoration flows could affect or depend upon operations and management of the Elephant Butte and Caballo Dams. Therefore, additional ESA consultation may be prudent with federal agencies, such as U.S. Bureau of Reclamation (USBR) and IBWC, as well as other affected stakeholders. For this consultation, the Service worked with IBWC and others to develop the conservation measures necessary to protect and conserve flycatcher habitat through a flycatcher management plan without regard to the frequency or availability of restoration flows, although restoration flows are anticipated as part of the proposed action as well as part of the Water Transfer Framework and its planning.

Surface water for these activities will be leased or acquired through a cooperative Water Transfer Framework with Elephant Butte Irrigation District (EBID) or El Paso County Water Improvement District#1 (EPCWID) and willing water rights holders. In order for EBID and EPCWID water to be delivered to the Restoration Sites, the lands would need to be located within irrigation district service boundaries, which may be extended at the discretion of a cooperating irrigation district (e.g., EBID or EPCWID) board of directors if the sites do not currently fall within irrigation service boundaries. The EBID has extended the irrigation service boundaries to include over 3000 acres (ac; 1,214 hectares (ha)) of land located on the east and west banks of the Rio Grande near Selden Canyon.

Surface water for the Restoration Sites will be leased, donated, or water rights permanently acquired and transferred through a EBID or EPCWID board-approved leasing, or voluntary suspension and transfer, or through reclassification. Within a district, all water users receive an equal allocation; with water users sharing equally in times of water shortage, such as during drought. The shortage policy applies equally to all district constituents including any entity who owns or leases water rights for Restoration Sites. EBID, IBWC, Audubon New Mexico, and others have collectively worked on the creation of a voluntary, market-based Water Transfer Framework to benefit riparian restoration and riparian wildlife while fostering novel approaches for beneficial water use in the Lower Rio Grande since 2003 (Audubon New Mexico 2011).

Action Area

This Opinion uses the term ‘Lower Rio Grande’ to refer to the channel of the Rio Grande and its floodplain (within the levees, as applicable) in the Rio Grande-Caballo Watershed (U.S. Geologic Survey (USGS) Hydrologic Cataloging Unit 130301; Seaber et al. 1987) to the junction of the New Mexico, Texas, and Mexico international boundary. This Opinion uses the term ‘Middle Rio Grande’ to refer to the Rio Grande and its floodplain in central New Mexico from Cochiti Dam to Elephant Butte Dam. To clarify the various spatial areas of impact associated with the proposed project activities, the following terms were also used in this Opinion:

- *Restoration Sites*, included those wetted and riparian areas identified in BA, by a site number between 1 to 30, or by letter, and a site name (Figure 1 and Table 1). A site included the area of riparian vegetation planting, and any mechanical activities on this area including site preparation, mowing, bank destabilization, as well as the Rio Grande nearby, and any water transfer facilities used to deliver supplementary water within IBWC boundaries.

- *The Rio Grande Canalization Project* (RGCP) included all areas described in the FEIS (IBWC 2005) as modified by the ROD (IBWC 2009) and the BA.

- *The Lower Rio Grande Management Unit* was as described in the flycatcher Recovery Plan (USFWS 2002), which is contiguous with the Lower Rio Grande described above, but also included the Mimbres River Basin; and,

- *The Action Area* included the Restoration Sites and activities that occur within the RGCP in the Lower Rio Grande (as described above). The proposed action (including riparian restoration) will benefit the ecosystem processes and function of the Rio Grande downstream. However, the effects of those restorations on the Lower Rio Grande below American Dam were considered insignificant as they would no longer be measurable given the changes in riparian vegetation, contributions of agricultural return flows, stormwater runoff, and wastewater discharges within the El Paso/Juarez Valley, as well as the various hydraulic changes associated with the Rio Grande Rectification Project and water diversions (Stotz 2000; Schmidt and Everitt 2000; Fullerton and Batts 2003; USACE 2008). Therefore, the action area was assumed to end at American Dam.

The action area included all areas to be affected directly or indirectly by the proposed action (50 CFR 402.02). In summary, the action area is defined to include the Lower Rio Grande floodplain from Elephant Butte Dam to American Dam, as flycatchers that benefit from the proposed action may seek additional nesting and foraging territories within the Lower Rio Grande Management Unit of the flycatcher Recovery Plan (USFWS 2002) as well as upstream.

Table 1. Restoration site number, name, location on river, acreage, ownership, proposed riparian vegetation treatment, water supply, flycatcher status, potential flycatcher habitat use, cuckoo use, USFWS Priority Category (indicated by number and row shading), and potential expected terriories for the IBWC Land Management Alternative. [Sources: BA, USFWS 2011, Carstenson 2012; priority based on best professional judgement, vegetation types, migration, and acres in proposed critical habitat]

Site Number	Site Name	River Mile	Total Area (acres)	Presumed Land Ownership or Management (no warranty provided for land ownership information below)	Site Within Proposed Flycatcher Critical Habitat ?	Proposed Riparian Vegetation Types (includes acreage of Dense Riparian Shrub suitable for flycatcher breeding habitat)
1	Trujillo	103	18.0	IBWC	Yes	Dense riparian shrub (10 acres)
2	Jaralosa	94.9	4.5	IBWC	Yes	Open riparian woodland
3	Yeso Arroyo	94	10.6	IBWC	Yes	Improved aquatic habitat
4	Yeso East	93.7	9.7	IBWC	Yes	Open riparian woodland
5	Yeso West	93.5	2.5	IBWC	Yes	Improved floodplain habitat
6	Crow Canyon A	92	90.0	IBWC	Yes	Riparian Savanna and Shrubland
7	Crow Canyon B	90.5	25.6	IBWC	Yes	Dense riparian shrub (10.6 acres) and riparian meadow
8	Placitas Arroyo	85	21.8	IBWC	Yes	Improved aquatic habitat
9	Rincon Siphon (4 parcels A, B, C, D)	82.5	18.0	IBWC	Yes	Dense riparian shrub (18 acres)
10	Angostura Arroyo	80	15.4	IBWC	Yes	Improved aquatic habitat

Site Number	Site Name	River Mile	Total Area (acres)	Presumed Land Ownership or Management (no warranty provided for land ownership information below)	Site Within Proposed Flycatcher Critical Habitat ?	Proposed Riparian Vegetation Types (includes acreage of Dense Riparian Shrub suitable for flycatcher breeding habitat)
31	Site # 31	69	88.0	Ownership may change to IBWC	Yes	Dense riparian shrub (14 acres)
12	Pasture 18	68.5	52.0	New Mexico State University	Yes	Improved floodplain habitat
11	IBWC Broad Canyon Parcel (Site replaced #11 Lack)	68	25.8	IBWC	Yes	Dense riparian shrub (4 acres)
13	Broad Canyon Ranch Middle	67	13.8	New Mexico State Parks	Yes	Saltgrass meadow
14	Broad Canyon Ranch South	66.8	20.6	New Mexico State Parks	Yes	Saltgrass meadow
15	Selden Point Bar	66	7.8	IBWC	Yes	Dense riparian shrub (6.9 acres)
16	Bailey Point Bar	64	16.6	Private property	Yes	Not Analyzed in 2012
17	Shalem Colony	50.5	14.2	IBWC	No	Improved floodplain habitat
18	Leasburg Extension Lateral Wasteway 8	47.8	4.1	IBWC	No	Dense riparian shrub (3.1 acres)
19	Clark Lateral	43.5	6.0	IBWC	No	Dense riparian shrub (4.5 acres)

Site Number	Site Name	River Mile	Total Area (acres)	Presumed Land Ownership or Management (no warranty provided for land ownership information below)	Site Within Proposed Flycatcher Critical Habitat ?	Proposed Riparian Vegetation Types (includes acreage of Dense Riparian Shrub suitable for flycatcher breeding habitat)
20	Mesilla Valley Bosque State Park	41.5	31.8	IBWC / New Mexico State Parks / NM Department of Game and Fish	No	Riparian forest habitat, shrubland, meadow and grassland
21	Mesilla East	41	15.8	IBWC	No	Dense riparian shrub (15.8 acres)
22	Berino West	25.5	10.3	IBWC	No	Dense riparian shrub (10.3 acres)
23	Berino East	24.8	9.5	IBWC	No	Dense riparian shrub (5 acres)
24	Vinton A	17	14.7	IBWC	No	Riparian forest habitat
25	Vinton B	16	20.0	IBWC	No	Riparian forest habitat
26	Valley Creek	9	22.0	IBWC	No	Open riparian woodland
27	Nemexas Siphon or Alternative Site	7	16.7	IBWC / Private property	No	Dense riparian shrub (16.7 acres)
28	Country Club East	6.8	29.0	IBWC	No	Riparian forest habitat and woodland
29	Sunland Park	4	28.8	IBWC	No	Riparian woodland
30	Anapra Bridge	3	11.0	IBWC	No	Open riparian woodland

Table 1. Restoration site number, name, location on river, acreage, ownership, proposed riparian vegetation treatment, flycatcher status, potential flycatc flycatcher habitat use, cuckoo use, USFWS Priority Category (indicated by potential expected terriories for t terriories for the IBWC Land Management Alternative. [Sources: BA, based on best professional judge on best professional judgement, vegetation types, migration, and acres in proposed critical habitat]

Site Number	Site Name	Does it need Supplemental Irrigation water? or Benefit from Restoration Flows?	In 2009-11 were there flycatcher territories detected at site or nearby?	Acres Dense Riparian Shrub and Year expected to provide flycatcher breeding habitat?	Does Site Support Migrant Flycatchers? (that is, within 20 miles to next flycatcher habitat in miles)	IBWC and USFWS Flycatcher Habitat Priority (1=high to 4=low)	Potential Future Flycatcher Territories (using average 2.7 acres per territory; if dense riparian shrub habitat)
1	Trujillo	Irrig Yes / Flows No	No	10 acres by 2019	Yes (13 miles)	1	4
2	Jaralosa	Irrig No / Flows Yes	No	No	Yes	3	0
3	Yeso Arroyo	Irrig No / Flows Yes	No	No	No	4	0
4	Yeso East	Irrig Yes / Flows Yes	No	No	Yes	3	?
5	Yeso West	Irrig No / Flows Yes	No	No	No	4	0
6	Crow Canyon A	Irrig No / Flows Yes	No	No	Yes	3	?
7	Crow Canyon B	Irrig No / Flows Yes	Yes	10.6 acres by 2017	Yes (8 miles)	1	4
8	Placitas Arroyo	Irrig No / Flows Yes	No	No	No	4	0
9	Rincon Siphon (4 parcels A, B, C, D)	Irrig No / Flows Yes	Yes	18 acres by 2017	Yes (12 to 14 miles)	1	7
10	Angostura Arroyo	Irrig No / Flows Yes	No	No	No	4	0

Site Number	Site Name	Does it need Supplemental Irrigation water? or Benefit from Restoration Flows?	In 2009-11 were there flycatcher territories detected at site or nearby?	Acres Dense Riparian Shrub and Year expected to provide flycatcher breeding habitat?	Does Site Support Migrant Flycatchers? (that is, within 20 miles to next flycatcher habitat in miles)	IBWC and USFWS Flycatcher Habitat Priority (1=high to 4=low)	Potential Future Flycatcher Territories (using average 2.7 acres per territory; if dense riparian shrub habitat)
31	Site # 31	Irrig No / Flows Yes	Not Analyzed	14 acres by 2017	Yes (1 mile)	1	5
12	Pasture 18	Irrig No / Flows Yes	No	No	No	4	0
11	IBWC Broad Canyon Parcel (Site replaced #11 Lack)	Irrig No / Flows Not Analzed	Yes	4 acres by 2017	Yes (2 miles)	1	1
13	Broad Canyon Ranch Middle	Irrig No / Flows Yes	No	No	Yes	3	0
14	Broad Canyon Ranch South	Irrig No / Flows Yes	No	No	Yes	3	?
15	Selden Point Bar	Irrig No / Flows Yes	Yes	6.9 acres by 2017	Yes (2 to 18 miles)	1	3
16	Bailey Point Bar	Irrig No / Flows Yes	Yes	No	Yes	3	?
17	Shalem Colony	Irrig No / Flows Yes	No	No	Yes	3	?
18	Leasburg Extension Lateral Wasteway 8	Irrig Yes / Flows No	No	3.1 acres by 2019	Yes (4 miles)	2	1
19	Clark Lateral	Irrig Yes / Flows No	No	4.5 acres by 2019	Yes (3 miles)	2	2

Site Number	Site Name	Does it need Supplemental Irrigation water? or Benefit from Restoration Flows?	In 2009-11 were there flycatcher territories detected at site or nearby?	Acres Dense Riparian Shrub and Year expected to provide flycatcher breeding habitat?	Does Site Support Migrant Flycatchers? (that is, within 20 miles to next flycatcher habitat in miles)	IBWC and USFWS Flycatcher Habitat Priority (1=high to 4=low)	Potential Future Flycatcher Territories (using average 2.7 acres per territory; if dense riparian shrub habitat)
20	Mesilla Valley Bosque State Park	Irrig No / Flows Yes	No	No	Yes	3	?
21	Mesilla East	Irrig No / Flows Yes	No	15.8 acres by 2019	Yes (16 miles)	2	6
22	Berino West	Irrig No / Flows Yes	No	10.3 acres by 2019	Yes (1 miles)	2	4
23	Berino East	Irrig No / Flows Yes	No	5 acres by 2019	Yes (1 miles)	2	2
24	Vinton A	Irrig No / Flows Yes	No	Yes	Yes	3	?
25	Vinton B	Irrig No / Flows Yes	No	No	Yes	3	?
26	Valley Creek	Irrig No / Flows Yes	No	No	Yes	3	?
27	Nemexas Siphon or Alternative Site	Irrig No / Flows Yes	No	16.7 acres by 2019	Yes (2 to 3 miles)	2	6
28	Country Club East	Irrig No / Flows Yes	No	No	Yes	3	?
29	Sunland Park	Irrig No / Flows Yes	Yes	No	Yes	3	?
30	Anapra Bridge	Irrig No / Flows Yes	No	No	No	4	0

STATUS OF THE SPECIES

SOUTHWESTERN WILLOW FLYCATCHER (FLYCATCHER)

The terms 'territory' and 'site' (not equivalent to 'Restoration Site') were used throughout this Opinion to help describe flycatcher population biology and breeding habitat. A territory is an area occupied by a single male or pair of flycatchers throughout the breeding season. Territories are the unit of measurement used by the Service in determining population numbers. However, flycatchers tend to cluster their territories. A site may include a single territory or a cluster of territories. When used alone, the term 'habitat' was used to describe those areas that provide food, shelter, and protection from predators. Habitat was also further described for flycatcher long-distance migration and stopover habitat. The term 'breeding habitat' was used to describe those habitats that also provide resources for nest support, extra food for raising young, and protection from nest predators.

Subspecies Description, Listing as Endangered under the ESA, and Critical Habitat

The flycatcher is a small passerine bird (Family Tyrannidae) measuring approximately 5.75 inches (in; or 14.6 centimeters (cm)) in height. It has drab plumage; often including grayish-green feathers on its back and wings, a pale, white-colored throat, a light, gray-olive breast, and a pale, yellow-colored belly. Two white wingbars are often visible (juveniles have buff-colored wingbars). The eye ring is faint or absent in many individuals. Plumage color can vary on observer bias as well as feather wear and fading can affect color and lightness (Paxton et al. 2010a). Generally, the southwestern willow flycatcher has a lighter and more yellowish plumage coloration compared with other flycatcher subspecies. The upper portion of a flycatcher's beak is often dark, and the lower portion is light yellow, grading to black at the tip. A flycatcher's song is not particularly melodious, and has been characterized as a sneezy "fitz-bew" and their call is a repeated, but soft, "whitt" (Howell and Webb 1995).

There are four commonly recognized subspecies of willow flycatchers, with the southwestern one breeding in Arizona, western New Mexico, and southern portions of California, Nevada, Utah, Colorado and extreme northwestern Mexico. The southwestern subspecies was described by Phillips (1948), and its taxonomic status has been accepted by most authors (USFWS 1995, 2002). Recent genetic research (Paxton 2000; Paxton et al. 2008) concluded the southwestern subspecies was genetically distinct from other willow flycatcher subspecies. Biannually, the flycatcher migrates long-distance to Costa Rica, and to other parts of Central and South America during the wintering season and returns to breed in the spring (Phillips 1948; Stiles and Skutch 1989; Browning 1993; Ridgely and Tudor 1994; Howell and Webb 1995; Paxton et al. 2011).

In the most recent genetic evaluation targeting the flycatcher's northern boundary, USGS (Paxton et al. 2008) found that with the exception of three breeding sites situated along the current boundary, breeding sites generally fell into two major groups and were appropriately located on either side of the currently designated range boundary. However, delineating a precise boundary that would separate the two subspecies is difficult because (1) there is evidence for a region of intergradations along the boundary area, suggesting the boundary is not discreet, and (2) there are too few extant flycatcher breeding populations to precisely locate a boundary (Paxton et al. 2008).

Flycatcher populations have declined significantly throughout their range because of changes to riparian ecosystems (trees and shrubs near water) including reductions in water flow, alteration of flood flows, physical modifications to watersheds and streams, and removal of riparian vegetation. These changes have occurred as a result of dams and reservoirs, groundwater pumping, channelization of streams for flood control, livestock overgrazing, agriculture developments, urbanization and other modifications. An increase in nest parasitism by cowbirds and predation of flycatcher nests affects populations, especially those in smaller numbers and at more isolated locations. Modification and loss of wintering habitat as well as loss of migratory "stopover" habitat used by flycatchers to replenish energy reserves during their long-distance migration may also contribute to the decline of flycatcher survival and reproduction. The widespread distribution, accumulation, or continued use of agrichemicals and pesticides in North, Central, and South America as well as the legacy of previous chemical use, storage, leaks, spills and atmospheric re-distribution also likely contributed to the decline of the flycatcher.

Flycatcher Designated and Proposed Critical Habitat

The final rule that listed the flycatcher as an endangered species was published in the Federal Register (FR) on February 27,1995 (60 FR 10694) without designating critical habitat. On July 22, 1997, critical habitat was designated for the flycatcher along 964 river km (599 river mi) in Arizona, California, and New Mexico (62 FR 39129). In May 2001, citing a faulty economic analysis, the 10th Circuit Court of Appeals vacated the designation of critical habitat and instructed the Service to issue a new flycatcher critical habitat designation. On October 19, 2005, the Service again designated critical habitat for the flycatcher in approximately 48,896 ha (120,824 ac) or 1,186 km (737 mi) within Arizona, California, Nevada, New Mexico and Utah. On July 13, 2010, the Service agreed to revise critical habitat for the flycatcher; while the 2005 critical habitat designation remained in place.

On August 15, 2011 (76 FR 50542; USFWS 2011), the Service proposed designation of revised critical habitat for flycatcher in approximately 3,364 km stream km (2,090 mi) in a combination of Federal, State, tribal, and private lands in California, Nevada, Utah; Colorado, Arizona, and in New Mexico. In determining which areas within the geographical area occupied by the flycatcher, the Service considered physical or biological features essential to the conservation of the flycatcher in accordance with sections 3(5)(A)(i) and 4(b)(1)(A) of the ESA and regulations at 50 CFR 424.12. These areas included

- the specific areas within the geographic area occupied by flycatchers on which are found those physical or biological features essential to the conservation of the flycatcher; and,
- specific areas outside the geographical area occupied by the flycatcher at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential to the conservation of the species.

Proposed critical habitat areas included, but were not limited to:

(1) Space for individual and population growth and for normal behavior;
(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;
(3) Cover or shelter;
(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and
(5) Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

The specific physical or biological features required for the flycatcher from studies of its habitat, ecology, and life history were also described by the Service (USFWS 2011). In general, the physical or biological features of critical habitat for nesting flycatchers are found in the riparian areas within the 100-year floodplain or flood-prone areas. Flycatchers use riparian habitat for feeding, sheltering, and cover while breeding, migrating, and dispersing. It is important to recognize that flycatcher habitat is ephemeral in its presence, and its distribution is dynamic in nature because riparian vegetation is prone to periodic disturbance (such as flooding). The Primary Constituent Elements of critical habitat proposed for the flycatcher included:

(1) Primary Constituent Element 1— Riparian vegetation. Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Trees and shrubs that include Gooddings willow (*Salix gooddingii*), coyote willow (*S. exigua*), Geyers willow (*S. geyerana*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), yewleaf willow (*S. taxifolia*), pacific willow (*S. lasiandra*), boxelder (*Acer negundo*), tamarisk (*Tamarix ramosissima*; also known as saltcedar), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus occidentalis*), cottonwood (*Populus fremontii*), stinging nettle (*Urtica dioica*), alder (*Alnus rhombifolia, A. oblongifolia, A. tenuifolia*), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus ursinus*), seep willow (*Baccharis salicifolia, B. glutinosa*), oak (*Quercus agrifolia, Q. chrysolepis*), rose (*Rosa californica, R. arizonica, R. multiflora*), sycamore (*Platinus wrightii*), false indigo (*Amorpha californica*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis arizonica*), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans hindsii*).

(2) and some combination of:

   (a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 meters (m) to 30 m (about 6 to 98 feet (ft)). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; and/or

   (b) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or

(c) Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or

(d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac); and

(3) Primary Constituent Element 2— Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and cicada (Homoptera).

A final rule on the revised critical habitat is expected by December 2012, or earlier.

The Service (USFWS 2011) proposed as critical habitat a 75.8 km (47.1 mi) segment of the Lower Rio Grande in Sierra and Doña Ana Counties, New Mexico, from Caballo Dam to Leasburg Dam. This segment of the Lower Rio Grande was known to be occupied by flycatchers at the time of listing, and contains the physical or biological features essential for flycatcher conservation that may require special consideration or protection. The Service (2011) used information based on known flycatcher territories and breeding sites, guidance from the flycatcher Recovery Plan (USFWS 2002), and knowledge about stream habitat to determine critical habitat segments that may be essential for flycatcher conservation.

Recovery Plan

Because the breeding range of the flycatcher encompasses a broad geographic area with much site variation, management of its recovery is approached in the Recovery Plan by dividing the flycatcher's range into six Recovery Units, each of which are further subdivided into Management Units (USFWS 2002). This provides an organizational strategy to "characterize flycatcher populations, structure recovery goals, and facilitate effective recovery actions that should closely parallel the physical, biological, and logistical realities on the ground" (USFWS 2002). Recovery goals are recommended for most Management Units. Recovery Units are defined based on large watershed and hydrologic units.

Within each Recovery Unit, Management Units are based on watershed or major drainage boundaries at the Hydrologic Unit Code Cataloging Unit level. The "outer" boundaries of some Recovery Units and Management Units were defined by the flycatcher's range boundaries. Flycatcher habitat within Recovery and Management Units is expected to expand, contract, or change as a result of flooding, drought, inundation, and changes in floodplains and river channels (USFWS 2002) that result from natural occurrences and water or land management choices.
The Recovery Plan (USFWS 2002) provides recommendations to recover the flycatcher and provides two alternatives, either of which can be met, in order to consider downlisting the species to threatened. The first alternative for downlisting requires reaching a total population of

1,500 flycatcher territories geographically distributed among all Recovery Units and maintained for 3 years with habitat protections. Habitat protections include a variety of options such as conservation plans, conservation easements, or safe harbor agreements. The second alternative approach for downlisting calls for reaching a population of 1,950 territories also strategically distributed among all Recovery and Management Units for 5 years without additional habitat protection. In order to delist this flycatcher subspecies (to remove it from the List of Endangered and Threatened Wildlife and Plants), a minimum of 1,950 territories are geographically distributed among all Recovery and Management Units, and that twice the amount of habitat is provided to maintain these territories over time. Twice the amount of suitable habitat is needed to support the numerical territory goals, because the long-term persistence of flycatcher populations cannot be assured by protecting only those habitats in which flycatchers currently breed. Second, these habitats must be protected from threats to assure maintenance of these populations and habitat for the foreseeable future through development and implementation of conservation management agreements. Third, all of these delisting criteria must be accomplished and their effectiveness demonstrated for a period of 5 years.

The amount of additional habitat needed may vary in each Management Unit, based on local and regional factors that could affect the rate of occupied habitat loss and change. Until such time as these factors can be better quantified, the Service believes that conserving, within each Management Unit, double the amount of breeding habitat needed to support the target number of flycatchers assures that displaced flycatchers will have habitats in which to settle, given even a catastrophic level of local habitat loss.

Based on a range-wide review of riparian patch sizes and flycatcher population sizes presented in published and unpublished literature, a patch has an average of 1.1 ha (2.7 ac/1.1 ha) (± 0.1 ac Standard Error) of dense, riparian vegetation for each flycatcher territory found within the patch. Therefore, delisting would require that twice this amount of breeding habitat (i.e., 2.2 ha/5.4 ac) be protected for each flycatcher territory that is part of the recovery goal within a Management Unit. For example, a Management Unit with a recovery goal of 50 territories would need to assure the protection of 110 ha/272 ac (50 territories x 1.1 ha/2.7 ac for each territory x 2) of suitable habitat. This total amount of available and protected breeding habitat includes: (a) habitat occupied by flycatchers meeting the population target (50 territories), (b) flycatchers in excess of the population target, and (c) suitable but unoccupied habitat. The factor of 2.2 ha/5.4 ac of breeding habitat per flycatcher territory can be modified based on more local data on patch sizes and population numbers. For example, if the average amount of dense, riparian vegetation per flycatcher territory were higher or lower for a given Management Unit, the amount of breeding habitat required, within that unit, to meet delisting criteria would change accordingly. Suitable breeding habitat conditions may be maintained over time through natural processes and active human manipulation. In this Opinion, the average patch size of 2.7 ac (1.1 ha) will be used to determine the potential number of future flycatcher territories in dense riparian shrub habitats.

The Service (2002) identified several key strategies tied to flycatcher conservation identified in the Recovery Plan (USFWS 2002) such as: (1) populations should be distributed close enough to each other to allow for movement; (2) maintaining/augmenting existing populations is a greater priority than establishing new populations; and (3) a population’s increase improves the potential to disperse and colonize. Breeding habitat objectives are incorporated into the delisting criteria because of the importance of providing replacement habitat for dispersing flycatchers after natural stochastic destruction of existing breeding habitat, and suitable habitat for future population growth. Essential to the survival and recovery of the flycatcher is a minimum size, distribution and spatial proximity of habitat patches that promotes metapopulation stability. The current size of occupied breeding habitat patches is skewed heavily toward small patches and small population sizes; this situation inhibits recovery. Recovery will be enhanced by increasing the number of larger populations and by having populations distributed close enough to increase the probability of successful immigration by dispersing flycatchers. For example, decreasing the proportion of small breeding groups can be achieved by striving for a minimum patch size that supports 10 or more territories. Available data indicate that current populations with 10 or more territories occupy patches with a mean size of 24.9 ha/61.5 ac. Alternatively, along the lower San Pedro River and nearby Gila River confluence in Arizona, smaller, occupied habitat patches show substantial between-patch movement by flycatchers and function effectively as a single site. Thus, to promote recovery, land managers and other conservation entities should strive to protect larger breeding habitat patches (on the order of 25 ha/62 ac or more) within Management Units to minimize the distance between smaller occupied patches so that they function ecologically as a larger patch.

The proposed action will occur in the Lower Rio Grande Management Unit of the Rio Grande Recovery Unit for the flycatcher (USFWS 2011). The Recovery Plan identified a goal of 25 flycatcher territories in the Lower Rio Grande Management Unit. Therefore, amount of breeding habitat necessary to recover 25 such territories would be approximately 135 ac (57 ha) (2.2 ha/5.4 ac. per territory x 25). On average, to protect adequate breeding habitat patches for 25 territories would require approximately 67.5 ac (27 ha) ((1.1 ha/2.7 ac. per territory x 25).

Habitat

Flycatchers use and inhabit riparian habitats that are generally dense, shrubby, and wet with abundant flying insects. Flycatchers (and many other species of neo-tropical migrant songbirds) use the Rio Grande riparian corridor as stop-over habitat during their long-distance migration. Riparian habitat within the Rio Grande often includes dense stands of willows, cottonwoods, Russian olive, or tamarisk adjacent to the river channel. Studies have shown that during the spring and fall migration, flycatchers were more commonly found in willow habitats than in other riparian vegetation types, including the narrow band of coyote willows that line surface waters (Finch and Yong 1997). Recent presence or absence surveys during May have detected migrating flycatchers throughout the Middle Rio Grande in vegetation types that are would often be classified as “low suitability” for breeding habitat (Reclamation 2006; Yong and Finch 2002).

The hydrologic regime (stream flow pattern) and supply of (and interaction between) surface and subsurface water is a driving factor in the long-term maintenance, growth, recycling, and regeneration of flycatcher habitat (USFWS 2002). As streams reach the lowlands, their gradients typically flatten and surrounding terrain opens into broader floodplains (USFWS 2002). In these geographic settings, the stream-flow patterns (frequency, magnitude, duration, and timing) will provide the necessary stream-channel conditions (wide configuration, high sediment deposition, periodic inundation, recharged aquifers, lateral channel movement, and elevated groundwater tables throughout the floodplain) that result in the development of flycatcher habitat (Poff et al. 1997; USFWS 2002). Allowing the river to flow over the width of the floodplain, when overbank flooding occurs, is integral to allow deposition of fine moist soils, water, nutrients, and seeds that provide the essential material for plant germination and growth. An abundance and distribution of fine sediments extending farther laterally across the floodplain and deeper underneath the surface retains much more subsurface water, which in turn supplies water for the development of the vegetation that provides flycatcher habitat and micro-habitat conditions (USFWS 2002). The interconnected interaction between groundwater and surface water contributes to the quality of riparian vegetation community (structure and plant species) and will influence the germination, density, vigor, composition, and the ability of vegetation to regenerate and maintain itself (Arizona Department of Water Resources 1994).

<u>Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements</u>

The flycatcher is somewhat of an insect generalist (USFWS 2002), taking a wide range of invertebrate prey including flying, and ground- and vegetation-dwelling species of terrestrial and aquatic origins (Drost et al. 2003). Wasps and bees (Hymenoptera) are common food items, as are flies (Diptera), beetles (Coleoptera), butterflies, moths and caterpillars (Lepidoptera), and spittlebugs (Homoptera) (Beal 1912; McCabe 1991). Plant foods such as small fruits have also been reported (Beal 1912; Roberts 1932; Imhof 1962), but are not a significant food during the breeding season (McCabe 1991). Diet studies of adult flycatchers (Drost et al. 1998; DeLay et al. 1999) found a wide range of prey taken. Major prey items were small (flying ants) (Hymenoptera) to large (dragonflies) (Odonata) flying insects, with Diptera and Hemiptera (true bugs) comprising half of the prey items. From an analysis of the flycatcher diet along the South Fork of the Kern River, California (Drost et al. 2003), flycatchers consumed a variety of prey from 12 different insect groups. Flycatchers have been identified targeting seasonal hatchings of aquatic insects along the Salt River arm of Roosevelt Lake, Arizona (Paxton et al. 2007).

Flycatcher food availability may be largely influenced by the density and species of vegetation, proximity to and presence of water, saturated soil levels, and microclimate features such as temperature and humidity (USFWS 2002). Flycatchers forage within and above the tree canopy, along the patch edge, in openings within the territory, over water, and from tall trees as well as herbaceous ground cover (Bent 1960; McCabe 1991). Flycatchers employ a “sit and wait” foraging tactic, with foraging bouts interspersed with longer periods of perching (Prescott and Middleton 1988).

Long-Distance Migration, Migratory Behavior, and Stopover Flight Distance

Flycatchers migrate through the Rio Grande and arrive in breeding habitat between early May and early June; whereas autumn migration can occur anywhere from late July to mid September (Finch et al. 2000). Additionally, autumn flycatcher migration may vary from year to year, from site to site, and especially, in response to environmental conditions that affect nesting success or fledgling survival, such as drying events, fire, weather patterns or a combination of factors (Finch et al. 2000).

Flycatchers that breed in the Rio Grande Valley likely stopover in the Lower Rio Grande during long-distance migration to Central America (Paxton et al. 2011). During migration, flycatchers use a greater variety and distribution of habitats, including non-riparian vegetation than during breeding (Finch et al. 2000). Stopover habitats may lack some of the components important for breeding birds such as the presence of standing water or moist soils and suitable riparian patch size and structure. However, Yong and Finch (1997) and Finch et al. (2000) reported that capture rates and body mass of flycatchers were often highest in flycatchers captured in willow than in cottonwood, tamarisk, agricultural edge, or mowed willow.

Flycatchers do not deposit large amounts of fat in their bodies in order to prepare them for the high energy demands of long-distance migration as do migratory waterfowl (Finch et al. 2000). Alerstam and Lindstrom (1990) proposed that flycatchers may maintain low fat stores to minimize the energetic costs of flying with unnecessary weight. Owing to low fat stores, flycatchers may be constrained to feed at stopover habitats in order to make progress toward their breeding or wintering destination. Yong and Finch (1997) reported that the average body mass of migrant flycatchers on the middle Rio Grande was 12.7 grams (g) and ranged from 10.3 to 15.9 g. About 70% of the spring and fall migrant flycatchers captured along the Middle Rio Grande were captured between the hours of 0700 and 0900 (Yong and Finch 2002). After that time period, migrant flycatchers had apparently stopped for an average of one day and were then recaptured. Yong and Finch (1997) reported an average increase of 1.6 percent body mass per day after their recapture, generally increasing with time of day. DeLay et al. (1999) found a positive association between the relative abundance of migrant willow flycatchers and the relative abundance of aerial insects, suggesting that flycatchers migrate briefly in the morning, and stopover in habitats containing abundant insects sufficient to gain body mass and fat reserves before their next segment of their long-distance migratory journey.

Alerstam et al. (2007) suggested that maximum potential flight distance is the product of the potential hours of flight based on available flight energy from fat multiplied by flight speed. Therefore, based on the average flycatcher weight, and using the Alerstam et al. (2007) estimator, the average flight speed of a flycatcher is likely 18 to 23 mph (8 to 10 meters per second (mps)). If 70 percent of flycatchers migrate 2 hours per day, then the distance travelled would range from 35 to 46 mi per day (56 to 74 km per day). Since flycatcher wintering habitat is approximately 1,700 to 1,800 mi (2,736 to 2,897 km), and flycatchers spend approximately 12 percent of the year migrating (or 44 days; based on Yong and Finch 2002), then the average migration distance per day would be approximately 40 mi (64 km). Based on flight speeds, and distance travelled by flycatchers during 2 hours flight, flycatchers would be able to reach their wintering grounds in fall, or breeding grounds in spring, if adequate stopover habitats occurred at no less than every 40 miles. Since the average sized flycatcher likely flies approximately 9 mps (20 mph) for approximately 2 hours per day, migratory flycatcher habitats at distances greater than 65 km (40 mi) apart would likely stress flycatchers by reducing their fat and protein reserves necessary for survival and their long-distance migration. While the maximum average distance flycatchers could potentially fly in a day is larger, perhaps as far as 140 mi (225 km; see Finch et al. 2000), however, such distances may come at high energetic cost, as indicated by the lack of fat reserves in nearly 50 percent of migrant flycatchers captured, and potentially resulting in protein metabolism, reduced flight performance, and an inability to overcome obstacles.

Migrant flycatchers face a variety of obstacles and threats during migration including inclement weather, landscape barriers, predators, limited food and water, and discontinuity of stopover habitat (Finch et al. 2000, citing Moore 2000). If migrating flycatchers cannot periodically replenish their fat stores and do so quickly, the probability of a successful migration is reduced. If food supply varies among habitats during migration periods, fat stores, and body mass may depend on how successfully migrant flycatchers select foraging habitats with plentiful food during stopover (Finch et al. 2000). During flights, birds metabolize not only fat but protein. Because there is no storage form of protein, protein metabolism may entails a structural or functional loss in flight performance, particularly if breast muscle is lost. Therefore, the probability of a successful migration is likely to be increased when stopover habitats are managed with distances between stopovers minimized as well as having stopover habit contain willow vegetation and abundant insects (Finch et al. 2000; Wong and Finch 2002). Whenever stopover habitats become degraded, diminished, or fragmented, migrating flycatchers will likely experience stress, a reduction of fitness, reduced mating or nesting success, increased time and energy expenditures, or an impaired ability to defend nesting or wintering sites, which could ultimately result in a population reduction. However, specific features associated with riparian habitats that support migratory flycatchers requires further study (Yong and Finch 2002).

Sites for Germination or Seed Dispersal of Riparian Vegetation

Subsurface hydrologic conditions may be equally important to surface water conditions in determining riparian vegetation vigor and landscape patterns (Lichivar and Wakely 2004). Where groundwater levels are elevated to the point that riparian forest plants can directly access those waters, it can be an area for breeding, non-breeding, territorial, dispersing, foraging, or migrating flycatchers. Elevated groundwater helps create moist soil conditions believed to be important for nesting conditions and prey populations (USFWS 2002).

Depth to groundwater plays an important part in the distribution of riparian vegetation (Arizona Department of Water Resources 1994) and consequently, flycatcher habitat. The greater the depth to groundwater below the land surface, the less abundant the riparian vegetation (Arizona Department of Water Resources 1994). Localized, perched aquifers (a saturated area that sits above the main water table) can and do support some riparian habitat, but these systems are not extensive (Arizona Department of Water Resources 1994).

The abundance and distribution of fine sediment deposited on floodplains is critical for the development, abundance, distribution, maintenance, and germination of the plants that grow into flycatcher habitat (USFWS 2002). Fine sediments provide seed beds to facilitate the growth of riparian vegetation for flycatcher habitat. In almost all cases, moist or saturated soil is present at or near breeding sites during wet and non-drought years (USFWS 2002). The saturated soil and adjacent surface water may be present early in the breeding season, but only damp soil is present by late June or early July (USFWS 2002). Microclimate features (temperature and humidity) facilitated by moist or saturated soil, are believed to play an important role where flycatchers are detected and nest, their breeding success, and availability and abundance of food resources (USFWS 2002).

Riparian vegetation (described in more detail within the Breeding Habitat section) also provides the flycatcher cover and shelter while migrating and nesting. Placing nests in dense vegetation provides cover and shelter from predators or nest parasites that would seek out flycatcher adults, nestlings, or eggs. Similarly, using riparian vegetation for cover and shelter during migration provides food-rich stopover areas, a place to rest, and shelter or cover along migratory flights (USFWS 2002). Riparian vegetation used by migrating flycatchers can sometimes be less dense and abundant than areas used for nesting (USFWS 2002). However, migration stopover areas, even though not used for breeding, may be critically important resources affecting local and regional flycatcher productivity and survival (USFWS 2002, 2011).

Habitat Dynamics and Restored Habitat

It is important to recognize that most flycatcher breeding habitats are susceptible to future changes in site hydrology (natural or human-related), human impacts such as development or fire, and natural catastrophic events such as flood or drought (USFWS 2002). Flycatcher habitat can quickly change and vary in suitability, location, use, and occupancy over time (Finch and Stoleson 2000). For example, suitable habitat dominated by tamarisk can develop in five years, heavy runoff can create velocities or sediment deposition that may reduce or remove habitat within in a day, or river flow and channel topology may also change quickly. Flycatcher breeding habitat can mature beyond that suitable for nesting. Flycatcher use of breeding habitat in different successional stages may also be dynamic. For example, over-mature or young riparian vegetation may not be suitable for breeding habitat and instead can be used for foraging and shelter by migrating, dispersing, or non-territorial individuals (McLeod et al. 2005). Similarly, early successional riparian habitat may subsequently mature over time and later become suitable for breeding habitat. These and other factors can destroy or degrade breeding habitat, such that one cannot expect any given breeding site to remain suitable in perpetuity (USFWS 2002). Thus, in order to manage flycatcher breeding habitat over time, it is necessary to have additional suitable habitat available to which flycatchers, displaced by such habitat loss or change, can readily move into and breed (USFWS 2002).

In many instances, flycatcher breeding sites occur along streams where human impacts are minimized enough to allow more natural processes to create, recycle, and maintain flycatcher habitat. However, there are also breeding sites that are supported by various types of supplemental water including agricultural and urban run-off, treated water outflow, irrigation or diversion ditches, reservoirs, and dam outflows (USFWS 2002). Although the waters provided to these habitats might be considered “artificial,” they are often important for maintaining the habitat in appropriate condition for breeding flycatchers within the existing environment.

Breeding Habitat and Breeding Behavior

Flycatcher breeding chronology in the lower portion of the Middle Rio Grande falls within the generalized breeding chronology expected of southwestern willow flycatchers (based on Unitt 1987; Brown 1988; Whitefield 1990; Skaggs 1996; Maynard 1995; Sferra et al. 1997; USFWS 2002, Sogge et al. 2010). Extreme dates for any given stage of the breeding cycle may vary as much as a week from the dates presented. Egg laying begins as early as late May but more often starts in early to mid June. Chicks can be present in nests from mid-June through early August.

Young typically fledge from nests from late June through mid-August but remain in the natal area 14 to 15 days. Adults depart from breeding territories as early as mid-August, but may stay until mid-September in later nesting efforts. Fledglings likely leave the breeding areas a week or two after adults. Most flycatchers only live one or two years as adults, but there have been rare occurrences of flycatchers living at least 9 years of age (Paxton et. al 2007a). Each stage of the breeding cycle represents a greater energy investment in the nesting effort by the flycatcher pair and may influence their fidelity to the nest site or their susceptibility to quickly abandon if the conditions in the selected breeding habitat become adverse, decadent, or result in nest failure.

A breeding site is simply an area along the river that has been described while surveying for flycatcher territories (USFWS 2002; Sogge et al. 2010). A breeding site can contain none, only one, or many territories. However, breeding sites are areas where flycatcher territories were detected. A territory is defined as a discrete area defended by a resident single flycatcher or pair of flycatchers within a single breeding season (Sogge et al. 2010). This is usually evidenced by the presence of a singing male, and possibly one or more mates (Sogge et al. 2010).

Flycatchers have been recorded nesting in riparian habitat patches as small as 0.1 ha (0.25 ac) along the Rio Grande, and as large as 70 ha (175 ac) in the upper Gila River, New Mexico (USFWS 2002). The mean reported size of flycatcher breeding patches was 8.6 ha (21.2 ac), with the majority of sites toward the smaller end, as evidenced by a median patch size of 1.8 ha (4.4 ac) (USFWS 2002). Mean patch size of breeding sites supporting 10 or more flycatcher territories was 25 ha (62 ac). Aggregations of occupied breeding patches within a breeding site may create a riparian mosaic as large as 200 ha (494 ac), such as areas like the Kern River, Alamo Lake, Roosevelt Lake (Paradzick et al. 1999), and Lake Mead (McKernan 1997).

Flycatchers can cluster their territories into small portions of riparian sites (Whitfield and Enos 1996; Sogge et al. 2010), and major portions of the site may only be used briefly or not at all in any given year. Habitat modeling based on remote sensing and GIS data has found that breeding site occupancy at reservoir sites in Arizona is influenced by vegetation characteristics of habitat adjacent to the actual nesting areas (Hatten and Paradzick 2003); therefore, areas adjacent to nest sites can be an important component of a breeding site. The continued exploration into the use of satellite imagery combined with associated predictive modeling techniques, whether it is suitability of flycatcher nesting habitat (Hatten and Paradzick 2003, Hatten and Sogge 2007) or to evaluate habitat possible changes associated with tamarisk beetle (Dennison et al. 2009), may become an even more important tool in future management and recovery. How size and shape of riparian patches relate to factors such as flycatcher nest-site selection and fidelity, reproductive success, predation, and brood parasitism remains as areas for further research (USFWS 2002).

Using the extensive information derived from the tracking of banded flycatchers over multiple years, USGS (Paxton et al. 2007) determined that measures of reproductive success varied by site and year. Average seasonal fecundity for females was 1.6 at Roosevelt Lake and 2.0 at the San Pedro/Gila river confluence area. Male seasonal fecundity was 0.4 higher than females at Roosevelt Lake and 0.5 higher at San Pedro/Gila river confluence. Older females had higher seasonal productivity than second-year females. Average Minimum Lifetime Productivity (the total number of young fledged per individual over their estimated lifetime) was 3.3 offspring per female (Paxton et al. 2007). Over a third of individuals did not fledge young that were detected, and over 50% of the young fledged were contributed by just 16% of the breeding adults.

Breeding Habitat Vegetation

The flycatcher currently breeds in areas from near sea level to over 2,600 m (8,500 ft) (Durst et al. 2008) in vegetation alongside rivers, streams, or other wetlands (riparian habitat). It establishes nesting territories, builds nests, and forages where mosaics of relatively dense and expansive growths of trees and shrubs are established, near or adjacent to surface water or underlain by saturated soil (Sogge et al. 2010). Riparian habitat characteristics such as dominant plant species, size and shape of habitat patches, tree canopy structure, vegetation height, and vegetation density are important parameters of flycatcher breeding habitat, although they may vary widely at different sites (USFWS 2002). The accumulating knowledge of flycatcher breeding sites reveals important areas of similarity, which constitute the basic concept of what is suitable breeding habitat (USFWS 2002). These features are generally discussed below.

Flycatchers nest in thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft) (USFWS 2002). Lower-stature thickets (2–4 m or 6–13 ft tall) tend to be found at higher elevation sites, with tall-stature habitats at middle- and lower-elevation riparian forests (USFWS 2002). Nest sites typically have dense foliage at least from the ground level up to approximately 4 m (13 ft) above ground, although dense foliage may exist only at the shrub level, or as a low, dense tree canopy (USFWS 2002). Breeding habitat is often associated with dense, riparian scrub-shrub wetlands.

Regardless of the plant species' composition or height, breeding sites usually consist of dense vegetation in the patch interior, or an aggregate of dense patches interspersed with openings creating a mosaic that is not uniformly dense (USFWS 2002). Historical breeding habitat included mostly willow vegetation (*Salix* spp.) (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987). Current breeding habitat often includes Geyer willow (*Salix geyeriana*), coyote willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*), boxelder (*Acer negundo*), tamarisk (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), and live oak (*Quercus agrifolia*). Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). Other plant species used for nesting may become known over time as more studies and surveys occur.

Most flycatcher breeding sites are comprised of spatially complex habitat mosaics, often including both exotic (mostly tamarisk) and native vegetation. Within a site, territories are frequently clumped or distributed near the patch edge. Thus, the vegetative composition of individual territories may differ from the overall composition of the patch. Flycatchers may move extensively within a breeding patch, travel between patches, or exploit resources outside of a patch (Cardinal and Paxton 2005; Cardinal et al. 2006). Therefore, an area much larger than a territory or even a patch may be important to flycatcher breeding success and persistence at a particular site (Hatten and Paradzick 2003).

The habitat at flycatcher breeding sites can be broadly characterized by proportion of native and exotic habitats into four broad categories (Sogge et al. 2010). Most commonly, tamarisk is the exotic plant species (Russian olive has also been used). Those categories are based on species composition of the tree/shrub layer(s) of the site:

1. Native = >90% native vegetation.
2. Mixed (>50% native) = 50 to 90% native vegetation.
3. Mixed (>50% exotic) = 50 to 90% exotic vegetation.
4. Exotic = >90% exotic vegetation.

Habitat patches are comprised of a variety of native and exotic mixtures across the flycatcher's historical range. Fewer than half (44%) of the known flycatcher territories occur in patches that are greater than 90% native vegetation and just 4% of the known territories occur at sites with almost all exotic vegetation. Another 50% are located at sites that include native/exotic mixtures. In many of these areas, exotic plants are significant contributors to the habitat structure by providing the dense lower strata vegetation that flycatchers prefer.

Canopy density (the amount of cover provided by tree and shrub branches measured from the ground) at various nest sites ranged from 50 to 100 percent (USFWS 2002). Flycatcher breeding habitat can be generally organized into three broad habitat types-those dominated by native vegetation (typically willow), by exotic (nonnative) vegetation (typically tamarisk), and those with mixed native and those dominated by exotic plants (typically tamarisk and willow).

Data collected and analyzed on nest substrate and surrounding breeding habitat communities in the Middle Rio Grande, indicate that flycatchers may key in on areas dominated by native vegetation, but often select exotic vegetation, particularly tamarisk as a nest substrate (Moore and Ahlers 2011). Tamarisk may actually be the flycatchers' substrate of choice due to its dense and vertical twig structure. From 1999-2010, approximately 40% of 1,690 nests located in these river reaches were physically on exotic plants Russian olive (2.2%) and tamarisk (38.0%). In the Middle Rio Grande, between 1999 and 2010, 74 nests (4.4%) with known outcomes were in tamarisk-dominated territories, 1,283 (75.9 %) were in willow-dominated territories and 333 (19.7 %) were in mixed-dominance territories (Moore and Ahlers 2011).

Breeding Habitat Water

Flycatcher breeding habitat is largely associated with perennial (persistent) stream flow that can support the expanse of vegetation characteristics needed by breeding flycatchers, but there are exceptions. Flycatcher nesting habitat can persist on intermittent (ephemeral) streams that retain local conditions favorable to riparian vegetation (USFWS 2002). The range and variety of stream flow conditions (frequency, magnitude, duration, and timing) (Poff et al. 1997) that will establish and maintain breeding habitat can arise in different types of both regulated and unregulated flow regimes throughout its range (USFWS 2002). Also, flow conditions that will establish and maintain breeding habitat can be achieved in regulated streams, depending on scale of operation and the interaction of the physical characteristics of the landscape (USFWS 2002).

In the Southwest, hydrological conditions at a flycatcher breeding site can vary remarkably within a season and between years (USFWS 2002). At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (May and part of June) (USFWS 2002). At other sites, vegetation may be immersed in standing water during a wet year, but be hundreds of meters from surface water in dry years (USFWS 2002). This is particularly true of reservoir sites such as the Kern River at Lake Isabella, California; Roosevelt Lake, Arizona; and Elephant Butte Reservoir, New Mexico (USFWS 2002). Similarly, where a river channel has changed naturally, there may be a total absence of water or visibly saturated soil for several years. In such cases, the riparian vegetation and any flycatchers breeding within it may persist for several years (USFWS 2002).

In some areas, natural or managed hydrologic cycles can create temporary breeding habitat, but may not be able to support it for an extended amount of time, or may support varying amounts of breeding habitat at different points in during its maturation and succession phases. Some dam operations create varied situations that allow different plant species to thrive when water is released below a dam, held in a lake, or removed from a lakebed, and consequently, varying degrees of breeding habitat are available as a result of dam operations (USFWS 2002). The riparian vegetation that constitutes breeding habitat requires substantial water (USFWS 2002). Because breeding habitat is often associated where there is slow-moving or still water, these slow and still water conditions may also be important in influencing production of an insect prey base for flycatcher food (USFWS 2002). These slow-moving water situations can also be managed or mimicked through manipulated supplemental water originating from sources such as agricultural return flows or irrigation canals (USFWS 2002).

Flowing streams with a wide range of discharge conditions that create and support expansive riparian vegetation is an essential physical and biological feature of flycatcher habitat (USFWS 2011). The most common stream flow conditions are largely perennial (persistent) stream flow with a natural hydrologic regime (frequency, magnitude, duration, and timing). However, in the Southwest, hydrological conditions can vary, causing some flows to be intermittent, but the floodplain can retain surface moisture conditions favorable to expansive and flourishing riparian vegetation. These appropriate conditions can be supported by managed water sources and hydrological cycles that mimic key components of the natural hydrologic cycle.

Flycatcher Movements

Flycatchers have higher site fidelity (to a local area) than nest fidelity (to a specific nest location) and can move among sites within stream drainages and between drainages (Kenwood and Paxton 2001). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001). Evidence gathered during studies of banded populations shows that although most male willow flycatchers return to former breeding areas, southwestern willow flycatchers regularly move among sites within and between years (Ellis et al. 2008). Juvenile flycatchers were the group of flycatchers that moved (dispersed) the farthest to new and distant breeding sites from the area where they hatched (Paxton et al. 2007).

The USGS's 10-year flycatcher study in central Arizona (Paxton et al. 2007) is the key movement study that has generated these conclusions, augmented by other flycatcher banding and re-sighting studies (Sedgwick 2004; McLeod et al. 2008). Between 1997 and 2005, of the 1,012 relocated banded flycatchers, 595 (59%) banded flycatchers in Arizona returned to the breeding site of the previous year, while 398 (39%) moved to other breeding areas within the same major drainage, and 19 (2%) moved to a completely different drainage (Paxton et al. 2007). Overall distance moved amongst adults and returning nestlings ranged from 0.03 to 444 km with mean distance moved by adults (9.5 km) much less than the mean natal dispersal distance (20.5 km) (Paxton et al. 2007). Movement patterns are strongly influenced by reproductive success and the age class of habitat patches may also be of consideration (Paxton et al. 2007).

Flycatchers showed a high degree of movement, with movements common among breeding sites that were 30 to 40 km (18 to 25 mi) apart and within the same drainage (Paxton et al. 2007). Therefore, the idea of a biologically meaningful breeding site has shifted from considering every habitat patch as a distinct site, to a network of patches within the same drainage as a site. At a larger geographic scale, infrequent movements that connect different drainages allow for metapopulation-scale processes to occur. Along the Lower Colorado River and its major drainages, flycatchers demonstrated similar patterns of movement (MacLeod et al. 2008a). Thus, consideration of drainage and regional breeding habitat connectivity when planning flycatcher recovery and management will be more effective.

The USGS concluded that rapid colonization and increased metapopulation stability could be accomplished by establishing breeding sites within 30 to 40 km (18 to 25 mi) of each other (Paxton et al. 2007). Flycatchers at breeding sites configured in this way would be able to regularly disperse or move between new or known breeding sites within the same year or from year-to-year. This proximity of sites would increase the connectivity and stability of the metapopulation, as well as support migratory stopover activity. Therefore, distances between patches for flycatcher breeding (30 to 40 km or 18 to 25 mi) in a stable metapopulation within an area may need to occur more closely than the proximity of riparian habitats used for stopovers during their long-distance migration (35 to 46 mi or 56 to 74 km, see migration section above).

ENVIRONMENTAL BASELINE

Flycatcher Distribution and Abundance in the Action Area

Rangewide Distribution and Abundance

The status of flycatchers rangewide, and in New Mexico, are discussed here as they help identify trends of flycatcher abundance and distribution overall and these metapopulations may influence or reflect flycatcher patterns in the Lower Rio Grande Management Unit. Overall, the flycatcher's current range is similar to the historical range, but the quantity of suitable habitat within that range has been significantly reduced from historical levels (USFWS 2002, 2011). Durst et al. (2008) reported a reduction in overall survey efforts, although an overall and recent increase in known breeding sites and estimated number of territories continues. Since 1993, the number of known flycatcher breeding sites has grown from less than 50 to 288 sites. This increase was also reflected in the number of estimated flycatcher territories, growing from less than 200 territories in the 1990s to 1,299 in 2007. However, from 2005 to 2007, Durst et al. (2008) estimated that the number of territories rangewide increased only modestly from 1,214 to 1,299, and breeding sites from 275 to 288.

Flycatcher breeding sites typically have five or fewer territories. Of the 288 known flycatcher breeding sites where a territory has been detected, 34% held l to 5 territories (n=97) and half (n=142) currently no longer have breeding birds. Breeding sites with fewer territories were the locations that typically become unoccupied. Of the 142 sites no longer occupied by nesting flycatchers tracked since 1993, 140 of them had 5 or fewer territories (mostly 1 or 2). However, 64 breeding sites have become re-occupied with nesting flycatchers after at least a single year where no territories were detected. The re-colonization of a breeding site reflects the dynamic nature of flycatcher habitat and flycatcher use, and that habitat can cycle into and out of suitability for nesting birds as environmental conditions and as flycatcher's needs change.

Across the flycatcher's range, certain river drainages have more territories than others. More flycatcher territories are found along the Gila River in New Mexico and Arizona than any other major drainage. Elsewhere in New Mexico and in southwest Colorado, territories are mostly found along the Rio Grande. The primary drainages in California with territories are the Kern, Owens, San Luis Rey, Santa Ana, and Santa Margarita Rivers. In Arizona, most flycatchers are found along the Gila, San Pedro, and Salt Rivers (particularly, at Roosevelt Lake). The Gunnison River drainage supports the majority of flycatchers in Colorado, while the Virgin and Pahranagat Rivers support the most territories in Nevada.

There are four general locations across the flycatcher's breeding range that has the most number of territories. Breeding locations along the Middle Rio Grande and Cliff-Gila Valley in New Mexico, and Roosevelt Lake (Salt River/Tonto Creek confluence) and the lower Gila River/San Pedro river confluence in Arizona fluctuate in numbers, but each can have about 200 territories in a single season (sometimes increasing to about 300 along the Middle Rio Grande). As result, those four locations, can account for about 60 percent (approximately 800 out of 1,299 rangewide territories) of all known territories. These sites create great colonization potential and opportunities to accomplish the Recovery Plan's goal of developing many breeding sites spread across the landscape (USFWS 2002). However, having that high of a proportion of territories in those few locations increases concern for the subspecies from catastrophic events. Additionally, two of these locations (Roosevelt Lake in Arizona and Elephant Butte Reservoir in New Mexico) are associated with water storage. So, while these locations are anticipated to maintain the dynamic nature of habitat, those cycles could be altered by water demand and climate change.

Tracking the distribution and abundance of the flycatcher has become more challenging (USFWS 2011). The compilation of flycatcher survey data forms, database entry, and reporting is becoming more difficult to coordinate and accomplish across six states without dedicated funding. There have been annual statewide reports from Arizona and rangewide reports completed between the mid-1990s to 2007, but none since. As a result of current limitations in database management, the ability to estimate populations and detect changes is becoming more difficult. USBR had recently compiled New Mexico flycatcher data (Carstensen et al. 2012).

Unitt (1987) considered New Mexico as the state with the greatest number of flycatchers remaining. After reviewing the historic status of the flycatcher and its riparian habitat in New Mexico, Hubbard (1987) concluded, "[it] is virtually inescapable that a decrease has occurred in the population of breeding flycatchers in New Mexico over historical time. This is based on the fact that wooded sloughs and similar habitats have been widely eliminated along streams in New Mexico, largely as a result of the activities of man in the area." Unitt (1987), Hubbard (1987), and more recent survey efforts have documented very small numbers and/or extirpation in New Mexico on the San Juan River (San Juan County), near Zuni (McKinley County), Blue Water Creek (Cibola County), and the Lower Rio Grande (Doña Ana and Sierra County).

There are varying reasons why there have been changes in the number of territories in specific Management or Recovery units since completion of the Recovery Plan. In general, riparian habitat is dynamic due to it being subjected to river flooding, water storage, dam releases, river diversion, fire, agricultural return flow, drought, and so on. As a result, breeding habitat quality and distribution can rapidly change in quality and quantity (Paxton et al. 2007), which will be reflected by the number of breeding territories observed. For example, nesting habitat can grow out of suitability; vegetation can develop from seeds to nesting suitability within five years; heavy river flow can remove or reduce habitat suitability in a day; and water storage can inundate habitat within conservation pools of lakes, and recede during the breeding season (USFWS 2002). Flycatcher's use of breeding habitat in different successional stages can also be dynamic. There is little doubt that changes to breeding habitat quality and quantity, and possibly increased survey efforts, have led to increases in flycatcher territories detected in the Middle Rio Grande (Moore and Ahlers 2010), Middle Gila and San Pedro River (Ellis et al. 2008, Graber and Koronkiewicz 2009), and Upper Gila Management Unit (Dockens et al. 2006), and decreased territories in Roosevelt Lake after reservoir elevation changes (Ellis et al. 2008).

Table 2. Rangewide population status for the flycatcher based on 1993 to 2007 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas. [Note: There are no survey data or other records on current status and distribution within Texas]. (Source: Durst et al. 2008).

State	Number of sites with flycatcher territories as of 2007	Percentage of sites with territories as of 2007	Number of flycatcher territories as of 2007	Percentage of total territories as of 2007
Arizona	124	43.1 %	459	35.3 %
California	96	33.3 %	172	13.2 %
Colorado	11	3.8 %	66	5.1 %
Nevada	13	4.5 %	76	5.9 %
New Mexico	41	14.2 %	519	40.0 %
Utah	3	1.0 %	7	0.5%
Texas	no survey data	no survey data	no survey data	no survey data
Total	288	100 %	1299	100 %

Total territory numbers recorded were based upon the most recent years flycatcher survey information from that site between 1993 and 2007 (see Durst et al. 2008).

<u>Distribution and Abundance in New Mexico and the Middle Rio Grande Management Unit</u>

Recent flycatcher breeding site reports show increases and maintenance of some of the largest populations in Arizona and New Mexico. Along the Middle Rio Grande in or near Elephant Butte Reservoir in New Mexico, the number of known flycatcher territories has increased from 51 territories in 2002 (USFWS 2002) to 319 in 2009 (Moore and Ahlers 2010). During the 2010 breeding season, a total of approximately 400 flycatcher territories were found within the entire Rio Grande Basin in New Mexico (USBR 2011) and 617 were detected rangewide in New Mexico (D. Carstensen, USBR, written comm., Jan 30, 2012).

Approximately 75% of the total known territories found within the Rio Grande Basin during the 2010 season were within the conservation pool of Elephant Butte Reservoir. The distribution of flycatcher territories within Elephant Butte Reservoir has shifted with the development of younger riparian habitats at lower elevations within the conservation pool as it receded over time. Fluctuating reservoir levels, reminiscent of the once-frequent scouring peak flood events of major rivers in pre-dam times, can create large swaths of dense riparian shrub habitat at relatively young successional stages suitable as flycatcher breeding habitat. When this occurs, the riparian habitat is quickly colonized by wildlife, particularly by vagile species such as birds, and can become important for the period of time that it exists (Hatten et al. 2010). However, although flycatchers are utilizing breeding habitat at elevations associated with the changing conservation pool, some of the greatest densities remain in those areas supported by ground water seepage and some of the outflows from the Low Flow Conveyance Channel. Breeding habitat availability appears to have been a key component to the increasing population trend in the Middle Rio Grande Management Unit. This trend is expected to continue based on the current availability of unoccupied suitable breeding habitat in the Rio Grande Valley.

Distribution and Abundance in the Lower Rio Grande (Action Area)

The number of flycatcher territories detected annually in the action area has fluctuated between zero and nine from 1993 to 2010 (Durst et al. 2008; Carstensen 2012). IBWC has sponsored recent flycatcher surveys in the action area (Blackburn 2010, 2011) resulting in an increase in the overall survey efforts as well as an increase in known breeding sites and estimated total number of territories. For example, Blackburn (2010, 2011) identified additional territories on or near Bailey’s Point Bar and near Crow Canyon (Table 1). This increase may reflect an increase in survey effort, or in 2011, may reflect a change in riparian habitat quality after some grazing and mowing restrictions were applied by IBWC (2009; SWCA Environmental Consultants 2011) in 2011, or possibly that flycatchers dispersed from within the Middle Rio Grande Management Unit seeking additional breeding habitat nearby or along their migration route.

Until 2008, previously occupied sites such as Selden Canyon and Radium Springs, both near Radium Springs, New Mexico, have been fairly consistent in territory numbers since 1993, which was indicative of somewhat stable populations at these sites. However, disturbance by fire and other vegetation changes likely reduced the quality of breeding habitat at Selden Canyon as no detections were reported in 2010 (Carstensen 2012). Flycatcher territories near Radium Springs, New Mexico have been more consistent and averaged 2 territories per year. Since 1993, the number of known flycatcher territories in the action area grew from one to nine (Table 3). While it is unlikely that any large populations of flycatcher territories have gone undetected, sites supporting undetected territories may exist in some isolated patches of riparian habitat throughout the Lower Rio Grande, and particularly near Hatch, New Mexico (Table 3).

Table 3. Current and Potential Future Density of Flycatcher Territories in the Lower Rio Grande Managment Unit. [ns, not surveyed]

Flycatcher Territory Site and Survey Year	Mimbres River - Disert	Rio Grande - Trujillo	Rio Grande - Crow Canyon B	Rio Grande - Hatch	Rio Grande - Rincon Siphon	Rio Grande - Broad Canyon	Rio Grande - Selden Canyon	Rio Grande - Selden Point Bar	Rio Grande - Site # 31
1993	ns	ns	ns	ns	ns	ns	ns	ns	ns
1994	ns	ns	ns	ns	ns	ns	ns	ns	ns
1995	ns	ns	ns	ns	ns	ns	ns	ns	ns
1996	ns	ns	ns	ns	ns	ns	ns	ns	ns
1997	ns	ns	ns	ns	ns	ns	ns	ns	ns
1998	ns	ns	ns	ns	ns	ns	ns	ns	ns
1999	ns	ns	ns	ns	ns	ns	5	ns	ns
2000	ns	ns	ns	ns	ns	ns	3	ns	ns
2001	ns	ns	ns	ns	ns	ns	ns	ns	ns
2002	ns	ns	ns	ns	ns	ns	3	ns	ns
2003	ns	ns	ns	ns	ns	ns	3	ns	ns
2004	ns	ns	ns	ns	ns	ns	2	ns	ns
2005	1	ns	ns	ns	ns	ns	ns	ns	ns
2006	1	ns	ns	ns	ns	ns	ns	ns	ns
2007	0	ns	ns	ns	ns	ns	1	ns	ns
2008	0	ns	ns	ns	ns	ns	4	ns	ns
2009	ns	ns	ns	ns	ns	ns	1	ns	ns
2010	ns	0	4	ns	0	0	ns	0	ns
2011	ns	0	4	12?	0	0	0	0	ns
Potential Maximum Anticipated Flycatcher Territories expected with IBWC Land Management Alternative including Riparian Restoration of Flycatcher Habitat - below this line									
2013									
2014									
2015									
2016									
2017	?	2	2	?	3	1	?	1	2
2018									
2019	?	4	4	?	7	1	?	3	5
2020									
2021									
2022									
2023									
2024									
2025									

All survey data based on Carstensen Jan 30, 2012, email, of NM rangewide flycatcher territory summary, as modified by Blackburn 2010, 2011.
Potential future flycatcher territories based on restoration site acreage/2.7 acres in dense riparian shrub habitat type proposed by IBWC in the BA.

Table 3. Current and Potential Future Density of Flycatcher Territories in the Lower Rio Grande Managment Unit. [ns, not surveyed]

Flycatcher Territory Site and Survey Year	Rio Grande - Radium Springs	Rio Grande - Leasburg Lateral	Rio Grande - Clark Lateral	Rio Grande Mesilla East	Rio Grande - Berino West	Rio Grande - Berino East	Rio Grande - Nemexas/ Sunland/Altern-ative Site	Total territories in Action Area (RGCP without Mimbes)	Summary with IBWC projects
1993	1	ns	ns	ns	ns	ns	ns	1	0
1994	ns	ns	ns	ns	ns	ns	ns	0	0
1995	ns	ns	ns	ns	ns	ns	ns	0	0
1996	2	ns	ns	ns	ns	ns	ns	2	0
1997	ns	ns	ns	ns	ns	ns	ns	0	0
1998	ns	ns	ns	ns	ns	ns	ns	0	0
1999	1	ns	ns	ns	ns	ns	ns	6	0
2000	3	ns	ns	ns	ns	ns	ns	6	0
2001	ns	ns	ns	ns	ns	ns	ns	0	0
2002	5	ns	ns	ns	ns	ns	ns	8	0
2003	3	ns	ns	ns	ns	ns	ns	6	0
2004	4	ns	ns	ns	ns	ns	ns	6	0
2005	ns	ns	ns	ns	ns	ns	ns	0	0
2006	ns	ns	ns	ns	ns	ns	ns	0	0
2007	1	ns	ns	ns	ns	ns	ns	2	0
2008	1	ns	ns	ns	ns	ns	ns	5	0
2009	1	ns	ns	ns	ns	ns	ns	2	0
2010	1	0	0	0	0	0	0	5	4
2011	2	0	0	0	0	0	2	8	6
Potential Maximu	Potential Maximum Anticipated Flycatcher Territories expected with IBWC Land Management Alternative including Riparian Restoration of Flycatcher Habitat - below this line								
2013									
2014									
2015									
2016									
2017	?	0	0	0	0	0	0	?	11
2018									
2019	?	1	2	6	3	4	6	?	46
2020									
2021									
2022									
2023									
2024									
2025									

All survey data baAll survey data based on Carstensen Jan 30, 2012, email, of NM rangewide flycatcher territory summary, as modified by Blackburn 2010, 2011.
Potential future flyPotential future flycatcher territories based on restoration site acreage/2.7 acres in dense riparian shrub habitat type proposed by IBWC in the BA.

<u>Texas and Mexico Distribution and Abundance</u>

While west Texas and northern Mexico are within the historical breeding range of the flycatcher, there are little to no current survey data or records available to provide updated information on status or distribution in those two locations. The last confirmed breeding activity in the Trans-Pecos area of Texas was reported in 1890 (Peterson and Zimmer 1998). While flycatcher territories have been documented along the Texas-New Mexico border and may give the appearance of Texas occupancy, the Nemexas Siphon and Sunland Park sites, where flycatchers have been observed (Blackburn 2010, 2011), are geographically in New Mexico. Flycatchers are likely to have occurred in northern Chihuahua and along the Rio Grande, where riparian habitat is now reduced and altered due to upstream dams (USFWS 2002). Historical records of breeding flycatchers on the Rio Grande at Fort Hancock, Texas, suggests its previous occurrence in Chihuahua, Mexico; where the Rio Grande now is typically dry in that area (USFWS 2002).

FACTORS AFFECTING FLYCATCHERS IN THE ACTION AREA

<u>Physical Modification of the Channel, Floodplain, Riparian Vegetation, and Watershed</u>

The watersheds and rivers of the southwestern United States (Southwest) are the physical foundation of habitat for the willow flycatcher (Graf et al. 2002). Hatten et al. (2010) also described the importance of riparian habitats in the Southwest for wildlife. For example, over 50 percent of southwestern birds species are directly dependent on riparian habitat even though it only covers about 1 percent of the landscape (Knopf et al. 1988; Skagen et al. 1998). According to Hatten et al. (2010), riparian habitat has declined by as much as 90 percent as in historical times, and is generally considered a habitat of great conservation and management concern. Many stressors have contributed to the decline of riparian habitat, but one of the most wide-scale stressors to riparian systems is due to dams, diversions, and other modifications of rivers in the Southwest (Graf et al. 2002, Graf 2006). Dams disrupt the natural flood cycle that riparian systems have adapted to, creating rivers that flood infrequently, lose their meanders, and generally become more channelized (Graf 2006; Webb and Leake 2006).

Dams, Operations, and Diversions

The headwaters of the Rio Grande are fed by far away mountain snowpack or tropical monsoon rains and provide water important to people living in a climate is that semi-arid in the Lower Rio Grande (Scurlock 1998; Stotz 2000; Schmandt 2010). Upstream river water is captured in reservoirs by dams, thus making human settlements possible, with irrigated agriculture providing the local economy with food and jobs (Schmandt 2010). Eventually villages and cities were built or expanded, and their communities increasingly relied on the Rio Grande for drinking water and other demands (IBWC 2001, 2004).

While dams and reservoirs provide societal benefits including urban water supply, irrigation, hydroelectric power, flood control, and recreation, they also cause changes in river riparian environments that include adjustments in potential habitat for the willow flycatcher (Graf et al. 2002). Dams are the most pervasive and significant changes to flycatcher habitat because they are the primary cause of altered flows of water, energy, and sediment throughout the Rio Grande (Graf et al. 2002). Dams have stored an amount of water equal to almost four times the mean annual runoff in the Rio Grande, which has reduced floods and the amount and timing of flow in the Lower Rio Grande (Graf et al. 2002, Fullerton and Batts 2003).

In the Lower Rio Grande, "operations" of the river have included the engineering tasks of water management, construction and maintenance of dams, diversions, channeling water to irrigation districts and bringing return flow back to the mainstem, leveling and clearing of flood plains, alterations of the stream and watershed, and allocation of water between New Mexico, Texas, and Mexico. The Lower Rio Grande also experiences periodic droughts during which water allocations are reduced. The specific hydrologic changes downstream from dams depend on the inflows to the reservoir, the engineering characteristics of the dam, and its operating rules (Graf et al. 2002). Dam operating rules often involve the release of water from a reservoir or through the dam according to a variety of agreements by various entities and maintenance conditions. River flows and diversions to irrigation systems, municipal water supplies, or other facilities and levels of water within a reservoir can be increased or decreased depending on how the dam is operated and to meet societal needs.

However, the operating rules of dams can often modify, reduce, destroy, or increase riparian habitat both downstream and upstream of the dam (Graf et al. 2002). Below dams, natural hydrological cycles are modified. Peak and low flow events both can be altered in time, duration and magnitude. Peak flows are reduced in size and frequency below many dams (Graf 2006). The cycle of base flow punctuated by short duration floods is often lost. In so doing, dams inhibit the natural cycles of flood-induced sediment deposition, floodplain hydration and flushing, and timing of seed dispersal necessary for establishment and maintenance of native riparian habitats (USFWS 2002).

Upstream of dams, previous river channels and near-channel surfaces that are in the reservoir area are often inundated, either permanently or periodically, so that the riparian habitat associated with them is lost (Graf et al. 2002). However, the shoreline of the newly formed reservoir may create new riparian habitats where the stream enters the lake, is a dynamic zone where deposition of sediment creates a delta because the lake reduces the energy gradient of flow (Graf et al. 2002). These areas typically support flycatchers when the riparian vegetation become suitable at the edges of the reservoir pool (Behle and Higgins 1959; Graf et al. 2002; USFWS 2002).

In the 1900s, the United States (and Mexico) began constructing dams and channelizing the Rio Grande to control sediment, drainage, flooding, and to provide a more secure and stable water supply primarily for agricultural use (IBWC 2004). In particular, the Rio Grande Project was a regional water initiative coordinated by United States Bureau of Reclamation (USBR) that was designed to furnish irrigation water for about 178,000 ac (72,034 ha) of agricultural land, and electric power for communities and industries in southern New Mexico and west Texas. Elephant Butte Reservoir, constructed between 1912 and 1916, provides most of the storage for the Rio Grande Project, while three diversion dams (i.e., Percha, Leasburg, Mesilla) route stored water to various irrigation canal systems in the action area. The Elephant Butte Dam was completed and operations began in 1916 and slowed the periodic flooding of the river downstream (Stotz 2000; USFWS 2002). In 1933, Congress approved plans to straighten, stabilize, and shorten the Lower Rio Grande east of El Paso, and to construct Caballo Dam a short distance downstream of Elephant Butte Dam, which was completed in 1938. Operation of these tandem reservoirs allows for electric power generation at Elephant Butte and seasonal release of irrigation water at Caballo (IBWC 2004; Schmandt 2010).

Additionally, construction of sediment and flood control dams in tributary arroyos occurred in the early 1970s by the United States Natural Resources Conservation Service (USACE 1996). A combination of flood control dams at Broad Canyon, Green Canyon, Arroyo Cuervo, and Berrenda Arroyo, controls discharges over 300 mi^2 (777 km^2) of the tributary basins to the RGCP, and reduces the flood peak frequency by an estimated 40 percent (USACE 1996).

Elephant Butte and Caballo Dam (and American Dam) have reduced the normal flows downstream; sometimes completely dewatering the channel below El Paso (Parsons 2001, 2003). Under current operations, discharges from Caballo and Elephant Butte Reservoirs may cease entirely during much of November to February (IBWC 2004). Flows in the river are reduced to seepage (including agricultural return flows), minor groundwater accretion, and urban water returns downstream of Caballo Dam. Winter flows near the town of Hatch are typically about 20 cfs (0.6 cms). Flows at Mesilla Dam are about 50 cfs (1.4 cms) and accrete to about 160 cfs (4.5 cms) below the American Dam Diversion (USFWS 2001). Peak irrigation water use occurs from mid April through October, and flows are typically 1,000 to 2,500 cfs (28.3 to 70.8 cms). The channel and floodway have a capacity ranging from 22,000 cfs (623 cms) in the upper reaches to 17,000 cfs (481 cms) in the lower reaches.

Historically, the Lower Rio Grande has been used for agriculture (Scurlock 1998; Stotz 2000). Pueblo people were utilizing small diversions and ditch irrigation on a limited scale at the time of Spanish exploration in 1591. The Spanish expanded irrigation greatly, including diverting the main stem at low flow, and the area of irrigated farming steadily increased in New Mexico until it reached a peak of 127,800 ac (50,500 ha) in 1880 (Scurlock, 1998). Ditch irrigation began in the mid-1600's in the El Paso/Juarez valley, and direct diversions were underway by at least the late 1700's (Stotz, 2000). Thus, agricultural diversions of stream flow were extensive in the Lower Rio Grande at the time flow gaging began in the 1880's. Stotz (2000) estimated that more than half the summer stream flow from the Rio Grande between 1890 and 1893 was consumed by irrigation or was lost to seepage and evapotranspiration. Water loss due to agriculture was also associated with irrigation in the San Luis Valley (SLV) of Colorado (Scurlock 1998; Stotz 2000). Between 1936 and 1953, the average annual depletion in the SLV was approximately 802,600 ac ft (9.9×10^8 m^3) and annual depletions ranged from about 502,600 ac ft (6.2×10^8 m^3) in dry years to more than 997,200 ac ft(12.3×10^8 m^3) in wet years. The effect of these SLV depletions was primarily reflected in the shorter duration of the median snowmelt flood at El Paso (Stotz 2000).

Peak flow or floods are the primary natural disturbance in riparian ecosystems (Poff et al. 1997). The components of flow, including its amplitude, magnitude, frequency, duration, timing, and rate of change of hydrologic conditions, strongly influenced the structure and function of riparian habitat below dams (Poff et al. 1997, USFWS 2002). Many of the riparian plant species in the southwest such as Goodding willow are pioneer species that depend on periodic winter and spring flood disturbance for regeneration. Cottonwoods and willows release small, windborne seeds timed to the distributional patterns of flows common to the Rio Grande (Moss 1938; McBride and Strahan 1984; Graf 1994). For example, cottonwood seeds are released coinciding with higher flows, while willow seeds are released during lower flows when sandier substrates are exposed and are wet enough to allow for germination (McBride and Strahan 1984). Other plant species regenerate in response to periodic flooding in the Lower Rio Grande (Stotz 2000).

Infrequent but very large floods reset riparian habitat succession and can rejuvenate large stands of the riparian habitat upon which flycatchers depend (Graf et al 2002). Smaller floods that inundate, but do not destroy riparian vegetation, help to maintain a diversity of herbaceous plant species that may also play important roles in maintaining the food base of the flycatcher. Floods exert important physical and biological controls on riparian habitats, because they inundate and moisten floodplain soils, raise water tables, and recharge aquifers, mobilize and deposit sediment on flood plains creating seed beds for riparian plants, flush salts and redistribute nutrients, cause river channels to relocate or meander, create abandoned channels and backwaters, disperse and scarify plant propagules, scour and relocate vegetation, and deposit organic materials that have higher water-holding capacity than the inorganic materials in the substrate (USFWS 2002).

Scurlock (1998) determined that there were at least 50 major floods exceeding 280 cms in New Mexico between 1849 and 1942. Twice as many of these floods occurred in the 1800's than in the 1600's or 1700's, although the record of large floods improves with time. Scurlock (1998) and Stotz (2000) suggested that environmental degradation may have contributed to the increase in flood frequency in the 1800's. The largest flood occurred in 1828 and had an estimated discharge of about 2830 cms. The entire Rio Grande valley was inundated from Albuquerque to El Paso. Natural floods large enough to destroy riparian vegetation and flycatcher habitat operate at regional and local scales in the Rio Grande (USFWS 2002). Extensive flooding can result in widespread loss of riparian habitat. In the intervening years, the riparian habitat recovers and matures. On the time scale of decades, therefore, it is reasonable to expect regional changes in the amount of available riparian habitat for flycatchers due to natural flooding (Graf et al. 2002). The existing hydrology and flood control operations created by dams, diversions, and provisions for safe channel capacity now make flood events large enough to destabilize the current vegetation and change the channel pattern and pattern extremely unlikely in the Lower Rio Grande.

Reduced annual flow shrinks both peak and low flows, which increases channel stability, and decreases water tables that can reduce riparian habitat (Graf et al. 2002). Construction of Elephant Butte and Caballo Dam significantly reduced the floods and high flow pulses in the action area (Schmandt 2010). The width of riparian habitat and biomass decreases with decreased mean and median annual flow volume and drainage size in alluvial river channels (Stromberg 1993). Reduced peak flow shrinks the high flow channel from braided to single thread and thereby reduces riparian habitat dynamics (Stotz 2000). With reduced low flows, or during drought or extended loss of surface flow during drying events, the alluvial groundwater levels also decline often resulting in mortality of riparian vegetation. Dams eliminated the spring snowmelt peak flows and moderate flows were extended between April and September that facilitated agricultural water withdrawals (Stotz 2000).

Operations of dams have decreased annual fluctuations in flow, which contributed to the simplification of the channel system, reduced the size and amount of beaches, sand bars, or floodplains, and reduced or simplified riparian vegetation, thereby reducing river function and processes, and increasing conditions that favored tamarisk replacement of native vegetation in the action area (Everitt 1993; Graf et al. 2002). These flood-driven fluvial processes maintain high species diversity, productivity, and habitat complexity in riparian ecosystems, all of which benefit habitat for the willow flycatcher. Loss and alteration of surface flows reduced productivity and native riparian habitat quality as well as affected the production and biomass of insects important to flycatcher breeding habitat in the action area.

Channelization: Channel Narrowing, Levee Protection, and Channel Straightening

After the Elephant Butte Reservoir began storing water in 1915, the reduced downstream flow resulted in accumulated sediments and vegetation in the river's natural, meandering channel, including changes in channel width, channel depth, and channel pattern (Everitt 1993; IBWC 2004). After a channel is narrowed, vegetation encroachment will tend to protect the banks. Bank heights can be increased leading to channel incision or channel bed degradation and increased channel uniformity. Once channel capacity was reduced, floods from tributaries created flows that affected communities nearby, cut river meanders, and accumulated sediment and vegetation. The combined effect made it difficult to regulate the releases from upstream reservoirs to meet the downstream obligations. As a result, in June 1936, Congress authorized the construction, operation, and maintenance of the RGCP.

The IBWC operates and maintains the channel and floodway (i.e., the area between the river channel and the levees) within the RGCP (IBWC 2009). Maintenance includes dredging sediment out of the river channel and arroyos, leveling of the floodway; mowing of vegetation along channel banks, floodway, and levees; replacement of channel bank riprap; care of dams on arroyos; and maintenance of infrastructure such as levee roads, bridges, and dams in order to maintain hydraulic efficiency for floodwater conveyance and water distribution (IBWC 2004).

The RGCP extends for approximately 105 mi, or 170 km, along the Rio Grande from the Percha Diversion Dam in Sierra County, New Mexico, to the vicinity of the American Diversion Dam in El Paso County, Texas. As part of the RGCP (IBWC 2004), a deeper main channel was dredged for a length of 95 mi (153 km) to facilitate water deliveries for irrigation and other water demands. Annual channel maintenance (i.e., removal of islands, bars, arroyo plugs, and snags) still occurs (IBWC 2003, 2009, BA). Associated flood control activities include clearing and leveling of approximately 3,400 ac (1,375 ha) of the floodway, diverting arroyo outlets, and constructing sediment control structures. Sections of the river bank were armored with rock revetment to reduce erosion and help maintain a consistent channel alignment. The canalization process also removed a number of meanders (Baker 1943). The RGCP includes additional features such as culverts, and drainage gates, removal and construction of bridges, building of access roads, levees over irrigation water return drains (i.e., wasteways), and placement of miles of fence and revetment to prevent erosion and to create or protect new channel banks.

Flood control levees extend for 57 mi (92 km) along the west side of the RGCP, and 74 mi (119 km) on the east side for a combined total of 131 mi (210 km) of the RGCP, nearly two-thirds of its length (IBWC 2004). The total sediment volume moved onto levees during construction of the RGCP was nearly ten million cubic meters (Baker 1943). Naturally elevated bluffs and canyon walls contain flood flows along portions of the RGCP that do not have levees. The levees are positioned on average about 750 to 800 ft apart north of Mesilla Dam and 600 ft apart south of Mesilla Dam. Levees were originally built to provide 3 ft of freeboard during the design flood in most reaches, but were and are expected to be further modified in the future. Roadways are atop the levees and are generally unpaved gravel roads designed for passage of personnel and equipment. Levee maintenance includes road grading and road resurfacing with gravel as needed.

Pre-canalization channel conditions were characterized by Stotz (2000) as wide and shallow with some meanders in the stream configuration. Channel sinuosity is defined as the ratio of channel length to valley length (USBR 2011). Mack and Leeder (1998) reported that the Lower Rio Grande historically had variable width ranging from 330 to 4,265 ft (100 to 1300 m) and sinuosity (1.9 to 1.2) and displayed km of lateral migration and avulsions within a 5 mi (8 km) wide floodplain. The river now varies in width from 175 to 300 ft (53 to 91 m) with a depth of 2 to 3 ft (0.6 to 0.9 m) in the lower reaches and 7 to 10 ft (2.1 to 3.0 m) in the upper reaches with a sinuosity of 1.05. Most of the Lower Rio Grande had a sand substrate, high sediment load, and low sinuosity which predominantly resulted in a wide, sometimes but rarely braided, channel pattern. Channel pattern is the view of a river depicting the center line of a stream (e.g. see Parsons 2001, 2003). Changes to the flow and channel described previously have resulted in a current channel pattern that is a more narrow, single channel that supports less native riparian vegetation than historically (Stotz 2000).

Completion of Elephant Butte and Caballo Dam caused the Rio Grande channel to degrade in the reach immediately downstream from the dam, because most of the river's sediment load was trapped in the reservoir. Sediment-free water is released from Caballo Dam, causing some channel incision, but within a short distance, sediment-laden flows from tributaries enter the system. Further downstream, the channel began to shrink in size because the low-gradient channel could not transport this delivered load, nor the load sluiced to the channel from irrigation channels or delivered naturally from ephemeral tributaries. With no peak flows on the mainstem to wash these tributary sediments downstream, deposits or sediment plugs are formed. The IBWC (2004) routinely removes these deposits by dredging to maintain channel capacity.

These conditions eventually led to development of several major water projects on the river. The protection of property from floods lead to the construction and maintenance of channelized rivers and levees along Lower Rio Grande, and associated loss of habitat for the flycatcher. Levees provided further flood protection, but during construction they were placed near channel at low flow, thus further restricting the active channel width during peak floods. Channelization, levees, and reduced flow imposed a single thread with relatively straight geometry on the previous meandering system.

Changes to the Floodplain and Riparian Habitat

As a river channel narrows, it deepens and the adjoining floodplain is inundated less frequently, which fosters conditions favoring vegetation growth on or near the banks, and thereby reducing the width of the active channel. This vegetation encroachment is likely the result of decreased peak flows and increased low flow duration. Increased low flow duration provides water more consistently and encourages vegetation growth near the channel. Since riparian vegetation has been shown to provide geotechnical strength to the soil (Simon and Collison 2002; Pollen and Simon 2005; Pollen 2007; Pollen-Bankhead et al, 2009), it can effectively at stabilize channel banks and bars (Thorne 1990; Abernethy and Rutherford, 2001; Gran and Paola 2001; Simon and Collison 2002; Griffin and Smith 2004), and reduce channel-margin flow velocities and shear stresses (Carollo et al. 2002, Tal et al. 2004; Griffin et al. 2005; Tal and Paola 2007), and induce sedimentation (Tooth and Nanson 2000; Schultz et al. 2003). As a result, channel width is often decreased. Thus, riparian vegetation can exacerbate processes of channel narrowing during low flow periods by promoting sediment deposition within the channel and on the floodplain.

Remnant cottonwood and willow, screwbean mesquite and wolfberry, and tamarisk dominated vegetation now occurs along the Lower Rio Grande but is fragmented and of low quality (Stotz 2000; Watts 2001). The invasion of riparian vegetation, predominantly by non-native tamarisk, has been extensive in the Lower Rio Grande and has contributed to the widespread narrowing of channels (Everitt 1993; Allred and Schmidt 1999; Graf et al. 2002). Tamarisk was introduced as an ornamental plant and as a windbreak in the Albuquerque area by 1908, and in Mesilla Park by 1910, and in El Paso by 1926 (Crawford et al. 1993; Everitt 1998).

As dam-building, flow-regulation, and channelization occurred, tamarisk became more and more dominant. The specific role of tamarisk in floodplain aggradation and channel narrowing is a matter of debate. Tamarisk was not common on the floodplain until the 1930's, after channel narrowing had began in the Lower Rio Grande (Everitt 1998). The spread of tamarisk throughout the Lower Rio Grande may be taken place due to the decreased flows and channel narrowing. Nevertheless, tamarisk may play a role in limiting the ability to reconnect the river channel with its floodplain.

Non-native plant species, including tamarisk, Russian olive, and Bermuda grass (*Cynodon dactylon*), are now well-established in the action area (Watts 2001). Tamarisk was found at all sites and was the dominant shrubland species 75 percent of the time. Russian olive was also introduced into the Lower Rio Grande early in the twentieth century (Crawford et al. 1993) though its spread along the desert Rio Grande has been less dramatic than that of tamarisk. Under stress, dense tamarisk patches can be prone to fire that can directly affect flycatcher habitat (Paxton et al. 2008a).

River managers do not always view non-native riparian vegetation positively (Graf et al. 2002). Agencies and groups may suspect that the water transpired by the vegetation could be ''salvaged'' and used if such riparian vegetation is removed, which has given rise to removal programs (Robinson 1958: Stromberg et al. 2009). Additional pressures to remove riparian vegetation may come from flood control interests that see vegetation encroachment in and near the channel as reducing flow capacity and increasing the likelihood of flooding (USFWS 2002). In some areas of the Lower Rio Grande, riparian vegetation has been removed from streams, canals, and irrigation ditches to increase watershed yield, remove impediments to streamflow, and limit water loss through evapotranspiration (Horton and Campbell 1974; USFWS 2001, 2002). Removal of vegetation have included mowing, cutting, root plowing, and application of herbicides. The results are that riparian habitat is often eliminated or maintained at very early successional stages not suitable as breeding habitat for flycatchers (Taylor and Littlefield 1986). Clearing or mowing can also result in establishment of exotic plants species, which can further reduce habitat.

The floodway between the levees is generally level or uniformly sloped toward the channel. The floodway contains mostly grasses, some shrubs, and widely scattered trees (mainly tamarisk; Watts 2001). The bank of the channel at the immediate edge of the floodway is typically vegetated with a narrow strip of brush and trees. Maintenance includes encouraging grass growth on the levee slopes for erosion control, cutting brush and tall weeds from the slopes, and repairing levee slopes. Levee slopes are mowed to prevent growth of brush and trees that could obstruct flows, or cause root damage to the structure itself.

The Lower Rio Grande and associated riparian habitat has historically been a very dynamic system in constant change and without this change, the diversity and productivity decreased. Sediment deposition, scouring flows, inundation, and irregular flows, are natural dynamic processes that occurred frequently enough in concert to shape the characteristics of the river channel, floodplain, and riparian vegetation in the action area. Flycatcher habitat has historically developed in conjunction with this dynamic system where habitat was created and destroyed at various time scales and locations. It was this type of dynamic, successional system that flycatchers depended upon for the establishment and development of breeding habitat. Through the development of dams, reduced flow, channelization, water withdrawal, and development, the dynamics of the river system have been eliminated except for localized areas such as the reservoirs where water storage levels frequently change with releases and inflows, where the river is wide and connects to the floodplain, or where riparian vegetation and flycatcher prey is maintained by seepage and high water tables.

Still Waters, Water Table, and Ground Water Interactions

The Lower Rio Grande interacts with groundwater in its alluvial sediment. These alluvial groundwater aquifers are often much wider than the stream channel and can be shaped by aquifer geology. Precipitation on the uplands can infiltrate soils, and depending on elevation and surface geology, it can contribute to the alluvial groundwater. It can also be affected by drought. Recharge to the groundwater aquifer below the Lower Rio Grande can occur from mountain-front seepage, tributary seepage, community wastewater and septic return flow, urban stormwater seepage, or irrigation seepage. Additionally, the timing, location, and rate of these exchanges between groundwater and surface water are constantly changing and are often unmeasured making specific observations limited. Groundwater pumping for agricultural, mining, industrial, and municipal uses has resulted in water table declines along many rivers and can a be major factor in the quality of flycatcher habitat (Briggs 1996; USFWS 2002). The net result of lowered water tables has been declines in river flow, with stress, injury and loss of riparian vegetation.

The effect of activities that alter groundwater can lead to the reduction (or increase) of water tables in or below riparian habitats that may support flycatchers (USFWS 2002). The floodplain of the Lower Rio Grande historically contained numerous marshes, swamps, meanders, oxbows and pools (Stotz 2000). In addition to providing evidence of channel shifting and flooding, such features also suggest a high water table within the floodplain. (Graf et al. 2002). High water tables in floodplains and near river channels sustain extensive growth of riparian vegetation that provide habitat for flycatchers. These still and slow-moving waters and high water tables associated with alluvial aquifers are essential for flycatchers as they foster abundant insects necessary for breeding habitat.

Riparian Habitat Restoration

There have been several planting projects that have placed hundreds of young cottonwood trees on the floodways between the levees and the Regional Sustainable Water Project (IBWC 2001), calls for enhancement projects along the river such as embayment habitat, sloped banks, and reseeding of native vegetation. However, the interaction of flow (its timing and magnitude), diverse river channel patterns, and connected floodplains that favor the establishment of native riparian vegetation and enhance the development of flycatcher breeding habitat will need to be further developed within the Lower Rio Grande. Management options to recreate these dynamic processes in the Lower Rio Grande, a very static river system, will require more information on the processes to manage riparian vegetation, channel patterns, operational flows, or perhaps even planned avulsions and river realignment. Processes to manipulate and operate the river and its floodplain in an attempt to restore the diversity of a functioning river ecosystem need further development.

Agricultural Development

The availability of relatively flat land, rich soils, high water tables, and water for flood irrigation has fostered agricultural development in the Lower Rio Grande. Conversion of floodplains to agricultural fields reduced the areas covered by native vegetation and certain types of vegetation were more susceptible to conversion than others. These areas often contained extensive grassland, riparian, and wetland vegetation (Stotz 2000). Agricultural development sometimes cleared riparian vegetation, or drained and protected floodplains using levees and other engineering techniques. Agricultural development can also increase the likelihood or severity of cowbird parasitism, by creating foraging sites (e.g., short-grass fields, grain storage, livestock concentrations) in proximity to breeding habitat. However, riparian vegetation that supports flycatcher habitat can also be sustained by agricultural seepage and return flows.

Urbanization, Recreation, and Human Disturbance

Urban development can results in many impacts to riparian ecosystems and flycatcher habitat. Urbanization near flycatcher habitat provides the catalyst for a variety of indirect effects which can adversely affect flycatchers or contribute to habitat loss. Urban development fosters demand for domestic, municipal, and industrial water use. These demands are satisfied by diverting water from streams and groundwater pumping, which can reduce flow and groundwater aquifers. Urbanization can favor domestic cat predation as well as other predators or competitors of flycatchers (e.g., cowbirds, blackbirds). Urban areas have transportation systems that include bridges, roads, and vehicles that can be detrimental to riparian habitat (Marshall and Stoleson 2000). Some communities may desire to remove riparian vegetation to reduce fire risk or control insect populations. Stormwater management can involve construction of settling basins, reservoirs, and other structures necessary to control floods, alter flow velocity, native riparian habitat, and groundwater infiltration patterns. Urban development can also concentrate pollutants and non-native species in riparian habitats. Riparian vegetation that supports flycatcher habitat can also be sustained by urban stormwater and wastewater. Streams where flow is desiccated that receive some wastewater can increase water tables and water in channels to support riparian vegetation suitable for flycatcher habitat (Stromberg 1993, USFWS 2002). However, the chemical quality of riparian habitat and insects associated with urban water may affect breeding habitat and may need further research. Continued use of chemicals and certain pesticides as well as a legacy of previous chemical use, spills, and atmospheric re-deposition may also affect flycatchers.

Urban development also tends to increase recreational use of riparian habitat. Recreation can occur in riparian habitat because of the shade, water, aesthetic values, as well as its association with opportunities for fishing, boating, swimming, and other activities in surface waters. As developed areas and human populations grow, the magnitude and cumulative effects of these activities often increases. Effects may include: reduction in vegetation through trampling, clearing, woodcutting and prevention of seedling germination due to soil compaction; bank erosion; increased incidence of fire; promoting invasion by exotic plant species; promoting increases in predators and scavengers due to discarded food and solid waste (e.g., ravens, jays, grackles, skunks, squirrels, domestic cats, etc.); promoting increases in brood parasitism by cowbirds; and noise disturbance. Recreational development also tends to promote an increased need for foot and vehicle access, roads, pavement, trails, boating, and structures which fragment habitat. Effects of these activities on flycatchers may vary with frequency, intensity, and management actions. Reductions in density and diversity of bird communities, including flycatchers, have been associated with recreational activities (Aitchison 1977, Blakesley and Reese 1988, Szaro 1980, Taylor 1986, Riffell et al. 1996).

Human disturbance in the action area include the paintball course near the Nemexas Siphon, recreational activities near parks, and some operations and maintenance activities conducted by various staff of the IBWC, EBID, and EPCWID that may occur without seasonal restrictions in or near riparian habitats. Additional human activities involving flycatcher science and research as well as flycatcher surveys also affect flycatchers (USFWS 2002). Temporary, short-term impacts to wildlife may occur from noise, dust, and the presence of workers and machinery during project construction where activities occur within flycatcher breeding season and therefore, will need to be addressed in the flycatcher management plan. Accidental spills of fuels, lubricants, hydraulic fluids and other petrochemicals, although unlikely, could also be harmful to aquatic insect prey or riparian habitat vigor and may affect the flycatcher.

Livestock Grazing

Overgrazing by domestic livestock has been a significant factor in the modification and loss of riparian habitats in Southwest (Rickard and Cushing 1982, Klebenow and Oakleaf 1984, Clary and Webster 1989, Schultz and Leininger 1990, Belsky et al. 1999). If not properly managed, livestock grazing can significantly alter plant community structure, species composition, relative abundance of species, and alter stream channel morphology. The primary mechanism of effect is by livestock feeding in and on riparian vegetation. Overutilization of riparian vegetation by livestock also can reduce the overall density of vegetation that provides flycatcher breeding habitat. Palatable broadleaf plants like willows and cottonwood saplings may also be preferred by livestock, as are grasses and forbs comprising the understory, depending on season and the availability of upland forage. Though rare, livestock may also physically contact and destroy nests (Stafford and Valentine 1985, Valentine et al. 1988). Livestock also physically degrade nesting habitat by trampling and seeking shade and by creating trails that nest predators and people may also use for recreation. Furthermore, improper livestock grazing in watershed uplands above riparian systems can cause bank destabilization, increased runoff, increased sedimentation, increased erosion, and reduced capacity of soils to hold water. Because the impact of grazing can be highly variable both geographically and temporally, proper management strategies must be developed locally (USFWS 2002).

Feral hogs also have potential to degrade riparian habitat and native animals populations through soil disturbance, uprooting of native plants, competition for foraging resources, particularly acorns, predation on small animals, and disease transmission. Feral hogs degrade wildlife habitat and compete directly with native wildlife for food. Hogs are omnivorous, primarily consuming vegetation, mast, roots and tubers, and to a lesser degree a wide range of animal species including invertebrates, reptiles, amphibians, small mammals and birds (Davis 1994, Hellgren 1997). Their rooting habits create severely disturbed areas, which may lead to a localized shift in plant succession and increase the potential for soil erosion (Davis 1994). Feral hogs also destabilize wetland areas, springs, creeks and other riparian areas through excessive rooting and wallowing. They also pose a threat to humans and livestock through the spread of disease (Miller 1997).

Fire

Fire is an imminent threat to flycatcher breeding habitat (USFWS 2002). Although fires occurred to some extent in riparian habitats historically, many native riparian plants are neither fire-adapted nor fire-regenerated. Thus, fires in riparian habitats are typically catastrophic, causing immediate and drastic changes in plant density and species composition. Busch (1995) documented that the current frequency and size of fires in riparian habitats is greater than historical levels because reduced floods have allowed buildup of fuels, and because of the expansion and dominance of the highly-flammable tamarisk. Tamarisk and arrowweed tend to recover more rapidly from fire than do cottonwood and willow. Riparian fires have destroyed nesting flycatcher sites along the Middle and Lower Rio Grande and elsewhere in New Mexico (USFWS 2002).

Predators, Predation, Parasites, and Disease

Flycatcher nesting success may be influenced by predation, but predation rates are within the range typical for other open-cup nesting passerine birds (Newton 1998). However, for an endangered species "normal" predation rates may exert disproportionately greater effects on the populations. Predation has been reported as the single largest cause of nest failure in some years (Whitfield and Enos 1996, Paradzick et al. 1999). In a New Mexico, Stoleson and Finch (1999) attributed 37 percent of nest failures to predation. Predation of flycatcher eggs and nestlings has been documented by the common kingsnake (*Lampropeltis getulus*) (Paxton et al. 1997; McKernan and Braden 2001; Smith et al. 2003), gopher snake (*Pituophis* spp.) (Paradzick et al. 2000, McKernan and Braden 2001), Cooper's hawk (*Accipiter cooperii*) (Paxton et al. 1997), red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*) (Stoleson and Finch 1999), western screech owl (*Megascops kennicottiii*) (Smith et al. 2003), yellow-breasted chat (*Icteria virens*) (Paradzick et al. 2000), and Argentine ants (*Linepithema humili*) (Famolaro 1998). Other potential predators of flycatcher nests include other snakes, lizards, chipmunks, weasels, raccoons, ringtailed cats, foxes, and domestic cats (McCabe 1991; Langridge and Sogge 1997; Paxton et al. 1997; Sferra et al. 1997; McCarthey et al.

1998; Paradzick et al. 2000). Predatory birds such as jays, crows, ravens, hawks, roadrunners, and owls may hunt in flycatcher habitat.

Brown-headed cowbirds (*Molothrus ater*), and to a lesser extent, bronzed cowbirds (*M. aeneus*) effectively function as predators if they remove flycatcher eggs during their parasitism. The cowbird lays its eggs in the nests of several bird species. The “host” bird species will then incubate the cowbirds eggs and raise the young. Because cowbird eggs hatch after relatively short incubation and hatchlings develop quickly, they often outcompete the hosts’ own young for parental care. Cowbirds may also remove eggs and nestlings of host species from nests (or injure nestlings in nests), thereby acting as nest predators (Beane and Alford 1990; Scott and McKinney 1994; USFWS 2002). Cowbirds can therefore have negative effects on reproductive success of flycatcher females and populations.

Several factors influence the degree to which cowbird parasitism is a problem to nesting flycatchers, including: parasitism rate; flycatcher response to parasitism (e.g., nest abandonment); and net reproductive success per female flycatcher. Various factors have increased the range and numbers of the brown-headed cowbird, and potentially its impacts on hosts, including expansion of suburban and agricultural areas into and near riparian habitats, and increases in cowbird access into riparian habitats through narrowed riparian habitat and increased fragmentation. Stumpf et al. (2011) examined whether temporal and habitat characteristics were associated with risk of predation and probability of brood parasitism by cowbirds on flycatcher nests. They found that date of parasitism and an interaction between parasitism status and nesting stage affected the overall nestling survival rates. Additionally, of the variables modeled, distance to habitat edge decreased the odds of parasitism 1 percent for every 1 m from the habitat edge. Nests greater than 100 m from an edge were 50 percent less likely to be parasitized as those on an edge, however, only 22 percent of nests were found at that distance. Stumpf et al. (2011) found that where management and conservation goals include reducing nest losses due to parasitism, restoration of habitat patches that minimize edge and maximize breeding habitat further from edges was recommended. At sites where cowbirds have been documented as important nest predators, controlling cowbirds may be one option, but further study of the link between parasitism and nest predation and the identification of major nest predators at specific sites was warranted (Stumpf et al. 2011). Similarly, the USFWS (2002) recommended that cowbird impacts on some (but not all) populations may be sufficiently large to warrant management efforts. However, rates of cowbird removal efficiencies and nest predation have often not declined significantly in response to cowbird control efforts (Siegle and Ahlers 2004; Ahlers et al. 2009).

Although all wild birds are exposed to disease and various internal and external parasites, little is known of the role of disease and parasites on most species or populations. Disease and parasites may be significant factors in periods of environmental or physiological stress, during certain portions of a life cycle, or when introduced into a new or naive host (Karstad 1971, Atkinson and van Riper 1991, van Riper 1991). Flycatcher subspecies are known to be a hosts to a variety of internal and external parasites. These include blood parasites such as Leucocytozoon, Microfilaria, Tyrpanosoma and Plasmodium (Bennett et al. 1982,USFWS 2002); blow fly (*Protocalliphora* sp.) (Boland et al. 1989, Sabrosky et al. 1989, McCabe 1991); and nasal mites (Pence 1975). Most bird species, flycatchers, are susceptible to viral pox (Karstad 1971) and may be susceptible West Nile virus (Flaviviridae) and avian influenzas (Orthomyxoviridae). Although these parasites likely occur in flycatchers, there is no information on what impact they have on infected birds or populations.

Tamarisk Leaf Beetles

Threats to flycatchers and flycatcher breeding habitat now include introduced tamarisk leaf beetles (tamarisk beetles; *Diorahbda* spp.). The tamarisk beetles have been and continue to be released in Texas to eradicate tamarisk in the Rio Grande (Knutson 2010). Tamarisk beetles have the potential to spread widely and defoliate large expanses of tamarisk-dominated flycatcher breeding habitat, but the effects of such a widespread loss of riparian vegetation on flycatcher remains unknown. Tamarisk is widely used as breeding habitat by flycatchers without negative consequences to their physiology, immunology, site fidelity, productivity, and survivorship (Sogge et al. 2005). Tamarisk-dominated habitats also vary with respect to breeding habitat quality as do cottonwood and willow dominated habitat (Sogge et al. 2005).

Release of tamarisk beetles within 200 mi (322 km) of the occupied flycatcher breeding range is currently prohibited (USFWS 2002). Initial presumptions that tamarisk beetles would only move “tens of feet per year” and could not survive in the range of flycatcher breeding habitat have proven specious (USFWS 1999, 2011). In addition to tamarisk beetles moving on their own, they may also be transported accidentally or on purpose by people. Due to the variety of tamarisk beetles being introduced, transported by people, or introduction through biocontrol programs, it is predicted that tamarisk beetles will spread throughout the western United States and into Mexico (Tracy et al. 2008).

In 2010, tamarisk beetles were released near Presidio, Texas (approximately 225 mi (360 km) from Sunland Park, New Mexico) and they have defoliated approximately 20 mi (32 km) of tamarisk along the Rio Grande (Knutson 2010). Tamarisk beetles have been reported along the 45 river miles of the Pecos River, near Pecos, Texas (Knutson 2010), approximately 218 mi (350 km) east of Sunland Park, New Mexico. Additionally, tamarisk beetles have also been reported in the Middle Rio Grande near Santa Ana Pueblo, New Mexico (USBR 2011), approximately 228 mi (366 mi) to flycatchers near Radium Springs, New Mexico. Tamarisk beetles have dispersed approximately 30 to 50 mi (50 to 80 km) per year, based on a 200 mi (322 km) expansion over four years in the

Colorado River Basin (Tamarisk Coalition 2011). Given the occurrence of tamarisk beetles to the east, north, and south, all within approximately 250 mi (400 km) of occupied flycatcher breeding habitat, and the apparent long-distance dispersal ability of released tamarisk beetles, it is likely that tamarisk beetles will spread into the action area within five to eight years and begin defoliation of tamarisk-dominated flycatcher habitat. Tamarisk beetles' dispersal speed and distance may also increase due to the activities of people. Over 75 percent of flycatcher breeding habitat is dominated by tamarisk within the Lower Rio Grande (Watts 2001, BA).

Tamarisk beetle invasion of tamarisk that supports flycatcher breeding habitat has high potential to negatively affect flycatcher breeding success by changing food abundance, vegetation structure, nest temperature and site humidity (Paxton et al. 2010b). Breeding flycatchers within areas dominated by tamarisk may be negatively affected both in the short and long term. The rate of regeneration or restoration of native cottonwoods and willows relative to the rate of tamarisk loss will be critical in determining the effects of this large-scale ecological experiment. Without changes in water and land management, altered site conditions in the form of high salinity, lowered water tables, reduced spring flooding, and livestock grazing can continue to preclude establishment of native riparian vegetation suitable for flycatcher breeding habitat.

Drought and Climate Change

Climate change is a long-term shift in the statistics of the weather (including its averages). In its Fourth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) defines climate change as, "a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer" (Solomon et al. 2007). Changes in climate already are occurring. Examples of observed changes in the physical environment include an increase in global average sea level and declines in mountain glaciers and average snow cover in both the northern and southern hemispheres (IPCC 2007a). At continental, regional and ocean basin scales, observed changes in long-term trends of other aspects of climate include: a substantial increase in precipitation in eastern parts of North American and South America, northern Europe, and northern and central Asia; declines in precipitation in the Mediterranean, southern Africa, and parts of southern Asia; and an increase in intense tropical cyclone activity in the North Atlantic since about 1970 (IPCC 2007a).

Projections of climate change globally and for broad regions through the 21st century are based on the results of modeling efforts using state-of-the-art Atmosphere-Ocean General Circulation Models and various greenhouse gas emissions scenarios (Meehl et al. 2007; Randall et al. 2007). As is the case with all models, there is uncertainty associated with projections due to assumptions used and other features of the models. However, despite differences in assumptions and other parameters used in climate change models, the overall surface air temperature trajectory is one of increased warming in comparison to current conditions (Meehl et al. 2007; Prinn et al. 2011). Among the IPCC's projections for the 21st century are the following:

(1) It is virtually certain there will be warmer and more frequent hot days and nights over most of the earth’s land areas;

(2) it is very likely there will be increased frequency of warm spells and heat waves over most land areas, and the frequency of heavy precipitation events will increase over most areas; and

(3) it is likely that increases will occur in the incidence of extreme high sea level (excludes tsunamis), intense tropical cyclone activity, and the area affected by droughts in various regions of the world (IPCC 2007b).

Changes in climate can have a variety of direct and indirect ecological impacts on species, and can exacerbate the effects of other threats. Climate-associated environmental changes to the landscape, such as decreased stream flows, increased water temperatures, reduced snowpack, and increased fire frequency, affect species and their habitats. The vulnerability of a species to climate change impacts is a function of the species’ sensitivity to those changes, its exposure to those changes, and its capacity to adapt to those changes. Future climate change may present a particular challenge evaluating habitat conditions for species like the flycatcher because the additional stressors may push species beyond their ability to survive in their present locations.

Streams such as the Lower Rio Grande will likely be damaged by a combination of lower water flows, higher water temperatures, silting from erosion and non-native plant invasions (Schmandt 2010). Riparian habitat will likely contract and will be less tolerant of stress. The combination of increased droughts and floods, land use and land cover change, and human water demand will amplify these impacts and promote sedimentation (U.S. Department of Agriculture 2008). Flow and riparian habitat will also be affected by precipitation and evaporation and their seasonality (CCSP 2008; Seager et al. 2007; U.S. Global Change Research Program 2000b, 2000c, 2001). Compared to years before 1950, the snowpack is melting earlier in the year, rain is replacing some snow storms, and the April snow pack is containing less water (Schmandt 2010). Quantifiable data for water losses due to changes in snowpack still contain much uncertainty, however, riparian habitat losses due to evaporation and salinity or other stressors can be calculated with more confidence. Observed changes in droughts are influenced by climate variability and, increasingly, climate change (Guido 2008; Hidalgo 2009; Nemec 1982; Nitze 2004).

In the recent past, drought has had both negative and positive effects on breeding flycatchers and their habitat, which can provide insight into how climate change may affect flycatchers and flycatcher habitat. For example, the extreme drought of 2002 caused near complete reproductive failure of the 146 flycatcher territories in central Arizona (Smith et al. 2003), and caused a dramatic rise in the prevalence of non-breeding and unpaired flycatchers (Paxton et al. 2007). While extreme drought during a single year can generate impacts to breeding success, drought can also have localized short-term benefits in some regulated environments. For instance at some reservoirs, drought led to reduced water storage, which increased the exposure of wet soils at the lake's perimeter (USFWS 2011). Continued drought in those areas allowed the exposed areas to grow vegetation and become new flycatcher nesting habitat (Ellis et al. 2008). These short-term and localized habitat increases are not likely sustainable with persistent drought or long-term predictions of a drier environment, because of the overall importance of the presence of surface water and elevated groundwater needed to grow dense riparian forests for flycatcher habitat. As a result, long-term climate trends associated with a drier climate will likely have an overall negative effect on habitat for flycatchers rangewide.

The future predictions of impacts associated with climate change are similar, and in some respect, an extension or exacerbation of the effects of drought, diversions, and surface and groundwater withdrawal. The potential habitat impact to river flow is similar to the negative effects associated with the water and land management actions that have altered river surface and subsurface flow. Some of the negative impacts to the abundance and distribution of flycatcher habitat were caused by the alteration of peak flow, or the reduction of surface flow and lowering of groundwater tables. These impacts, which were key factors in shaping the distribution and abundance of flycatcher habitat and contributed to its listing as an endangered species.

Therefore, it is reasonable to conclude in the Southwest, based upon past negative effects from drought and water or land management actions that the flycatcher and its habitat will be impacted when future drought or low water conditions, including shortages, continue or re-occur. These conditions can be expected to be exacerbated by climate change or future reductions in water supplies and shortages with continued negative impacts to the flycatcher and its habitat.

Exactly how climate change will affect precipitation in the specific areas with flycatcher habitat is uncertain. However, consistent with recent observations of regional effects of climate change, the projections presented for the Southwest predict warmer, drier, and more drought-like conditions (Hoerling and Eischeid 2007; Seager et al. 2007). For example, climate simulations of the Palmer Drought Severity Index (PSDI) (a calculation of the cumulative effects of precipitation and temperature on surface moisture balance) for the Southwest for the periods of 2006 to 2030 and 2035 to 2060 show an increase in drought severity with surface warming. Additionally, drought still increases even during wetter simulations because of the effect of heat-related moisture loss through evaporation and evapotranspiration (Hoerling and Eischeid 2007). Annual mean precipitation is likely to decrease in the Southwest, as is the length of snow season and snow depth (IPCC 2007b). Most models project a widespread decrease in snow depth in the Rocky Mountains and earlier snowmelt (IPCC 2007b). In summary, climate change will result in a warmer, drier climate, and reduced surface water across the flycatcher's range in the Lower Rio Grande as well as in the action area.

Summary of the Environmental Baseline

Historically, the Lower Rio Grande in southern New Mexico was characterized by a wide, active floodplain with numerous marshes, backwaters, oxbow pools, and a fringe forest of cottonwoods, willows, and shrubby vegetation. Stream flows, although subject to great fluctuations, were believed to be perennial in all years. By 1880, most of the land along the river that could be irrigated was under development. Stream flows became more erratic and, at times, ceased completely. The environmental consequences of dam operation and channelization activities include the severance of the river from its floodplain; the straightening, narrowing, and incising of the river channel; the curtailment of the meandering process that formed oxbows and backwaters, and the loss of native wetland and riparian vegetation. The incised channel and dam operations prevent overbank flows and periodic scouring of floodplain areas.

Historically, the Rio Grande flowed and carried large sediment loads and its widely fluctuating flows caused the channel to be wide and relatively shallow, to have a meandering course at flood stage, to have a meandering channel at low flows, and to change course frequently. Due to changes in flow regimes, channelization, agriculture, riparian vegetation removal, and urbanization, drastic changes have occurred in native riparian vegetation communities have been removed or replaced by invasive species. These conditions favored the destruction (and in some cases, creation) of riparian habitat suitable for flycatcher breeding.

The changed hydrology and current management practices largely preclude natural regeneration of native cottonwoods and willows and promotes the growth of non-native vegetation such as tamarisk, Russian olive, and Bermuda grass, which have largely replaced the native cottonwood and willow vegetative community. The vast majority of floodplains in the action area may have been the location of riparian habitat including some occasional dense riparian forests used as flycatcher habitat and that are currently subject to substantial human disruption by agriculture, urbanization, recreation, vegetation encroachment and management, grazing, fire, and other stressors. Except for a few locations upstream of Radium Spring, including Selden Canyon, the river is now confined to a single channel that ranges in width from about 150 to 300 ft (46 to 91 m). Current conditions do not favor dynamic river changes and associated native riparian communities, and therefore do not greatly contribute to improved flycatcher breeding habitat or flycatcher recovery in the action area. Cumulatively, all of these changes have significantly reduced the complexity of riparian habitat and its ability to support flycatchers in the action area.

However, flycatchers have been routinely documented at Selden Canyon, which suggests that small areas have provided some breeding habitat, perhaps because of wider channel width and a floodplain with suitable riparian vegetation characteristics that is near water with abundant insect prey. Nonetheless, flycatcher territories in the action areas are distributed in five very small breeding groups. These isolated breeding groups are vulnerable to local extirpation from continued alterations in flow, channel pattern changes, vegetation management, agricultural activities and human disturbance, fire, severe weather, predation and nest parasitism, disease, and shifts in birth or death rates and sex ratios. Marshall and Stoleson (2000) noted that "even moderate variation in stochastic factors that might be sustained by larger populations can reduce a small population below a threshold level from which it cannot recover." The persistence of small populations likely depends in part on immigration from nearby populations, at least in some years (Stacey and Taper 1992). The small, isolated nature of current flycatcher populations in the action area exacerbates the risk of local extirpation.

EFFECTS OF THE ACTION

Regulations implementing the ESA (50 FR 402.02) define the *effects of the action* as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, which will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the proposed action. The following section describes the anticipated effects on the flycatcher and its proposed critical habitat resulting from the proposed action.

Direct Effects

The IBWC has committed to a flycatcher management plan (in conjunction with Service review and coordination) that will describe activity buffers around existing flycatcher breeding sites and seasonal restrictions so as to reduce any potential adverse affects to flycatcher so the effects of these activities are rendered insignificant and discountable. Under the proposed action, some continued channel maintenance activities, and some seasonally-limited mowing or targeted herbicide applications may also occur at or near Restoration Sites or affect flycatcher breeding habitats in the RGCP and that may disturb or harass flycatchers, if not properly managed. If IBWC's continued channel maintenance activities may adversely affect flycatchers or flycatcher habitat, including any projects that were identified in this Opinion that are not part of the proposed action, those potential effects should be further evaluated to determine if ESA consultation is necessary. Alternatively, IBWC's adoption of a flycatcher management plan may reduce any potential adverse effects to flycatchers and flycatcher habitat or breeding habitat such that they are insignificant or discountable. There is also one active grazing lease on the RGCP floodplain right-of-way, which may also result in vegetation loss, increase cowbird parasitism, or increase other disturbances to flycatchers and their habitat, and that IBWC has attempted to minimize, cease, and desist (BA; IBWC 2009). For example, additional restrictions can be more targeted in a flycatcher management plan allowing for selective cattle grazing discouragement, trespass cattle round up from within flycatcher buffers, installation of flood-friendly fencing to protect flycatcher buffers, seasonal grazing restrictions, grazing restrictions such that less than 30 percent of existing vegetation within a buffer around breeding habitat could be implemented with seasonal restrictions so as to not adversely affect flycatchers. Construction work to rehabilitate levees or maintenance activities may also provide sources of noise or disturbance to flycatchers, if only temporarily, without implementation of a flycatcher management plan to further reduce and minimize any potential effects to flycatchers.

Indirect Effects

Flycatcher surveys strongly suggest that a small breeding population occurs within the action area in association with a mix of exotic and native vegetation dominated primarily by tamarisk. Proposed riparian habitat restoration under the Land Management Alternative is expected to have an overall positive effect on the flycatcher through reduced grazing, reduced mowing, removal of non-native vegetation and replacement by a variety of native riparian shrubs, trees, native grasses, and forbs (BA). The proposed prescriptions for many of the Restoration Sites include measures that aim to raise the water table, or restore overbank flooding by bank lowering, or add natural levee breeches, secondary channels, bank destabilization, and construction of inset floodplains.

IBWC proposed to revegetate up to 3,053 ac (1,236 ha) of vegetation within the RGCP. Of that number, 565 ac (229 ha) are proposed for different riparian habitats, and as many as 149 ac (60 ha) of dense riparian shrub habitat, but this acreage was revised to 119 ac (48 ha) due to site availability. The IBWC has designed 119 ac (48 ha) specifically as dense riparian shrub that may be suitable as flycatcher breeding habitat (BA as modified through field surveys and discussions). Using 2.7 ac per flycatcher territory (USFWS 2011), we estimated that the proposed 119 acres could support a maximum of 44 potential future flycatcher territories (119÷2.7). However, the 12 Restoration Sites identified in Table 1 (of this Opinion), the total restored area is 119 ac, of which 63 ac occur in proposed critical habitat (Priority Category 1 in Table 1), and 56 ac occur downstream of proposed critical habitat (Priority Category 2 in Table 1). All told, as many as 44 potential future flycatcher territories, 24 that may occur in proposed critical habitat and 21 downstream (Tables 1 and 3) could result from the proposed action.

Approximately 40 ac (16 ha) of dense riparian shrub habitat are proposed for restoration near where there are currently flycatcher breeding territories recently reported (Carstensen 2012). For example, over 25 ac (10 ha) of riparian habitat restoration are proposed for Crow Canyon near where flycatcher breeding territories occur. With flycatchers documented near additional sites (Rincon Siphon, Selden Point Bar, Sunland Park), the size and location of all the proposed restoration sites (each within 20 mi (32 km) could significantly contribute to migratory stopover habitats and breeding metapopulation stability in the Lower Rio Grande Management Unit. The Recovery Plan describes a goal of 25 flycatcher territories in the Lower Rio Grande Management Unit (USFWS 2002). While there may be some short term impacts expected from bank shaving and removal of non-native vegetation, these activities will be accompanied by planting and re-establishment of native riparian vegetation, which is particularly important should tamarisk leaf beetles reduce current riparian habitat quality. Timing restrictions identified through the adoption of a flycatcher management plan will also reduce the potential for adverse effects of planned restoration activities to flycatchers.

As EBID and EPCWID, administer the majority of Rio Grande Project water (project water), sources of water for supplemental irrigation based on water rights delivered by EBID and EPCWID provide a critical, realistic, and available source of water for some of these Restoration Sites, including those that would support flycatcher breeding habitat (Table 1). As project water from within the districts is shared equally during all times of shortage of surface water supply by all users, no district constituent can exert any right to take a full supply, or more (proportionally) than any other water right or project water owner (BA). Transfer of project water rights for supplemental irrigation water or for periodic restoration flows as proposed is subject to the terms and conditions set out in the Water Transfer Framework. The Water Transfer Framework provided that Restoration Sites would receive less than their full allotment during drought or shortage of project water and the sites will not be afforded a higher priority for water than any other project water use. This reduction in supplemental water or reduced opportunity for restoration flows in any given year may be detrimental to vegetation vigor, quality survival and therefore may adversely affect flycatchers, nesting success, or breeding habitat quality and territories at these Restoration Sites. Other short-term negative effects to flycatchers from reduction of supplemental water or restoration flows include reduced water saturation of soils and related changes in vegetation, reduced site humidity and affects on nest and nestling quality, and reduced abundance of insects.

The Service agrees that dependence on supplemental water and restoration flows through the use of a Water Transfer Framework may result in water shortages during years of limited water supply that could affect riparian vegetation vigor, quality, and flycatcher survival and therefore, the proposed action may adversely affect flycatchers, flycatcher breeding habitat and potentially result in nest failure or flycatcher egg, nestling or fledgling death and breeding habitat abandonment. Water shortages in years of limited supply are expected on three Restoration Sites where supplemental irrigation is proposed to be provided (i.e., Trujillo, Leasburg Lateral, and Clark Lateral Restoration Sites) to flycatcher breeding habitats. Additionally, water shortages may also affect, to a lesser degree, the other Restoration Sites designed to provide dense riparian shrub habitat and where restoration flows are needed to maintain the quality, vigor and survival of riparian vegetation in those flycatcher breeding habitats.

If project water shortages occur, or drought or below-average precipitation conditions persist, the Service expects there will be a continuation of current conditions at Restoration Sites in the case that they do not receive supplemental irrigation water or restoration flows, perhaps including Crow Canyon B, Rincon Siphon, Site # 31, IBWC Broad Canyon, and Selden Point Bar totaling 53.5 ac (21.7 ha). Under these scenarios, it is expected that there will be continued enhancement of flycatcher breeding habitat at these Restoration Sites, and no adverse impact to flycatchers, with the potential for 44 maximum future flycatcher territories (Tables 1 and 3). Additionally, these five sites would likely still provide some riparian and flycatcher breeding habitat although with much reduced riparian vegetation quality (about 20 ac (8 ha) likely supporting up to 7 flycatcher territories).

In summary, riparian habitat restoration is expected to result in more flycatcher breeding habitat in the action area that will more than likely support nesting flycatchers resulting in an overall increase in flycatcher territories, breeding pairs, and possibly, nesting success over time, if managed correctly. The proposed action, including non-native vegetation removal, increased channel sinuosity, floodplain rehabilitation, reduction or elimination of grazing and mowing, and planting of native riparian vegetation along with supplemental irrigation and restoration flows, will increase the amount, composition and quality of dense riparian vegetation and therefore increase flycatcher breeding habitat along the RGCP. Additional commitments by the IBWC to monitor and sustain flycatcher breeding habitat characteristics over time through a flycatcher management plan will also improve conditions for flycatcher recovery in the Lower Rio Grande over the long term. As the Lower Rio Grande Management Unit target for flycatcher recovery is 25 territories, the proposed action has the potential to achieve significant conservation and recovery of the species in the Lower Rio Grande.

Effects to Proposed Critical Habitat

While the proposed action also included actions that would remove, thin, or destroy riparian flycatcher habitat (tamarisk-dominated riparian areas), those actions included implementation of an effective riparian restoration plan at Restoration Sites within proposed critical habitat will result in the development of native riparian vegetation of equal or better flycatcher quality in abundance and extent. As the proposed action includes restoration and protection of native vegetation riparian habitats at approximately every 32 km (20 mi), and the majority of those include willow vegetation, beneficial effects to flycatcher migration habitat and the physiological conditions of migratory flycatchers are expected within the proposed critical habitat.

IBWC (2009) has committed to restricting activities that destroy restored riparian vegetation by mechanical (e.g., mowing, fire), chemical (e.g., herbicide use), or biological (e.g., grazing, biocontrol agents) means. Livestock management actions seek to exclude improper grazing at or near the Restoration Sites in the proposed critical habitat (IBWC 2009; BA).

During 2010 and 2011, there were five locations in the Lower Rio Grande Management Unit that contained flycatcher territories (Blackburn 2010, 2011; Carstensen 2012) including at or near Crow Canyon B, Bailey Point Bar, Selden Canyon, Radium Springs, and Sunland Park. Note that Bailey Point Bar, Selden Canyon and Radium Springs are on private land and not managed by IBWC. Except for Sunland Park, four of these five occupied areas are within proposed critical habitat. These areas plus Trujillo, Rincon Siphon, Selden Point Bar, IBWC Broad Canyon Parcel, and Site # 31 are within proposed critical habitat and are proposed to establish or support those physical or biological features essential to the conservation of the flycatcher and were the focus of the Service's evaluation in this Opinion. The proposed action seeks to restore adequate water-related elements to improve and expand the quality, quantity, and distribution of riparian habitat and special management actions by IBWC (IBWC 2009; BA) have been proposed to protect riparian areas from a variety of impacts and to enhance the physical features.

The Trujillo Restoration Site is proposed to support dense riparian shrub habitat suitable for flycatcher breeding habitat and it is one of few upstream migratory stopover habitats that will contain dense willows. As such, the Service maintains that the Trujillo Site is a high priority site (Table 1). In the proposed action, the source of water to support the riparian vegetation at the Trujillo Restoration Site depends entirely upon supplemental irrigation and therefore, shortages of water could negatively affect up to 10 ac (4 ha) of dense riparian shrub habitat (that occur along approximately 0.4 miles of river) and potentially as many as four flycatcher territories that might occur there in the future.

Additionally, the proposed action of restoration flows may degrade or diminish some river surface and subsurface flow. The proposed activities may affect the frequency, magnitude, duration, timing, or abundance of surface flow (and also subsurface groundwater elevation) at these four areas, particularly at and above Selden Canyon. For example, the Conceptual Restoration Plan (USACE et al. 2009) identifies a potential 0.2 m (0.8 ft) loss in water elevation during a 10-year flood at Restoration Sites in this area.

Therefore, proposed critical habitat may be adversely affected by any future water shortages that reduce riparian habitat on those Restoration Sites that depend on supplemental irrigation water. Proposed critical habitat may be adversely affected by any shortage of restoration flows, as well as restoration flows may also adversely affect the subsurface water flow at five of the Restoration Sites (Crow Canyon B, Rincon Siphon, IBWC Broad Canyon Parcel, Selden Point Bar, and Site # 31), over time.

The potential loss of the Trujillo Restoration Site is not likely to destroy or adversely modify proposed critical habitat as the amount of habitat is only 0.02 percent of the entire 3,364 km (2,090 mi) of length of the proposed critical habitat (USFWS 2011). Similarly, considering all Restoration Sites that will support dense riparian shrub habitat within proposed critical habitat and that could be affected by water shortages, subsurface flow loss, or reduced restoration flows total only approximately 2.9 mi (4.7 km). All told, the Restoration Sites within proposed critical habitat represent only about 0.1 percent of the total stream miles of the entire proposed critical habitat, and therefore, adverse effects to those Restoration Sites would not destroy or adversely modify proposed critical habitat.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions 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 require separate consultation pursuant to Section 7 of the ESA. This Opinion summarizes, in general terms, the types of activities that are likely to occur, based on continuation of existing actions and likely future development.

Human Population, Land, and Water Use Changes

Population in the Lower Rio Grande Valley (including El Paso and Juarez, Mexico) has doubled every twenty years since the 1950s and will continue to grow. Growth has been driven by high birth rates, higher infant survival rates, and immigration. Other factors include increased border and military installation activities , increased manufacturing in a free trade zone, increased availability of agricultural and industrial jobs, as well as affordable housing, a high standard of living, and availability of freshwater (Schmandt 2010). Increasing urbanization and development within the historic floodplain would continue to eliminate remnant riparian areas located outside the levees, while putting increased pressure on the riparian habitat and wildlife (USFWS 2001).

The Texas Water Development Board (2007) projects that irrigated land will shrink in the Texas portion of the Lower Rio Grande Valley due to market forces and urbanization. Because irrigation uses over 80 percent of river water a reduction in agricultural land use may have important impacts on future water demands. Changes in irrigation use may also have significant impacts on surface and groundwater hydrology, agricultural economic activities, and population growth. Drought resistant or less water-intensive crops and improved irrigation techniques (e.g., lining of canals, use of modern sprinkler systems, floodwater capture) may result in substantial surface water conservation without economic loss (HARC 2000). Municipalities will also likely increase water conservation, reuse, recycle, and improve water quality, as well as repair of leaky distribution systems (Schmandt 2010). Regional water markets may be developed to facilitate the transfer of water rights from agricultural to municipal uses (Schmandt 2010), particularly during multiyear droughts (Schmandt 2010). Overall water quality may continue to decline and salinity increase such that riparian habitats may be further imperiled. Methodologies for developing flow recommendations and managing rivers could result in some improvements to salinity levels and sustained riparian vegetation. Desalinization of water may also become cost effective or agricultural production may also be severely constrained and reduce salt load in the future (Schmandt 2010).

General cumulative effects will likely continue to include:

- Increases in development and urbanization in the historic floodplain that result in reduced peak flows because of the flooding threat. Development in the floodplain makes it more difficult, if not impossible, to transport large quantities of water that will overbank and create low velocity habitats for flycatchers.

- Increased urban use of water, including municipal and private uses. Further use of surface water from the Rio Grande will reduce river flow and decrease available habitat for the flycatcher.

- Human activities that may adversely impact the flycatcher by decreasing the amount and suitability of habitat include dewatering the river for irrigation; increased water pollution from non-point sources; habitat disturbance from recreational use, and urban development.

- Wildfires and wildfire suppression in the riparian areas along the Lower Rio Grande may have an adverse affect on flycatchers. Wildfires can be fairly common occurrence in the bosque (riparian area) along the Rio Grande. The increase in wildfires has been attributed to increasingly dry, fine fuels and ignition sources. The spread of the highly flammable plant, tamarisk, and drying of river areas due to river flow regulation, water diversion, lowering of groundwater tables, and other land practices is largely responsible for these fuels. Wildfires have the potential to destroy flycatcher habitat.

- The removal of non-native vegetation, such as salt cedar and Russian olive can adversely affect the amount of available flycatcher habitat in the short term. In areas where non-native trees are removed and replaced with native vegetation as part of a restoration project, habitat may be created. Where phreatophyte removal or tamarisk beetle defoliation is not followed by restoration, habitat for the flycatcher will be lost.

- The effect global warming may have on the flycatcher is still unpredictable. Higher temperatures lead to higher evaporation rates which may reduce the amount of runoff, groundwater recharge, and lateral extent of rivers such as the Rio Grande. Increased temperatures may also increase the extent of area influenced by drought (Lenart 2003).

The Service anticipates that these conditions and types of activities will continue to threaten the survival and recovery of the flycatcher by reducing the quantity and quality of habitat through the continuation and expansion of habitat degrading actions.

CONCLUSION

The flycatcher's status has improved in both the Middle Rio Grande Management Unit upstream as well as in the Lower Rio Grande due to an overall increase in estimated territories as well as perhaps due to increased survey efforts since the flycatchers' 1995 listing.

Flycatchers will benefit from IBWC's restoration of riparian habitat in the RGCP, its management of activities, and its commitment to the conservation, maintenance and preservation of dense riparian shrub habitat for the duration of the project will beneficially affect migrant and nesting flycatchers, their breeding habitat, and conserve the physical and biological characteristics of proposed critical habitat in action area.

Adverse effects will result in the future when dense riparian shrub habitat will be degraded or lost due to water shortage, reductions in restoration flow, and/or reduction in subsurface flow.

After reviewing the current status of the flycatcher in the action area, the environmental baseline for the action area, the effects of the proposed action including IBWC commitment to a flycatcher management plan, and cumulative effects, it is the Service's opinion that the IBWC's Integrated Land Management Alternative for the Rio Grande Canalization Project and conservation measures is not likely to jeopardize the continued existence of the flycatcher nor destroy or adversely modify proposed critical habitat. The possible shortage of project water to supplement Restoration Sites or restoration flows, along with drought, and other activities in the action area represents a small subset of the current and expected future occupied range of flycatchers in the Rio Grande Basin. Activities planned in the Restoration Sites are likely to benefit flycatchers and improve breeding habitat. Commitments by IBWC toward adoption of a flycatcher management plan will further reduce potential adverse effects of activities to flycatchers as well as the installation and maintenance of at least 53.5 ac (21.7 ha) by 2017 and as many as 119 ac (48 ha) by 2019 of flycatcher breeding habitat during the proposed action. Combined with the potential flycatcher territory gains through IBWC riparian restoration, the level of take associated with the proposed action is unlikely to appreciably diminish the flycatcher population in the Lower Rio Grande.

It is the Service’s conference opinion that loss of Restoration Sites by water shortage, or riparian habitat quality reduction through reduced subsurface flow or reduced restoration flows are not likely to destroy or adversely modify proposed critical habitat. The IBWC must ask the Service to confirm this conference opinion as a biological opinion issued through formal consultation if proposed critical habitat is designated. The request must be in writing. The Service must respond to your request within 45 calendar days, and, within that period, may adopt the conference opinion as the biological opinion issued through a formal consultation if no significant changes have occurred in the proposed action or the information used during this conference on proposed critical habitat. When the conference opinion is adopted in this manner, it satisfies an action agency's section 7 consultation requirements.

The Service realizes that flycatcher habitat is dynamic and areas that are not currently suitable habitat are likely to become suitable breeding habitat in the future at Restoration Sites under the proposed action and a flycatcher management plan can be implemented to track these changes and provide the information necessary for IBWC to make adjustments to their riparian habitat management in order to meet their riparian habitat objectives and goals. Therefore, flycatcher habitat, flycatcher breeding habitat, and flycatcher proposed critical habitat will continue to serve their intended conservation role for the flycatcher with implementation of the proposed action.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by IBWC so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The action agency has a continuing duty to regulate the activity covered by this incidental take statement. If IBWC (1) fails to assume and implement the terms and conditions or (2) fails to require adherence to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, IBWC must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

The Service anticipates incidental take of flycatchers will be difficult to detect for the following reason(s): Incidental take of actual numbers of flycatchers that fail to nest, experience egg or nestling mortality, or that abandon nesting sites within riparian habitat that may dry or weaken due to water shortages may be difficult to detect as the species is vagile (i.e., has ability to move or disperse in the environment), has small body size, is difficult to detect in dense riparian shrub habitat, finding a dead or impaired specimen is unlikely, and losses may be masked by seasonal fluctuations in numbers or other causes. However, the following level of take of this species can be anticipated by loss of the spatial extent of dense riparian shrub habitat as it is known as an essential element of flycatcher breeding habitat and because it can be readily quantified over time and space using either satellite imagery, field observation and quantification techniques, or other methods. Additionally, incidental take based on the flycatcher breeding habitat will improve IBWC ability to adaptively manage flycatchers, their habitat, and breeding habitat within a dynamic riparian system that may be affected by various environmental changes including the availability and management of water spatially for the duration of the project. Therefore, the Service chose spatial extent of dense riparian shrub habitat (suitable flycatcher breeding habitat) as a surrogate for incidental take and as quantified by IBWC in their flycatcher management plan and annual reports.

The Service has developed the following incidental take statement based on the scenario that dense riparian shrub habitat will be impacted due to water shortages, reductions in restoration flow, and/or reduction in subsurface flow. The Service realizes that this is based on a worst-case scenario, and impacts may not be realized. The Service anticipates that acreage of dense riparian shrub habitat will be negatively affected over the years that will result in adverse effects to flycatchers. Each year, this type of habitat may be lost as long as a minimum of 53.5 ac (21.7 ha) of dense riparian shrub habitat suitable for flycatcher breeding habitat is maintained. As long as 53.5 ac (21.7 ha) of flycatcher habitat (all types) is maintained, incidental take associated with the Water Transfer Framework is exempted.

Degradation or loss of breeding habitat is expected to result in harassment (nesting birds may leave an area without adequate food or shelter), harm (flycatchers may abandon a nesting site if breeding habitat conditions change), or their nest may fail, or eggs fail to hatch, or nestlings perish, or displacement of adult flycatchers may occur when water inundation at certain Restoration Sites is no longer expected to occur or is expected to occur with a lower frequency. Receding water levels will stress or kill willows, depending on the extent or time they are dewatered by project water shortages and including any exacerbation by an ongoing drought.

Where such adverse effects occur to dense riparian shrub habitats that occur within proposed critical habitat, the prohibitions against taking the flycatchers found in section 9 of the ESA do not apply until the critical habitat is designated. However, the Service advises IBWC to consider implementing the following reasonable and prudent measures. If this conference opinion on proposed critical habitat is adopted as a biological opinion following a designation, these measures, with their implementing terms and conditions, will be non-discretionary within critical habitat.

The Service will not refer the incidental take of any migratory flycatcher for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions specified herein.

Effect of the Take

In the accompanying biological and conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of its proposed critical habitat. The Service determined that the amount of flycatcher breeding habitat that may be lost is relatively small compared to the critical habitat area proposed for designation and compared to the 119 ac (48 ha) or more of breeding habitat that will be established. The Service determined that the number of future flycatcher territories that may be affected can be minimized as well as managed through maintaining breeding habitat within the project area.

Reasonable and Prudent Measures

The Service believes the following Reasonable and Prudent Measures (RPMs) are necessary and appropriate to minimize impacts of incidental take due to activities associated with the proposed action.

1. Operations, maintenance, and the Land Management Alternative of the RGCP must maintain at least 53.5 ac (21.7 ha) of dense riparian shrub habitat suitable as flycatcher breeding habitat, during the months of May through August for the duration of the project by 2017 and as many as 119 ac (48 ha) by 2019.

2. Implement a flycatcher management plan by October 1, 2015, to minimize flycatcher disturbance and quantify and manage flycatchers and their habitat.

Terms and Conditions

Compliance with the following terms and conditions must be achieved in order to be exempt from the prohibitions of section 9 of the ESA. These terms and conditions implement the Operational Plan described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

To implement RPM 1, IBWC shall:

- 1.1. Restore and establish 53.5 ac (21.7 ha) of dense riparian shrub habitat suitable flycatcher breeding habitat at the Restoration Sites identified in the BA (or equivalent alternatives) for the duration of the proposed action.
- 1.2. At least half (26.8 ac or 10.8 ha) of the dense riparian shrub habitat suitable as flycatcher breeding habitat at Restoration Sites or at equivalent areas must occur within proposed critical habitat (above Leasburg Dam).
- 1.3. All flycatcher breeding habitat destroyed or degraded due to future project activities shall be restored at Restoration Sites or equivalent areas within

the RGCP to an acreage not less than 53.5 ac (21.7 ha) by IBWC for the duration of the project in accordance with a flycatcher management plan. Suitable breeding habitat may be maintained over time through natural processes and/or active human manipulation.

1.4. Where there is IBWC discretion regarding the scheduling of activities, Restoration Sites identified as Priority Category 1 and then Priority Category 2 in Table 1 of this Opinion should be prioritized for all actions, including reducing any project water shortages at the expense of other lower Priority Category sites identified in Table 1.

1.5. If IBWC is unable to implement the Water Transfer Framework by 2015, IBWC will identify and pursue any additional opportunities to improve the quality of flycatcher breeding habitat including, but not limited to, purchase of private property, purchase of additional water rights, obtaining any alternative sources of supplemental water necessary that will offset expected future water table declines, reduced restoration flows, or flycatcher breeding habitat loss.

1.6. Habitat restoration shall begin as soon as feasible, and occur outside buffer zones that may affect flycatchers as determined by appropriate flycatcher surveys and a flycatcher management plan. Habitat restoration activities may continually occur over time, but 53.5 ac (21.7 ha) of dense riparian shrub suitable as flycatcher breeding habitat at the Restoration Sites must be achieved by October 1, 2017. Additional dense riparian shrub at additional restoration sites totaling 119 ac (48 ha) should be achieved by the end of 2019.

1.7. IBWC will annually quantify the amount of dense, riparian shrub habitat suitable as flycatcher breeding habitat during the flycatcher breeding season, using methods of quantification described in the flycatcher management plan, and provide that information to the Service as described below.

To implement RPM 2, IBWC shall:

2.1 Prepare a draft flycatcher management plan for Service and other peer reviewers by December 31, 2013. After peer review of the draft flycatcher management plan by flycatcher experts or wildlife management agencies, including the Service, and any adjustments to reflect peer review and IBWC management needs, prepare and implement the final flycatcher management plan into IBWC rules and environmental operations.

2.2 Adopt policies and implement procedures that identify and restricts all activities funded, authorized, or permitted by IBWC within predetermined buffer areas or with seasonal timing restrictions necessary to prevent or minimize any adverse effects to flycatcher, its habitat, or its breeding habitat in a flycatcher management plan in the project area.

2.3 Eliminate mowing and grazing of native riparian vegetation, and forbs within a predetermined buffer area of around flycatchers and flycatcher breeding habitat unless it is demonstrated to be required for conveyance of all flood flows, in a flycatcher management plan.

2.4 Implement a flycatcher management plan that identifies the number, location, timing, and protocols of appropriate flycatcher surveys.

2.5 Monitor flycatchers at all Restoration Sites or other areas within the RGCP as described in a flycatcher management plan.

2.6 Implement a flycatcher management plan that identifies the quantity and quality of flycatcher habitat and dense riparian shrub suitable as flycatcher breeding habitat. Report annually on the amount of flycatcher habitat.

2.7 Monitor and quantify dense riparian shrub habitat suitable for flycatcher breeding habitat by developing and using a Geographic Information System based model using appropriate satellite imagery during cloud free periods inside the months of May, June, July or August and calculating the Normalized Difference Vegetation Index, or any equivalent measures, based on flycatcher breeding habitat use patterns in the RGCP through an adaptive management process. Quantify dense riparian shrub habitat and flycatcher breeding habitat on maps, determined using statistical or graphical methods of quantifying relationships, and assess areas at each Restoration Site or other areas to determine where breeding habitat is being lost or gained and adopt adaptive management strategies to maintain at least 53.5 ac (21.7 ha) of dense riparian shrub suitable as flycatcher breeding habitat as measured during the breeding, annually.

2.8 Restoration Sites containing some willow vegetation and insect prey must occur at locations at no greater than at 40 mi intervals to protect and conserve flycatcher migratory stopover habitat and flycatcher migration.

2.9 IBWC will review the Southwestern Willow Flycatcher Recovery Plan and update the environmental commitments related to flycatcher as appropriate.

2.10 Include the best available science, partner with stakeholders, agencies, and the public to learn and share information about riparian habitat restoration, flycatcher habitat use and flycatcher habitat optimization and monitoring in the Lower Rio Grande for the duration of the project.

For all RPMs, IBWC will monitor the implementation of the RPMs and their associated terms and conditions, and report their status to the Service annually. Ensure that the Service receives electronic copies of all annual or other reports quantifying the spatial extent of dense riparian shrub habitat suitable as flycatcher breeding habitat no later than March 31, 2015, for the preceding calendar year ending December 31, 2014, and annually thereafter. These should be sent to the email address nmesfo@fws.gov or by mail to the New Mexico Ecological Services Field Office, 2105 Osuna Road NE, Albuquerque, New Mexico 87113.

By providing these reasonable and prudent measures, the Service recognized the need to allow IBWC flexibility in achieving and maintaining riparian habitat restoration goals, to accommodate management logistics, differing jurisdictions, natural stochastic events, and local variances in habitat quality and potential. These reasonable and prudent measures provide for substantial progress toward attaining a recovered metapopulation level of flycatchers in the Lower Rio Grande and an amount and distribution of flycatcher habitat and flycatcher breeding habitat sufficient to provide for the long-term persistence of metapopulations and support migration and breeding activity. Therefore, habitat goals for the proposed action can be attained anywhere within the RGCP provided that the proposed critical habitat is not adversely modified and that some accommodation of migratory stopover habitat is provided. Note that any additional flycatchers above the minimum needed within a the Lower Rio Grande Management Unit that may occur within the RGCP are not "excess," and are deserving of the full protection afforded to all flycatchers until the flycatcher is delisted. These population levels above the minimum targets can provide for an important hedge against local catastrophic events, and can colonize other units.

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following conservation activities:

a. Encourage adaptive management of flows and conservation of water to benefit flycatcher and yellow-billed cuckoo habitat in the Lower Rio Grande.

b. Work to secure long-term water sources to support habitat restoration activities in the Lower Rio Grande.

c. Monitor, maintain, and expand riparian habitat restoration areas.

d. Expand the Yeso West Restoration Site further west into the floodplain. Allow river meanders from Yeso Arroyo Restoration Site to push water onto floodplain near the Yeso West Site.

e. Widen the arroyo mouths of Yeso, Placitas, and Angostora Arroyos, within the floodplain and within IBWC lands, to encourage riparian vegetation on swales at high and medium flows within the arroyos.

f. Develop and regularly convene a Flycatcher Lower Rio Grande Recovery Management Unit Implementation Subgroup.

g. Coordinate the reporting of flycatcher survey data and its management, collection, entry, and reporting with the Service and other agencies.

h. Inform partners and the public about tamarisk beetle issues. Continue to improve an understanding about tamarisk using the latest science.

i. Purchase private lands within the floodplain near Bailey Point Bar, Selden Canyon, and Nemexas along with necessary buffer areas to conserve those habitats and restoration options in perpetuity.

j. Trap Brown-headed Cowbirds and control feral hogs, as needed.

k. Monitor ground water levels near Restoration Sites, as needed.

l. Provide for and maintain riparian vegetation along drainage ditches.

RE-INITIATION NOTICE

This concludes formal consultation on the action(s) described in the November 2011 BA. As provided in 50 CFR § 402.16, re-initiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded, that is, when the amount of dense riparian shrub habitat suitable as flycatcher breeding habitat quantified as described above or in the flycatcher management plan is less than 53.5 ac (21.7 ha); (2) new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

IBWC may request the Service to confirm the conference opinion as a biological opinion issued through formal consultation if proposed flycatcher critical habitat becomes designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary. The incidental take statement provided in this conference opinion for activities occurring in proposed critical habitat does not become effective until the critical habitat is designated and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any additional or unanticipated take of the proposed critical habitat has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of proposed critical habitat may occur between the designation of critical habitat and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

In future correspondence on this project, please refer to consultation number 02ENNM00-2012-F-0016. If you have any questions or would like to discuss any part of this Opinion, please contact Joel D. Lusk of my staff at (505) 761-4709.

Sincerely,

Wally Murphy

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Assistant Regional Director, Region 2 (ES), U.S. Fish and Wildlife Service, Albuquerque, New Mexico
Regional Section 7 Coordinator, Region 2 (ES), U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

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